

## Salt Spring Water Quality

## Teacher's Guide

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

**Topic:** Record keeping and sampling of abiotic factors within an ecosystem.

**Summary:** Students will use various types of equipment to explore selected parameters of water quality to gain a better understanding of the dynamics of the abiotic factors influencing aquatic ecosystems. After completing the field lab, students will be able to:

**Objective(s):**

1. Use water quality equipment properly and record data using proper units of measurement.
- 2.

**Ecosystem(s):** Salt Spring

### Equipment:

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|-------------------------|------------------------|---------------------------|
| • First Aid Kit         | • Dissolved Oxygen kit | • Eye Dropper             |
| • Safety goggles        | • Armored Thermometer  | • Lens or tissue paper    |
| • Gloves                | • Ph Probe             | • Waste container         |
| • GPS unit              | • Turbidity Tube       | • Clean water squeeze     |
| • LaMotte, Inc. sampler | • Refractometer        | • Data Sheet & Clipboards |

### Background:

- Vocabulary: Parameter, abiotic, Salinity, D.O. , turbidity, pH
- Reference Material: NERRS <http://www.nerres.noaa.gov/Monitoring/Water.html>. Data form adapted from CBA <http://www.basinalliance.org/> Methods adapted from Bayou side classroom <http://www.lumcon.edu/education/studentdatabase/>
- Equipment Training: Students should be given an overview of the equipment and importance of parameters before entering the field.

### Procedure (Engage; Explain; Explore)

1. Engage the students by asking specific questions that gets to the heart of the activity: If salinity in the ocean is usually 35ppt, what do you think the salinity in the
2. Go over safety procedures. Wear gloves and goggles to protect skin and eyes, all waste should go into the waste container and be properly disposed of after returning from the field, etc.
3. Explain the importance of each parameter and how it supports life in this aquatic ecosystem.
4. Explore the following Parameters. Follow the procedures according to the directions for each instrument.
  - a. Take Longitude and Latitude, time of day, tide and weather conditions. Explain why it is important to note this data when doing a field study.
  - b. LaMotte, Inc. Sampler: explain how the sampler rinses the DO bottle 5 times as the sampler fills up. Let the sampler fill until the bubble stop.
  - c. DO: carefully add chemicals to the according to the directions of the test kit.
  - d. Temperature: hold the thermometer in the sample water within 1 minute of obtaining the sample
  - e. PH: use the PH pen or the PH test kit according to equipment instructions.
  - f. Turbidity: two students use a turbidity tube according to instructions.
  - g. Salinity/conductivity: use a refractometer for salinity in brackish or salty water. The pH pen also can be used to take salinity and conductivity.
5. Use the students' answers to ascertain what they already know, clarify any misconceptions, and then ask them to formulate their own hypothesis relating to their own expectations of the outcome of the lab.
6. Elaborate the prior discussion about abiotic factors. How do the parameters affect the survival of organisms within the water column? Evaluate the students understanding of the interconnectiveness of the ecosystem by answering the discussion questions.

### Sunshine State Standards:

**Science:** SC.D.1.3.3, SC.F.1.3.1.7.1, SC.G.1.3.4.7.2, SC.G.2.3.2.7.1, SC.G.2.3.2.7.3, SC.G.2.3.4.7.1

**Math:** MA.A.1.3.1, MA.A.1.3.2, MA.A.4.3.1, MA.B.3.3.1, MA.B.4.3.1, MA.B.4.3.2, MA.D.1.3.1, MA.D.1.3.2, MA.E.1.3.1, MA.E.3.3.1

**Geography/Social Studies:** SS.B.2.3.6 NATIONAL GEOGRAPHY STANDARDS: #4, #8

**Language Arts:** LA.C.1.3.1.7.1, LA.C.1.3.4.7.1, LA.C.1.3.4.7.4, LA.B.1.3.2.7.1, LA.B.1.3.2.7.3

# Salt Spring Water Quality

# Student Data Sheet

## General Information

Full Name:		Date:	
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## Student Hypothesis and Rationale

If the salinity of the ocean is 35 ppt and this area is tidally influenced, and the water coming out of the Salt Spring is saltwater, then I predict the salinity of this water to be \_\_\_\_\_ppt, because\_\_\_\_\_

\_\_\_\_\_.

## Field Observations/Measurements/Data

	Group name	Group name	Group Name	Average
Location:				
Time:				
Weather conditions:				
Cloud cover:				
Air Temperature:				
Water Type: Ground water/ surface water				
Feature:				
Depth of water sample:				
Water temperature:				
Color of water:				
Transparency:				
pH:				
Conductivity:				
Salinity:				
D.O.				
Nitrate:				
Phosphate:				

# Salt Spring Water Quality

# Assessment

1. What was the measurement and unit for Salinity? What does this measurement help you determine about the water body?

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2. Compare your Dissolved Oxygen results to the Dissolved Oxygen reference chart. Was the D.O. High, low or in the mid range? What are some causes for D.O. levels to change in this aquatic environment?

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3. Was your hypothesis supported by your data? Whether your hypothesis is supported or not, what can you infer from your observations, measurements, and results?

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4. In some salt springs around the world there is a halocline visual effect that looks like oil and water mixing where saltwater and freshwater mix. There is also high biodiversity in these areas. Explain why you think the biodiversity levels would be higher in an aquatic environment that has both fresh and salt water.

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5. Think about the observations you have just made. Did the activity raise new questions? Write a short question (start with “What, Why, Where, When, or How”) about something you want to learn more about.

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## Water Quality

## Range Reference Chart

### Dissolved Oxygen

5-6 ppm	Sufficient for most species.
<3 ppm	Stressful to most aquatic species
<2 ppm	Fatal to most species

### Temperature: preferred temperature range for aquatic organisms

Bacteria	Live in all temperatures!
Algae and other green water plants	55- 100 degrees F 13-38 degrees C
Most aquatic animals	55-100 degrees F 13 – 38 degrees C
* Best range for a healthy aquatic ecosystem	55-80 degrees F 13 – 26 degrees C

### pH: preferred pH ranges of aquatic organisms

Bacteria	1.0 – 13.0
Algae and other green plants	6.5 – 13.0
Lower animal forms like snails	7.0 – 9.0
Most aquatic animals * Best range for a healthy ecosystem.	* 6.5 – 7.5

Acids have a low pH, Bases have a high pH

### Salinity

Fresh water	<0.05 ppt
Brackish water	0.05 – 17 ppt
Ocean	35 ppt

**Clarity-** the measure of how deep light can penetrate through a body of water.  
Secchi disk in meters

