Profile a Lake *Lesson Plan*

Students practice for the FCAT while studying lake depth, area, volume and water clarity.

Topic: The Orange County Water Atlas provides information about lake size, depth, volume, clarity, and more. Even using this data, it is sometimes difficult to visualize a lake's size because many people aren't sure about the actual size of an acre. By comparing acres to something commonly understood (i.e. the size of a football field), the data on lake surface area becomes easier to understand and use. Similar comparisons for water depth and lake volume are also provided in the article.

Grade Level: 6-8

Performance Objectives

References are to the Next Generation Sunshine State Standards.

Reading

LA.6.1.7.2	The student will analyze the author's purpose (e.g., to persuade, inform, entertain, or explain) and perspective in a variety of texts and understand how they affect meaning.
LA.6.1.7.3	The student will determine the main idea or essential message in grade-level text through inferring, paraphrasing, summarizing, and identifying relevant details.

Writing

LA.6.4.3.1	The student will write persuasive text (e.g., advertisement, speech, essay, public service announcement) that establishes and develops a controlling idea, using appropriate supporting arguments and detailed evidence.

Math

MA.3.G.5.1	Select appropriate units, strategies and tools to solve problems involving perimeter.
MA.6.G.4.1	Understand the concept of pi, know common estimates of pi and use these values to estimate and calculate the circumference and the area of circles.
MA.6.S.6.2	Select and analyze the measures of central tendency or variability to represent, describe, analyze and/or summarize a data set for the purposes of answering questions appropriately.
MA.7.G.2	Develop an understanding of and use formulas to determine surface areas and volumes of three-dimensional shapes.
MA.8.A.6.1	Use exponents and scientific notation to write large and small numbers and vice versa and to solve problems.
MA.7.A.1.2	Solve percent problems, including problems involving discounts, simple interest, taxes, tips and percents of increase or decrease.

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Academic Outcomes/Lesson Objectives:

- Students will select a lake in which a contour map is available for this lesson.
- Students will draw (free-hand) the outline of the lake and approximate the contours from the Watershed Atlas Web Site.
- Students will translate, key and color the maps using prior knowledge of colored physical maps.
- Students will respond to FCAT-type questions or prompts in Reading, Writing and Math.

Time Allotted:

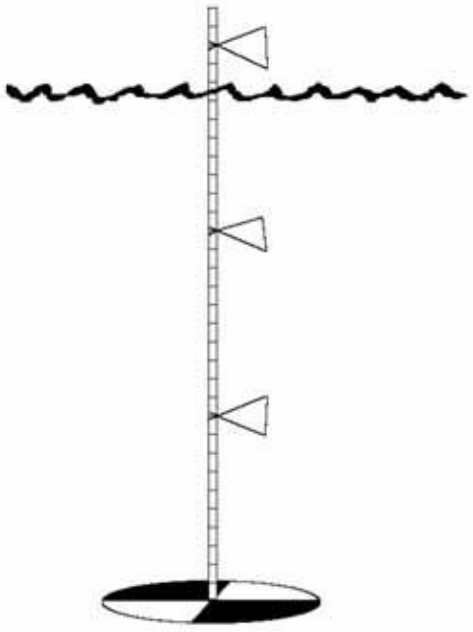
Two class periods of about 50 minutes each (One for website exploration and one for FCAT activities)

Materials:

- Computer with internet access
- Student handout: “Profile a Lake”

Key Vocabulary:

Clarity
Clearness. Whether water is clear or muddy-looking is an indication of how clean it is. Suspended solids in water can prevent sunlight penetration and inhibit the growth of plants. The opposite of clarity is *turbidity.*



Nitrogen
An element that is present in both air and water, is used as a nutrient by plants, and is considered a pollutant when present in water in excess quantity.

Phosphorous
An element that is used as a nutrient by plants, but is considered a pollutant when present in water in excess quantity.

Profile
A sketch or outline that describes something.

Secchi disk
A device used by water scientists to assess the clarity of water (see illustration above). It consists of a flat disk with a black-and-white pattern that is suspended from a rope into a body of water. The depth at which the disk is visible is termed the "Secchi depth".

Tannic acid
One of many naturally occurring organic acids, tannic acid leaches from leaves and other

organic material, giving water a tea or coffee color. The water is not polluted but in its natural condition; it has a low pH.

Volume

A measure of the size of a water body which indicates how much water it contains. Volume may be expressed as a liquid measure (gallons) or as a cubic measure (m^3 or ft^3, e.g.)

