

Water Quality (Stormwater Ditch)

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 waterbodies that are impacted by human influence.

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

1. Understand what nonpoint source pollution is.
2. Review water quality parameters and understand what nitrates and phosphates are, the sources of each, and how they are taken up by aquatic plants.
3. Use water quality equipment properly and record data using proper units of measurement.

Ecosystem(s): Freshwater

Equipment:

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

Background:

- Vocabulary: Parameter, abiotic, Salinity, Estuary, D.O., nonpoint source pollution, nitrate, phosphate
Reference Material: NERRS <http://www.nerrs.noaa.gov/Monitoring/Water.html>
Data form adapted from CBA <http://www.basinalliance.org/>
Methods adapted from Bayouside 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)

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

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Student Data Sheet

General Information

Full Name:		Latitude:	
Date:		Longitude:	

Student Hypothesis and Rationale

If nonpoint source pollution is a problem at this location then there will be (Choose one: high or low) nutrient levels in the ditch because... _____

Field Observations/Measurements/Data

	Group name:	Group name:	Group Name:	Average
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:				
Salinity:				
D.O.:				
Nitrate:				
Phosphate:				

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Range Reference Chart

Dissolved Oxygen

5 ppm or greater	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

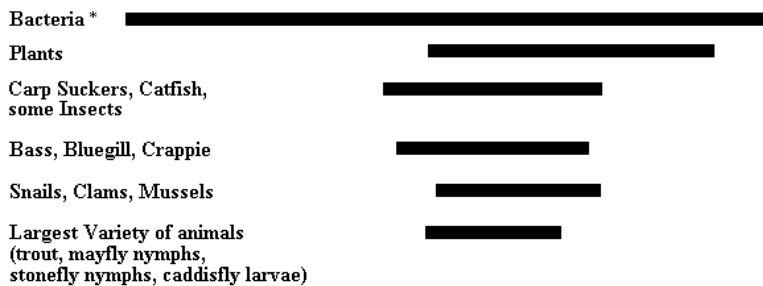
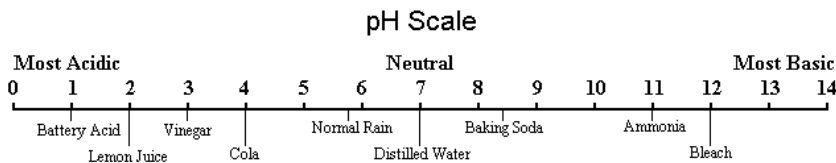
pH: preferred pH ranges of aquatic organisms

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

Salinity

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

Acids have a low pH, Bases have a high pH



*Line indicates the pH level at which the selected organism(s) can survive.

Clarity- the measure of how deep light can penetrate through a body of water.

Secchi disk in meters



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Discussion Questions

1. What was your measurement and unit for Nitrates at this location? If <1 ppm, what do you think happened to the nitrates in the water?

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 an aquatic environment?

3. Look at your hypothesis. Was it supported by your data? Whether your hypothesis is supported or not, what conclusions can you come to based on your observations, measurements, and results?

4. There is an active highway and parking lot very close to this ditch. Describe how the water moves during a rain storm. What types of substances make their way to the ditch via stormwater runoff?

5. Do you think there would be a seasonal pattern for Nitrate and Phosphate readings? Why or why not? Do you think that the reading would be higher or lower in midsummer than it was today?

6. 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.
