Water Quality & Velocity Teacher's Guide

Subject: Integrated Science (Life; Earth-Space; Physical)

Topics: Coastal River System, Water Quality, Salinity, Density

Summary: From the ANERR research vessel, students will use various types of water monitoring equipment to explore selected parameters of water quality (primarily salinity) and quantity (primarily velocity and discharge) to gain a better understanding of the dynamics of river water entering the Apalachicola Bay.

Objective(s): After completing the field lab, students will be able to:

1. Operate selected water quality field equipment
2. Collect and interpret water quality data

Ecosystem(s): Coastal Wetlands; Rivers, Estuary

Equipment:

- Refractometer (salinity)
- Secchi Disc
- Flow Meter (flow rate)
- Bottom Dredge (bottom sediment)
- GPS
- Data sheet & clipboard
- YSI Multi-meter

Background (Pre-field Classroom Activity)

- Reference Material: Project WET *Back to the Future* (pg. 293), USGS How Stream flow is Measured (part 1 & 2): http://ga.water.usgs.gov/edu/measureflow.html, Salt Wedge in Estuaries, Current speed/velocity and discharge (volume)
- Vocabulary: Crossword, Vocabulary, Word Search (Pre-activities)
- Equipment Training: In-class demonstrations as recommended

Field Lab Procedure/Steps

1. Students disembark from bus to docking location on River.
2. Ask students to imagine what would happen when a muddy creek flows into a clear lake. Make sure they describe what happens to the speed of the water as well as the quality of the water.
3. Students will be divided into groups of approximately four. Each small group will rotate through five equipment stations (refractometer, secchi disc, flow meter, bottom dredge, YSI)
4. At the first river location the instructor will demonstrate the use of each piece of equipment while the students record the readings on their data sheets.
5. The boat will then move to the second location (up-river) where the students will use the equipment to collect and record their own readings by rotating through each of the equipment stations.
6. Discuss the results with special emphasis on the differences in the velocity of water and the salinity of the water. How might these influence the other parameters (e.g., clarity)..

Sunshine State Standards

Science: SC.A.1.3.1, 3; SC.C.1.3.1; SC.D.1.3.1,3,5; SC.D.2.3.2; SC.G.1.3.4; SC.G.2.3.2,3,4; SC.H.1.3.2,4,6,7; SC.H.2.3.1; SC.H.2.3.7
Language Arts: LA.A.1.3.3; LA.B.2.3.1; LA.C.1.3.1
Mathematics: MA.A.4.3.1; MA.B.2.3.1; MA.B.4.3.1; MA.E.2.3.1
Social Studies: SS.A.6.3.2; SS.B.2.3.9

Water Quality & Velocity Student Data Sheet

General Information

Full Name:		Date:	
School (teacher):		Time:	
Latitude:	Enter in tables below	Longitude:	Enter in tables below

Hypothesis

I hypothesize that sediment size will be (Choose one: **smaller/ larger)** where current is faster because…_____

_____.

Field Observations/Measurements/Data

Location #1: Mouth of River

(Time: Lat: Long:)

Secchi Disk	**Flow Meter**	**YSI**	**YSI**	**Bottom Dredge**	**Refracto-meter**
Visibility (feet)	**Flow** (count)	**Temp**. (C)	Dissolved O_2 (%saturation)	**Sediment** (size texture*)	**Salinity** (ppt)

Location #2: Up-River

(Time: Lat: Long:)

Secchi Disk	**Flow Meter**	**YSI**	**YSI**	**Bottom Dredge**	**Refracto-meter**
Visibility (feet)	**Flow** (count)	**Temp**. (C)	Dissolved O_2 (%saturation)	**Sediment** (size texture*)	**Salinity** (ppt)

Water Quality & Velocity **Assessment**

1. At which location was the visibility lowest (that is, higher turbidity)? Why?

2. At which station was the salinity highest? Why?

3. At which location was velocity (current) highest (that is, which location had the highest flow meter count)? Why?

4. If salty water from the bay is more dense than freshwater coming from the river, which of the two (salty or fresh) would you be more likely to find on top (that is, closer to the surface) where the two meet? Why?

Optional Assessment

1. Calculate the water velocity for each station location as follows:
   Water flow velocity (V) m/s = (0.000854 x flow meter count) + 0.05
2. Calculate the discharge volume (Q) for each station location as follows (see below for depth* and width** information): Discharge Volume (Q) cubic m/s = Depth (D) x Width (W) x Velocity (V)

*Average depth at Location #1 = 1.5 meters; Average depth at Location #2 = 2.0 meters
**Average width at Location #1 = 200 meters; Average width at Location #1 = 100 meters

Portfolio Journal Prompt

People often associated water bodies (springs, lakes and rivers) with family and community because of how those water bodies have been used in the past. Before you begin writing, think about a water body that has some special meaning to you, your family or your community. Now, explain why that body of water has special meaning and how much you might be willing to pay to preserve it.