Conductivity *Teacher's Guide*

GRADE LEVEL: 6th- 8th

SUBJECT AREA/COURSE: 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 INSTRUCTIONS:
This teacher's guide is to be used for the following student handouts: Elevation & Tides in Tampa Bay, Linking Conductivity to Tides, and Conductivity in the Alafia River advanced student. The advanced student version is a cumulative lesson from the 2 previous listed student handouts. Preview the student activity and become familiar with the Real-Time Data Mapping Application tool. 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 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.

BACKGROUND INFORMATION: For the comparing stations section, you should notice the geographical location of each station. Alafia River is at the mouth of the river open to tidal influence. Roosevelt is behind a mangrove shoreline with no direct tidal source; hence time for the tide to be recorded will be slower. Salinities in near-coastal waters such as these two sites, vary seasonally and are influenced by the in-flow of freshwater or lack thereof. 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. Salinity (and conductivity) data are compared historically. This means that data collected at a sampling location (referred to as a sampling station) through this year are compared with data collected at that station last year, the year before and so on. Data have been collected for much longer periods at some stations than at others, and this may influence the trend (how the data indicate salinity is changing) at that station.

MATERIALS NEEDED: Internet access with www.Pinellas.WaterAtlas.org bookmarked, copies of the student 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:
SCIENCE:

6th Grade

SC.6.N.1.1	Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. *Cognitive Complexity/Depth of Knowledge Rating:* High

Conductivity *Teacher's Guide*

SUNSHINE STATE STANDARDS:
SCIENCE continued-

6th Grade

SC.6.P.13.2	Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are. *Cognitive Complexity/Depth of Knowledge Rating:* Low

7th Grade:

SC.7.N.1.1	Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. *Cognitive Complexity/Depth of Knowledge Rating:* High
SC.7.L.17.3	Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites. *Cognitive Complexity/Depth of Knowledge Rating:* High

8th Grade:

SC.8.N.1.1	Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. *Cognitive Complexity/Depth of Knowledge Rating:* High
SC.8.N.1.6	Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence. *Cognitive Complexity/Depth of Knowledge Rating:* Moderate

MATH-

6th Grade:

MA.6.A.3.6	Construct and analyze tables, graphs and equations to describe linear functions and other simple relations using both common language and algebraic notation. *Cognitive Complexity/Depth of Knowledge Rating:* High

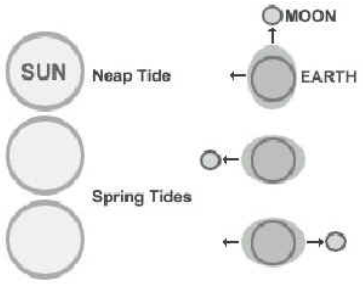
8th Grade:

MA.8.A.1.1	Create and interpret tables, graphs, and models to represent, analyze, and solve problems related to linear equations, including analysis of domain, range and the difference between discrete and continuous data. *Cognitive Complexity/Depth of Knowledge Rating:* High

Conductivity *Answer Keys to related lesson plans listed above.*

1-3 are step by step instructions for finding the data.

4. A. What data does this station record? Elevation (water surface), Specific Conductance, Temperature (water)
   B. What is specific conductance? 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.
   C. Click the link "Salinity Learn More". Under the salinity heading, click the link "learn more about salinity". 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.
   D. How often is the data updated at the Gibsonton station? Every 15 minutes at EVERY station in the datamapper
   E. When was the last data recorded? Varies depending on what time you access the site
5. Click on the 24-hour, 7-day, and 31-day graphs and answer the following questions: ALL data varies depending on when you access the site.
6. 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.
7. 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.
8. 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.
9. 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.
10. In the last 30 days how many high tides have there been? What are the elevations of the highest and lowest tides? Varies depending on when you access the site
11. 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.

12. 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.