Tampa Bay Tides *Teacher's Guide*

GRADE LEVEL: 9th- 12th

SUBJECT AREA/COURSE: Math/Science

ACADEMIC OUTCOMES/LESSON OBJECTIVES:

- Students will determine what sensors measure.
- Students will discover where in Tampa Bay sensors are located.
- Students will use real-time data to make observations about habitats in Tampa Bay.
- Students will interpret graphs and draw conclusions.

TEACHER INFORMATION:

Preview the student activity and become familiar with the Real-Time Data Mapping Application tool. The lesson has been broken up to accomodate teacher time constraints. Each lesson can be done separately. If you have time to do all the sections that is fine too. They are labeled part 1, part 2, part 2 cont'd, and take home portion. Check to see when high tide occurs on the day you want to do the lesson. You might want to change the times on the student handout table for the take home potion to make sure high tide occurs at one of the times that data is requested from the student. Tides can be found at http://www.saltwatertides.com/dynamic.dir/tampabaysites.html Select Hillsborough Bay for the Alafia River station tide time and Select Old Port Tampa for the Roosevelt station tide time. Review vocabulary terms on the Hillsborough County Water Atlas Website http://www.hillsborough.wateratlas.usf.edu/help/glossary.asp.
This lesson plan may be used as an introduction to the study of different habitats including mangroves and estuaries.

NOTE: As data is real time and sensors require maintenance, potential discrepancies may exist.

MATERIALS NEEDED: Internet access with www.Pinellas.WaterAtlas.org bookmarked, copies of the student handout and take home portion handout

VOCABULARY: specific conductance, salinity, tide, elevation (water level)

TEACHER WEBSITE RESOURCES:

- Sunshine State Standards can be found at http://www.fldoe.org/bii/curriculum/sss/
- Information about FCAT can be found at http://fcat.fldoe.org/
- FCAT rubric information can be found at http://fcat.fldoe.org/rubrcpag.asp
- More FCAT-Friendly Activities, visit http://pelotes.jea.com

SUNSHINE STATE STANDARDS:
MATH

MA.912.A.2.2	Interpret a graph representing a real-world situation. *Cognitive Complexity/Depth of Knowledge Rating: Moderate*
MA.912.S.3.1	Read and interpret data presented in various formats. Determine whether data is presented in appropriate format, and identify possible corrections. *Cognitive Complexity/Depth of Knowledge Rating: Moderate* Formats to include:
	bar graphs
	line graphs
	stem and leaf plots
	circle graphs
	histograms
	box and whiskers plots
	scatter plots
	cumulative frequency (ogive) graphs

SUNSHINE STATE STANDARDS continued:

SCIENCE

SC.912.L.17.2	Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. *Cognitive Complexity/Depth of Knowledge Rating: High*
SC.912.L.17.3	Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms. *Cognitive Complexity/Depth of Knowledge Rating: Moderate*
SC.912.N.1.1	Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: *Cognitive Complexity/Depth of Knowledge Rating: High*
	1. pose questions about the natural world,
	2. conduct systematic observations,
	3. examine books and other sources of information to see what is already known,
	4. review what is known in light of empirical evidence,
	5. plan investigations,
	6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs),
	7. pose answers, explanations, or descriptions of events,
	8. generate explanations that explicate or describe natural phenomena (inferences),
	9. use appropriate evidence and reasoning to justify these explanations to others,
	10. communicate results of scientific investigations, and
	11. evaluate the merits of the explanations produced by others.
SC.912.N.1.3	Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented. *Cognitive Complexity/Depth of Knowledge Rating: Low*
SC.912.N.1.7	Recognize the role of creativity in constructing scientific questions, methods and explanations. *Cognitive Complexity/Depth of Knowledge Rating: Low*
SC.912.P.8.2	Differentiate between physical and chemical properties and physical and chemical changes of matter. *Cognitive Complexity/Depth of Knowledge Rating: Moderate*

Tampa Bay Tides *Answer Key*

ROOSEVELT CANAL PINELLAS COUNTY:

2. a. What data does this station record? Elevation
   b. How often are the data updated? every 15 minutes for all datamapper sites
   c. What environmental occurrences make up the data (Elevation) at this station? In other words, what would make the elevation change? Rainfall, tidal activity
3. a. Has it rained in the last 7 days? Varies depending on when you access the site
   b. If so, did it rain every day? Varies depending on when you access the site
   c. If not, why is the elevation changing? In order to answer this question, you might want to close the station data box and zoom in to the station on the map. Think about where the station is and what kind of water it is measuring (saltwater or freshwater). High tide, low tide
   d. In the last 30 days how many high tides have there been? How many low tides? What are the elevations of the highest and the lowest tides? Varies depending on when you access the site.

4. Based on this tidal data, what types of organisms would you expect to find in this environment? Why? An answer that is something like: organisms that are not sensitive to salinity fluctuation, crabs, turtles, wading birds, some types of fish, look up estuaries-they are extremely productive areas of habitat

5. Why do we need this equipment that measures and records real-time data? Why is this information important and to whom? Environmental conditions change very frequently. Certain environmental projects require this type of data. The information allows for a snapshot view of the water quality happening in that area and can be used to make long term trends for water quality restoration and protection.

