Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Class: \_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Water Pollution Graphing Activity**

**PURPOSE**: To describe and identify the links between land use activities within a watershed and water quality.

**SUMMARY**: Students will evaluate the quality of two “water samples” (bags of candies), graph their results, and form hypotheses about land use, and changes in land use, within the watershed from which their “water sample” was collected.

**BACKGROUND**: A watershed is an area of land from which all the water drains to the same location such as a stream, pond, lake, river, wetland or estuary. A watershed can be large, like the Mississippi River drainage basin, or very small, such all the water that draining into the Pleasant River, which runs past the schools in Windham. Large watersheds (like the Casco Bay watershed) contain many small watersheds.

Watersheds can transport **nonpoint source pollution**. Nonpoint source pollution is associated with rainfall and snowmelt runoff moving over and through the ground, carrying natural and human made pollutants into water sources. Examples of nonpoint source pollutants are fertilizers, pesticides, sediment and gas and oil. Pollutants accumulate in watersheds as a result of various human driven and natural events. These pollutants, while sometimes inevitable, drastically alter the state of the ecosystem. If we can determine the type of pollutant and its cause, then we can classify the source of the pollutant and take preventative measures to reduce the impacts of these contaminants.

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| **Land Use** | **Activities** | **Pollution Problems** |
| Agriculture | Tillage, cultivation, pest control, fertilization, animal waste | Sediment, Fertilizers (nitrate, ammonia phosphate), pesticides, bacteria |
| Construction | Land clearing and grading | Sediment  |
| Forestry | Timber harvesting, road construction, fire and weed control | Sediment, pesticides |
| Human Housing and Industrial Development | Septic systems, lawn and garden care, | Bacteria, Fertilizers (nitrate, phosphate), Toxic Chemicals (PCB’s, dioxins, heavy metals) |
| Surface Mining | Dirt, gravel, and mineral excavation | Sediment, Toxic Chemicals (heavy metals, acid drainage) |
| Urban Storm Runoff | Automobile maintenance, painting, shopping mall parking lots, pavement | Oil, gasoline, antifreeze, pesticides, paints |

**MATERIALS:**

Candy (M&M’s)

Graph paper

Colored pencils

**PROCEDURE:**

1. You will work with one other student, and each pair of students will have two water samples to analyze/graph. Each bag of candy represents a “water sample” from a watershed, and the two water samples that you have are from different times: one was taken in 1980, and the other was taken this past weekend.
2. Define the word pollutant.

Each color of candy represents a different kind of pollutant.

**BROWN** = Sediment

**RED** = Pesticides

**GREEN** = Fertilizers

**YELLOW** = Oil, Gasoline, Salt, Asbestos, Antifreeze

**ORANGE** = Toxic Chemical Waste/Heavy Metals

**BLUE** = Bacterial Waste

Refer to the Land Use Chart on the first page.

1. Where do BROWN pollutants come from (what human activities produce them)?
2. Where do RED pollutants come from (what human activities produce them)?
3. Where do GREEN pollutants come from (what human activities produce them)?
4. Where do YELLOW pollutants come from (what human activities produce them)?
5. Where do ORANGE pollutants come from (what human activities produce them)?

f) Where do BLUE pollutants come from (what human activities produce them)?

1. What are RED pollutants used for (who uses them, and why)?
2. How can YELLOW pollutants be beneficial to humans?
3. How can GREEN pollutants be harmful to the environment?
4. Separate and count the number of each pollutant type in your first water sample (from 1980), then repeat for the second sample (from 2019). **You cannot eat the candies until you are finished with both graphs, and you have checked your work with an adult!**
5. For each water sample, you will draw a bar graph to show the number of pollutants found in the sample. Plot the graph of the 1980 water sample first, being sure to write “1980 water sample” at the top of the graph. After completing the 1980 water sample graph, complete the graph for the newer water sample.
6. EACH partner MUST draw both graphs—check with each other to make sure that your graphs are correct.
7. Using the graphs, you will hypothesize which land use activities might be occurring in your watershed, upstream from where your water samples were collected. For example, a water sample from an area with a lot of agriculture use may have more sediment, fertilizer and pesticides. Refer back to the Land Use Chart on the first page for help.

**Part II) Interpreting your 1980 water sample**

a) Which pollution problems (pollutants) are most common in your 1980 water sample? List them.

b) Using the land use table, identify all of the possible land uses that would produce each of the common pollutants that are found in your 1980 water sample.

c) Based on the specific pollutants that are found in your water sample, what would you think is a human activity that might be going on upstream from where your water sample was collected? Explain.

**Part III) Interpreting your recent water sample**

d) Which pollution problems (pollutants) are most common in your recent water sample? List them.

e) Using the land use table, identify all of the possible land uses that would produce each of the common pollutants that are found in your recent water sample.

f) Based on the specific pollutants that are found in your recent water sample, what would you think is a human activity that might be going on upstream from where your water sample was collected? Explain.

**Part IV) How has land use changed, and why?**

g) Compare your responses to questions c and f. Do you think that the use of the land in the watershed has changed since 1980?

h) What specific changes have taken place in terms of the pollutants found in your water samples?

i) Based on changes in pollutants, and your hypotheses about land use in the watershed, how has land use in the watershed changed since 1980?

j) Why do you think that the land use changed? What specific decisions might have been made about human activity in the watershed since 1980?

k) What is one reasonable hypothesis that could explain why human land use in the watershed changed since 1980?