Aquatic

Living in water. Aquatic organisms include fish, algae and other plants, mollusks, worms, arthropods, insects, amphibians and even some mammals, like manatees, dolphins and whales.

Answer Key

Reading

1. c. Lake water volume increases as the lake's surface area increases.
2. b. So the reader will recognize the difference between these two similar words.
3. b. The gallons in a tanker truck.
4. Use the rubric for Extended Response Reading Questions – 4 points
   Example of a Top-Score Response:
   "Three pieces of information found on the website might help new homebuyers choose a good lakeside home: lake size, lake volume, and water clarity. The size of the lake is important to homebuyers because a larger lake may have more lakefront houses available and more recreational opportunities for swimming, boating, fishing and water skiing. Lake volume is important because it affects water level. Knowing how much the water level has changed in the past can help homeowners find the best location for a dock. Water clarity is an important component of the environmental, visual, and recreational value of a lake. If the water clarity is low, property values might go down."

Writing

For All – Use the rubric for Florida Writes! – 6 points

Math

Use the rubric for Extended Response Math Questions – 4 points

1. Example of a Top-Score Response:
   circumference = 1,170 feet
   radius = circumference / 2π = 1,170 / (2 x 3.14) = 186.3 feet
   area = π x $radius^2$ = 3.14 x $(186.3)^2$ = 108,985.5 square feet
   acres = 108,985.5 square feet / 43,560 square feet per acre = 2.5 acres
2. b.
3. d. 871.469 ft^3
4. d.
5. b.

Procedure:

1. Preview this FCAT-Friendly activity. Print copies for your students.

2. Preview the Orange Water Atlas.
   a. Go to www.Orange.WaterAtlas.org
   b. Find your school's watershed: Under "Data and Mapping" on the menu bar, choose "Advanced Mapping Tool." A map of the county will appear. On the right of the map, under **Search For**, click on the button for "an address" and click in the text box. Type your school's address (no city). The map that comes up will show the address location and the watershed. (If you want to see more of the map, click on the Zoom Out tool.) Write the name of the watershed:

      _____

   c. Click on the link that says "Return to the page prior to loading the mapping application" to return to the main Water Atlas.
   d. In the **Water Resources Search** box, click the link for **Watersheds**. Find the watershed name you wrote above. Click on it to open the page for that watershed.
   e. In the **General Information** box, click on **List of All Water Resources** in the (name) Watershed. Make note of some nearby lakes, then click on a nearby lake. If the lake doesn't have information, click the back arrow and select another lake.
   f. Look over the General Information for the lake, including its surface area, maximum depth, and approximate volume.
   g. Click on the **Water Quality** tab and note the **Overall Trophic State Index** for the lake. Look at the **Secchi Depth**, a measure of water clarity that tells how far you can see underwater. Can you tell if the lake is clean, or polluted?
   h. Click on the Water Levels & Flows Tab and scroll down to **Bathymetric Maps** (contour map, a depth map of the lake bottom). Read about Bathymetric maps then click on **View Contour Map**. (If the lake does not have a contour map, select another lake in your watershed that does. Find one by clicking on **Topics** in the top menu bar, then scroll down and choose **Bathymetric Maps & Depth Information** to display a list of lakes that have maps.)
   i. Look for the deepest and shallowest areas of the lake. Are they in the center of the lake or dispersed throughout the lakebed? How can the distribution of deep spots affect wildlife and people?
   j. Many lakes are sinkhole lakes. Can you find evidence of a sinkhole, or a cluster of sinkholes?
   k. Select other lakes with contour maps and compare them in terms of their depths and the distribution of deep areas.
   l. Use the contour maps to find each lake's maximum depth. Check the answers by reading the maximum depth information on the lake's general information page.

3. Using the lakes you have located, guide your students on a virtual tour of nearby lakes, or print number 2 a-l above as a guide for independent or small group investigation(s).

4. Have your students estimate the surface area, height/depth, and volume of various items in the schoolyard or in their neighborhoods. Compare these estimates with actual measurements they collect and calculate.

5. Do the FCAT practice activities.

6. Using the information learned in the FCAT practice and on the Orange County Water Atlas, brainstorm real-life situations when estimation is required because actual measurement is impossible or unreasonably difficult. For example, the lake volumes provided on the website are approximate. Due to natural variation in topography and changing water levels, it would be difficult to get an exact lake volume.

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