ALAFIA RIVER HILLSBOROUGH COUNTY:

2. a. What data does this station record? Elevation (water surface), specific conductance, temperature (water)
   b. What is specific conductance? It is the ability of water to conduct an electrical current. It is an early indicator of changes in water quality because industrial and municipal pollution increase conductivity. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity.
   c. How does specific conductance relate to salinity? The saltier the water – that is the higher the concentration of salts – the more rapidly the current will pass through it. Similarly 'salinity' refers to the amount of salts dissolved in water, any water, and that includes "freshwater". Generally speaking, the salts that constitute salinity in oceans are the same as those in lakes and rivers; the amount (concentration) of those salts is of course much higher in oceans. An estuary can exhibit a change in salinity throughout its length as fresh water entering from the tributaries mixes with seawater from the ocean. Salinity is a measure of the amount of salts in the water usually measured in parts per thousand (ppt). The salts in sea water are primarily sodium chloride (NaCl). Because dissolved ions (Na+ and Cl-) increase salinity as well as conductivity, the two measures are related.
   d. Are changes in specific conductance physical or chemical changes? Why? Physical properties of substances can be explained in terms of chemical bonds and intermolecular forces. Some of these properties include conductivity, solubility, melting point, and boiling point. Physical property changes of matter do not produce a new substance. Conductivity is a physical characteristic. It is expressed in a chemical magnitude [millisiemens per centimeter (mS/cm)] but is a physical property of water.
   e. How do conductivity and salinity relate to the distribution of aquatic organisms? Every kind of organism has a narrow salinity range that it can tolerate, same applies for a conductivity range. When salinity changes to above or below this range, an organism may lose the ability to regulate its internal ion concentration. Indeed, 'osmoregulation' may become so energetically expensive that the organism dies due to the direct physiological effects or it becomes more vulnerable to biotic pressures such as predation, competition, disease or parasitism. Salinity is also an important control on the types of invasive species that can occur in a coastal waterway, Studies of inland freshwaters indicate that streams supporting good mixed fisheries have a conductivity range between 0.150 and 0.500 millisiemens per centimeter (mS/cm). Moreover, the ionic composition of the water can be critical. For example, some organisms are far more sensitive to potassium chloride than sodium chloride at the same concentration.
   f. How often are the data updated? Every 15 minutes for all datamapper stations
   g. When were the last data recorded at this station? Varies depending on when you access the site.

Tampa Bay Tides *Answer Key*

ALAFIA RIVER HILLSBOROUGH COUNTY:

3. Click on the 24-hour, 7-day, and 31-day graphs and answer the following questions:

a. What are the high and low values on the 24-hour conductivity graph? Varies depends on when you access the site

b. Do you see a pattern in the 7-day graph for conductivity? What are the possible causes? Typically the answer would be yes there is a pattern of one or two highs and lows which would be caused by incoming and outgoing tides depending on the season.

c. Looking at the 7-day temperature graph, why do you think the temperature changes? (Hint the vertical lines in the graph are midnight temperatures) hot during the day, cooler at midnight. The earth rotating around the sun. Solar heating, etc. any of these answers.

d. In the last 30 days how many high tides have there been? What are the elevations of the highest and lowest tides? Varies depends on when you access the site.

LINKING CONDUCTIVITY TO TIDES:

1. At high tide at this station, would there be a higher or lower flow of freshwater? As the tide comes into the mouth of the river, it mixes with the freshwater as far as possible back upstream in the river so the flow of freshwater would be lower during high tide.

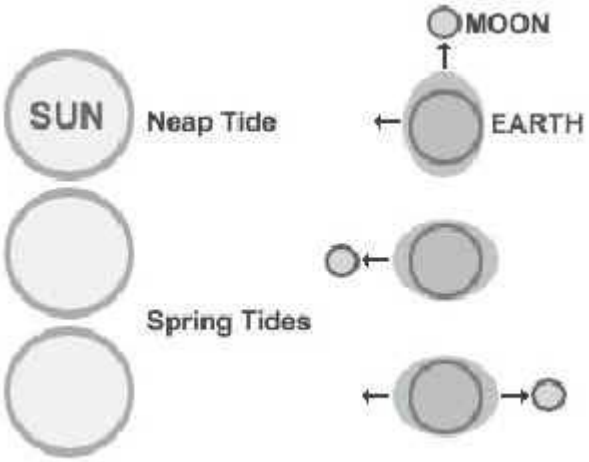
2.How would this impact salinity? The area would exhibit a change in salinity throughout its length as the saltwater from the incoming tide mixes with the freshwater from the river. Salinity readings would be higher at the station as more saltwater would be present than freshwater.

3.What does this mean in terms of conductance? The saltier the water – that is the higher the concentration of salts – the more rapidly the current will pass through it. The specific conductance or "conductivity" is the ability of water to conduct an electrical current. The higher tide means saltier water hence higher conductance.

4. Explain how the wet season vs. the dry season would affect conductivity. Conductivities of freshwaters can increase during dry times as water evaporates and allows salts to concentrate. Conversely, high rainfall can reduce the salinity. Therefore, data may vary with extreme weather events such as droughts and floods.

5. Using the space below, draw the position of the earth and moon during high and low tides.

Notice as the moon rotates around the earth the tide is pulled with it. You can discuss Neap & Spring tides and their relation to the sun if you wish.



Name: Date:

Tampa Bay Tides *Answer Key*

6. Explain the relationship between gravity and tidal cycle. Simply- the water of the entire world is pulled by the moon's gravity. More detail-Tides are influenced by the gravitational pull of the moon and the sun, along with other factors. As the moon orbits around the Earth its gravitational pull creates a bulge of water. A bulge simultaneously occurs on the other side of the Earth away from the moon. These bulges represent high tide, while the areas between the bulges experience low tide. The world's oceans subsequently rise and fall in response to the position of the moon and sun. Tides are higher when the Earth is closest to the moon and strongest overall when the moon and sun are aligned, increasing the total gravitational pull.

Name: Date: