

## Water Quality

## Teacher's Guide

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

**Topic:** Water quality, non-point source pollution, yard waste, parameter, and stormwater runoff

**Summary:** Students will use various types of water monitoring equipment to explore selected chemical and physical parameters of water quality (temperature, dissolved oxygen, pH, water flow, salinity, turbidity and turbidity) in Freedom Park Stormwater Treatment Facility to gain a better understanding of impacts on Golden Gate canals, Naples Bay and the Gulf of Mexico.

After completing the field lab, students will be able to:

**Objective(s):**

1. Use a variety of water quality test kits and Vernier probes.
2. Use their test data to infer the health of canals and subsequent impacts on Naples Bay and the Gulf of Mexico.

**Ecosystem(s):** Freshwater canal

### Equipment:

- Water test kits
- GPS Receiver
- Vernier Probe
- Data sheet & clipboard
- Waste container
- Turbidity tube
- Safety glasses
- Vinyl gloves

### Background:

- **Vocabulary:** parameters, non-point source pollution, estuary, salinity total nitrogen, turbidity, dissolved oxygen, phosphate, nitrate, coliform and pH
- **Reference Material:** Yard Waste and Water Quality: <http://www.ianrpubs.unl.edu/e-public/live/g1855/build/g1855.pdf> ; <http://www.uri.edu/ce/healthylandscapes/>
- **Equipment Training:** Water quality test kits, GPS; Equipment Training: Students should be given an overview of the equipment and importance of parameters before entering the field.

### Procedure (Engage; Explore; Explain)

1. Ask the students: What are canals built for? Does this canal lead to other water bodies? Does the water quality in this canal affect what the water quality will be in places downstream? 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.
2. Students will be divided into two groups. Each group will have a student(s) that will be responsible for the following: (1) data recorder (all students will record data on their data sheets after it has been collected), (2) dissolved oxygen measurer, (2) turbidity measurer, (1) temperature measurer, (1) pH measurer and (1) GPS and site assessor.
3. Each group will be assigned a pre-determined station and then rotate to the other stations. Protocol: Wear gloves and eye protection when told to do so. After completing each test, dispose of waste materials in designated buckets. Clean test equipment for the next group to use.
4. After completing the lab, allow the students to answer the discussion questions as a group and explain their answers relating them to the concepts, processes and skills associated with the activity. Students should record their answers individually. At this time, facilitators can introduce/explain the specific concepts and explanations in a formal manner.

### Sunshine State Standards:

**Science:** Big Idea 17: SC.7.L.17.3; 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;

**Language Arts:** LA.7.1.6.1; 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; **Mathematics:** Big Idea 1;

MA.7.A.1.1; 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

**Social Studies:** SS.7.G.6.1; SS.B.2.3.6

# Water Quality

# Student Data Sheet

## General Information

|                   |  |       |  |
|-------------------|--|-------|--|
| Full Name:        |  | Date: |  |
| School (teacher): |  | Time: |  |

## Student Hypothesis and Rationale

If surface water is contaminated before treatment, then I expect the least amount of pollution at (Retention Pond, Flood Plain, Gordon River) because \_\_\_\_\_

\_\_\_\_\_

## Field Observations/Measurements/Data

| Parameter                                       | Freedom Park<br>Retention Pond | Freedom Park<br>Flood Plain (1 <sup>st</sup><br>Platform) | Freedom Park<br>Gordon River<br>Headwaters (2 <sup>nd</sup><br>platform) | Golden Gate<br>Canal | Naples Bay |
|---|--------------------------------|---|--|----------------------|------------|
| Time:   |                                |   |  |                      |            |
| What type of waste is present (if any)?         |                                |   |  |                      |            |
| Density of vegetation:<br>(Low, Moderate, High) |                                |   |  |                      |            |
| Water temperature:                              |                                |   |  |                      |            |
| Water flow rate:                                |                                |   |  |                      |            |
| Salinity:                                       |                                |   |  |                      |            |
| Phosphate:                                      |                                |   |  |                      |            |
| Nitrate:  |                                |   |  |                      |            |
| Coliform:                                       |                                |   |  |                      |            |
| Turbidity:                                      |                                |   |  |                      |            |
| pH:   |                                |   |  |                      |            |
| D.O.:   |                                |   |  |                      |            |
| GPS Reading<br>(Latitude and Longitude)         |                                |   |  |                      |            |

## Water Quality

## 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             |

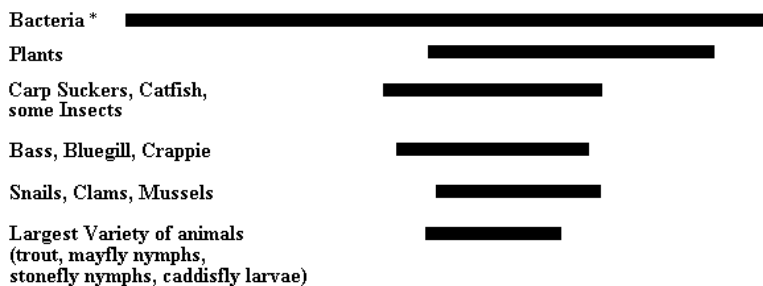
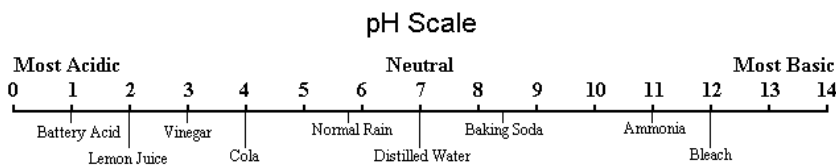
### Temperature: preferred temperature range for aquatic organisms

|  |                                    |
|--|------------------------------------|
| 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                  | * 6.5 – 7.5 |
| * Best range for a healthy ecosystem. |             |

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



## Water Quality

## Assessment

1. What is the relationship between nitrates and dissolved oxygen? What is the relationship between nitrates and coliforms?

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2. Which site(s) had the most dense vegetation? Which site(s) had the highest flow rate?

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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. Which site had the least amount of pollution? What factors do you think accounted for this?

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5. How do the amount of vegetation and the flow rate affect the level of pollution?

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6. Think about what you learned in this lab; has it generated any new questions? Write a new question about something you want to learn more about.

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