

**Codorus Creek Improvement Partnership (CCIP)**  
**High School Living Classroom Lesson Plan**  
**Watersheds and Wetlands**

Objectives:

- 1) Aid instructors in teaching PA Environmental Education criteria for 4.8.12
- 2) Increase student awareness of local habitat and ecosystems.
- 3) Provide access to tangible teaching materials.
- 4) Introduce the idea of stream restoration and conservation to students.
- 5) Illustrate the positive and negative effects of human interaction with the environment.

Materials:

- 1) Hip boots
- 2) Water testing kit
- 3) Maps
- 4) Stopwatch

Lesson Plan:

- 1) Organize students into groups of four.
- 2) Pass out copies of local stream maps.
- 3) Explain the simple concept of stream order
  - a. Any stream that originates with its own headwaters is a first or primary stream
  - b. Any confluence of two primary streams creates a secondary stream
  - c. Two secondary streams create a third order stream.
  - d. First order streams may dump into second or third order stream but they will remain the same order.
- 4) Have students identify the watershed's stream order from the headwaters of Willis Run out to the Codorus Creek.
- 5) Clarify that the lake is a lentic water body and the stream is a lotic water body. The stream feeds the lake. Explain the effects of the lake on the downstream reaches of Willis Run. The effects include increased nitrates and phosphates from animal waste accumulation in the lake, as well as pollution and increased water temperature.
- 6) Have students discuss what they feel some of the major differences between first, second and third order stream may be (i.e. habitat, aquatic life, and topography, size).
- 7) Supply students with definitions of waterways.
  - a. Headwater- source of a waterway where water originates from.
  - b. Mouth- place where water way dumps into a larger waterway.
  - c. Confluence- where two smaller waterways meet to form a higher order waterway.
- 7) Explain that the headwaters feed water to the streams and rivers. This water comes from runoff and from springs through the process of groundwater recharge.

- 8) Dig up a SMALL section of soil to show students how the soil is moist and will filtrate and purify the water as it runs through it to recharge underground aquifers (use a soil sampler if available).
- 9) Ask students what nutrient pollution is; make sure erosion, nitrates and phosphates are mentioned.
- 10) Have students compile a list of various ways nutrient pollution could reach the stream (erosion, agriculture, home & garden fertilizers, animal waste, and etc).
- 11) Separate students into groups and have each find an example of where these nutrients pollutants might come from around Kiwanis Lake and Willis Run. Try to have each group find a different source (including what might be stuck to the bottom of your shoe!)
- 12) Set up a test for phosphates, nitrates, and turbidity. The instructions are included in the test kit. (Warning! Precipitate resulting from the phosphate test includes cadmium. Do not pour out on the ground or down the drain! This is considered hazardous waste and be collected in a MARKED bottle and returned to CCIP.)
- 13) Have two of each test set up for comparison. One test should be taken above the drainage pipe where the Riparian Buffer was planted. The other should be taken at slightly downstream of the outfall of Kiwanis Lake (see the map).
- 14) Once the tests are complete have the students record the data and fill out the worksheet.

### **Answers to worksheet:**

#### **What effect do you think this stream has on the watershed? Include living and non-living parts of the ecosystem.**

The stream and lake influence the surroundings dramatically. All living organisms around the watershed get water resources from the stream and lake. It provides habitat for endangered species such as the Great Egret, black crowned night heron, and yellow crowned night heron. This watershed also contributes to the Codorus Creek Watershed which the city's drinking water comes from. The stream also supplies a deterrent to flooding problems.

#### **How could the test results above be affected by humans?**

Humans place an abundance of stress on streams and water bodies with their actions. Levels of phosphates and nitrates could be drastically increased by polluted runoff. This runoff could be polluted with fertilizers or animal waste that will increase nutrient pollutants. This runoff could come from urban or agricultural areas. Another problem humans will create is erosion from eliminating riparian buffer zones and damaging stream banks. This erosion will show in the turbidity test.

#### **How could the test results above be affected by natural occurrences?**

Natural occurrences will also play a roll in the nutrient pollutants you are testing for. Though the natural event may only confound the impact of human actions it still contributes. For example increased rain or flooding will increase runoff and erosion. This flooding may also wash foreign chemicals into the stream such as oils. Also winds may damage structures or plants supporting stream banks. Droughts will decrease water table and stream levels. Other possibilities could also affect tests taken.

Key vocabulary:

1. Watershed- the area of land from which runoff from mountains drains into specific streams, rivers, lakes, and finally the ocean.
2. Groundwater- Water that infiltrates the soil and is located in underground reservoirs called aquifers.
3. Homeostasis- The tendency for a system to resist change and remain in a state of equilibrium.
4. Lentic- relating to or living in still water.
5. Lotic- relating to or living in actively moving water.
6. Mitigation- The policy of constructing or creating man-made habitats, such as wetlands, to replace those lost to development.
7. Non-point source pollution-pollution that comes from an unidentifiable source. Example: nitrogen from agricultural runoff.
8. Point source pollution-pollution that is discharged from a specific, identifiable source. Example: literally out of a pipe as with a sewage treatment facility.
9. Recycling- collecting or reprocessing a resource or product to make into new products.
10. Renewable- a natural occurring raw material that will be replenish through natural ecological cycles or through sound management practices (wind, water, trees, light).
11. Sustainability- the ability to keep in existence or maintain. A sustainable ecosystem is one that can be maintained.
12. Groundwater recharge- The process of water soaking into the ground to become groundwater.
13. Aquifers- Holding area for underground water table.