Nashua River Watershed Investigations for Grades K-8

Lesson # 3-2

Title: 3-2 Which River Will You Choose?

Grade Level & Standard: Grade 3
3-LS4-4 Analyze and interpret given data about changes in a habitat and describe how the changes may affect the ability of organisms that live in that habitat to survive and reproduce.

Objective: Students will look at oxygen data from two rivers. River #2 will have lower oxygen levels. Students will compare the different macroinvertebrate species in the two rivers to determine that certain species cannot survive in a habitat that has been affected by pollution run-off resulting in lower oxygen levels.

Background: Dissolved oxygen is a vital substance for animals and plants. Plants and animals need oxygen and low dissolved oxygen can result in the death of aquatic animals and plants. Oxygen is used by fish, animals, bacteria, fungi, and plants. When oxygen is in air, it is called oxygen gas. When oxygen is in water, it is referred to as dissolved oxygen. Either way, the oxygen we are talking about is O_2, and not a part of the water molecule, H_20. Because dissolved oxygen is used by fish to breathe, the amount of dissolved oxygen in the water can tell you how healthy the water is for fish and other aquatic organisms.

The amount of dissolved oxygen in the water can be affected by the *types of organisms in the water, the temperature of the water, the movement or flow of the water body, and the amount of organic material in and on the surface of the water.* Photosynthesis in plants increases the available dissolved oxygen. In general, as you increase the flow rate of a water body, you increase the amount of dissolved oxygen in the water. Wind and waves add oxygen.

Conversely, as water becomes warmer, it decreases the amount of O_2 that the water can hold.The amount of organic matter in the water affects dissolved oxygen levels. The more organic matter in a water body, the lower the dissolved oxygen will be due to the decomposition process by bacteria using up oxygen. If bacteria severely reduce the dissolved oxygen level in the water, then larger aquatic organisms like fish suffocate.

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This is one way in which a “fish kill” can occur, and this is the reason an excessive amount of organic matter (sewage, grass clippings, leaves, animal waste) in the water becomes a pollutant.

Vocabulary:

- **Habitat:** the natural home or environment of an animal, plant, or other organism.
- **Dissolved oxygen**: oxygen dissolved in water
- **PPM**: parts per million

Materials:

- Straw with glass of water
- 20 Copies of “Nashua River Watershed Aquatic Invertebrates” key in Lesson 8-1.
- 20 copies of **Dissolved Oxygen and Aquatic Insect Table** below.
- Scissors
- Glue
- White paper (small 9 X 11, poster or mural paper)
- Markers, crayons or colored pencils

Procedure:

1. Demonstrate dissolved oxygen in water with students using a transparent glass half full of water, and a straw by blowing bubbles to add air into water. (clear explanation in background section)
2. Give pairs of students a copy of “Nashua River Watershed Aquatic Invertebrates” key in Lesson 8-1. The invertebrates in the “Good Water Quality” column will be the insects that require high levels of dissolved oxygen. The insects in the “Fair” and “Any” water quality columns, will require less oxygen.
3. Have students look at the data table below and make the connection with the insects that can live in each river.
4. Next have students cut and sort images of these insects. (Find images in Lesson 8-1 *Macro-Speak: How Benthic Macroinvertebrates Help Humans Determine Water Quality*)
5. Have groups, pairs, or individuals draw the two rivers and glue down the insects that can survive in River #1 and River #2,.

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6. Conclusion: Discuss how the high oxygen levels in River #1 provide a different habitat. How are the rivers different? How have insects adapted?

Dissolved Oxygen and Aquatic Insect Table

	Oxygen in water	Aquatic insects that can live in this water.
River #1	10 ppm	Caddisfly Mayfly Stonefly Crane Fly
River #2	5 ppm	Dragonfly Leech Giant water bug

Extension:

If you want to collect your own macroinvertebrate samples and create your own data, refer to lesson 8-1 *Macro-Speak: How Benthic Macroinvertebrates Help Humans Determine Water Quality.* There are three different ways to have students create their own data.

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