Is It Healthy, or in Trouble? *Teacher's Guide*

GRADE LEVEL: 6th – 8th

SUBJECT AREA/COURSE: Earth Science, Life Science, Chemistry, Environmental Science

SUNSHINE STATE STANDARDS:

- Big Idea #1: Scientific inquiry is a multifaceted activity. The processes of science include the formulation of scientifically investigable questions, construction of investigations in to those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation. Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge.
- Big Idea #2: Scientific knowledge is durable and robust, but open to change.
- Big Idea #7: The scientific theory of the evolution of Earth states that changes in our planet are driven by the flow of energy and the cycling of matter through dynamic interactions among the atmosphere, hydrosphere, cryosphere, geosphere, and biosphere, and the resources used to sustain human civilization on Earth.
- Big Idea #17: Plants and animals, including humans, interact with and depend upon each other and their environment to satisfy their basic needs. Both human activities and natural events can have major impacts on the environment.

ACADEMIC OUTCOMES/LESSON OBJECTIVES: Students will learn about water quality through:

- Sharing prior knowledge
- Making observations
- Reading graphs
- Making predictions based on observations
- Testing predictions with LaMotte water chemistry kit.
- Draw conclusions based on evidence gathered

BACKGROUND INFORMATION: A lake's overall health, or Trophic State, depends on many factors (variables). One factor is the nutrient chemistry. The basic nutrient chemistry is based on total nitrogen, total phosphorous, and chlorophyll. These nutrients can be tested using different test kits. If your lake has a LAKEWATCH Volunteer, ask the volunteer to test for chlorophyll with your class.

Another factor is water clarity. Water clarity can be tested using a secchi disc or a turbidity test.

A third factor is dissolved oxygen. This conventional pollution is usually measured by the amount of dissolved oxygen and fecal coliform, which can also be tested. In general, lakes are categorized in four trophic states based on their nutrient levels. Oligotrophic is a fairly low nutrient lake, mesotrophic is a lake carrying a medium nutrient load, eutrophic is a lake with fairly high nutrient levels, and hypereutrophic is a lake with very high nutrient levels. Florida lakes naturally vary in their trophic states. An increase in an overall trophic level might indicate nutrient pollution from outside sources, such as agriculture or urbanization.

MATERIALS NEEDED:

- Lake access
- Internet access with www.pinellas.wateratlas.org bookmarked.
- Test kits for nitrogen and phosphorus, distilled water, milk jugs for chemical waste. (There are no school-age tests for chlorophyll. You may want to test for other-than-nutrient factors, such as dissolved oxygen, pH, temperature, and water clarity.)
- Rubber gloves
- Safety glasses

Name: Date:

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SAFETY:

- Go over basic lab safety
- Go over proper outdoor behavior
- Go over how to properly perform the selected tests

VOCABULARY: Trophic states, variables, nutrients, limiting nutrients, nitrogen, phosphorous, chlorophyll, pollution, dissolved oxygen, fecal coliform, agriculture, urbanization, limnology

KEY: Answers will vary.

TEACHER PROCEDURES:

1. Have test kits ready for students to use.
2. Introduce the topic of Limnology.
3. Ask students why it is important to study freshwater ecosystems
4. Ask students how scientists can determine a lake's health. This is where the teacher would introduce the topic of Trophic States and cover vocabulary terms.
5. Talk about natural patterns and cycles of lakes.
6. Select a lake to which students have access.
7. Pass out lab papers to students and go over procedures with them.
8. Guide students through the internet exercise.
9. When finished gathering the data on the Watershed Atlas, be ready to take the students outside.
10. Assign students into lab groups. If you have enough test kits, more than one group can test each parameter.
11. Bring students back into the classroom to finish their conclusions.
12. Compile class data. As data is shared, check to be sure data reported is logical.

AUTHOR: Lindsey Spalding – Modified from the original lesson plans created for the Seminole County Watershed Atlas.