

## PROJECT INSPIRE LESSON PLAN

# HYDROLOGY WORKSHOP

### Curriculum Objectives

In this workshop, students will learn about various aspects of hydrology. Students will have the opportunity to conduct experiments and gather data to explore relationships freshwater and saltwater systems.

### Materials

- Carolina Low Country Impressions by Alexander Sprunt Jr. with illustrations by J.H. Dick
- Refractometer
- DO strips
- Secchi disk or turbidity kit
- Large plastic tub and at least four smaller wide containers
- pH strips
- Water collection bottle on stick
- ~4 Magnifying glass
- Liter Coke bottle prop
- 2 Plastic thermometers
- Large plastic tarp for students to sit
- Notebooks and pencils
- Worksheets (2)

### Activity 1: Freshwater Pond Lesson

- Students measure water quality parameters to gather quantitative data and compare unique aspects of freshwater and saltwater ecosystems.
- Students explore depictions of Lowcountry habitat through artwork.
- Students have the opportunity to employ scientific drawing to learn about the defining characteristics of plant and animal life.

The lesson begins by taking students out to a pond at Stono Preserve or other local area. Water quality measurements, including temperature, turbidity, pH, dissolved oxygen, and salinity will be measured either by the teacher or the students (depending on their age). As measurements are taken, students are instructed to record the measurements in their notebook. Throughout the process, explain what each measurement is for and how it connects to water quality. Also consider what kind of pollution may have entered this environment.

### Details

**Location:** Stono Preserve

**Lesson:** Outdoors

**Activity:** Outdoors

**Time of year:** Anytime

**Age:** Elementary - Middle school

## Procedure/Questions for Consideration

### 1. Temperature

- a. Do you think the pond water will be hotter or colder than the air?
  - i. Have students make a hypothesis
- b. Have one student measure water temperature (place thermometer in water sample), have one student hold a thermometer to measure air temperature.
- c. Have students give their measurements. Explain that scientists use Celsius.
- d. How does temperature affect organisms living here?

### 2. Turbidity: the clearness of the water

- a. Have another student or two measure turbidity
- b. What might increase turbidity of water?
- c. How does turbidity affect organisms living here?

### 3. pH: measures acidity

- a. pH is measured on a scale of 0-14
  - i. Lower numbers are acidic, 7 is neutral, and higher numbers are basic
- b. What number do you think water will be?
- c. What are some other examples of acidic liquids?
- d. How does pH affect organisms living here?

### 4. D.O.: dissolved oxygen

- a. Have one or two students measure D.O. using strips
- b. Why is it important to have oxygen in the water? (fish need to breathe)
- c. Lead a discussion on ways the pond gets reoxygenated seasonally: wind, rain... Does it? How does the duckweed hinder/help this process?
- d. What does the pond look like seasonally? (pics of pond through the seasons)
- e. How does oxygen get removed from the water?
- f. What happens if there is not enough oxygen in the water?

5. Salinity: how salty the water is

- a. Ask them if they have a suspicion of whether the pond water is salty or not.
- b. Introduce the refractometer and show them how to handle it and briefly explain how it works.
- c. Pass around refractometer
- d. Ask them how they measured salinity in the classroom. Explain ppt (parts per thousand) by showing 20mL of salt in liter Coke plastic bottle and dissolving it in water. Give a reading of the coke bottle solution with the refractometer and have students pass it around to see the salinity reading.
- e. How does salinity affect organisms living here?
- f. Do we expect this pond to have higher or lower salinity than the ocean?

Once water quality measurements have been taken, transition to the art and observation part of the lesson. Here students will be shown an example of John Henry Dick's nature drawings and shown examples of scientific drawing versus artistic drawing.

1. Stippling: the art or process of drawing, painting, or engraving using numerous small dots or specks.
2. Cross-hatching: Crosshatching is an extension of hatching, which uses fine parallel lines drawn closely together to create the illusion of shade or texture in a drawing. Crosshatching is the drawing of two layers of hatching at right-angles to create a mesh-like pattern.

Explain that students are going to draw their observations of pond organisms and can use the stippling or cross-hatching techniques.

Collect pond organisms in tubs and distribute among the students in groups of 3 or 4. Once everyone's settled, give them magnifying glasses and ask them to observe the organisms in their observation tubs. While they set out to drawing their specimens, go by each group and discuss what they observe (make ID books?).

Follow-up question: How do scientific drawings help us learn about our environment?

## **Additional Resources**

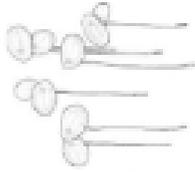
- [How To Stipple \(video\)](#)
- [Stipple Portrait Tutorial \(video\)](#)
- [Crosshatching for Beginners \(video\)](#)
- [Introduction to Scientific Sketching \(lesson plan\)](#)

NAME \_\_\_\_\_

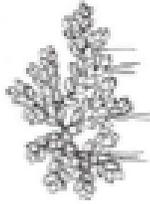
# What's that in the pond?

Bin Number \_\_\_\_\_

1. Draw a map of the bin and label the plants you find using the correct letter (A-E).



A. Duckweed



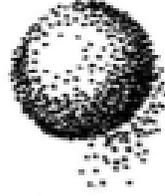
B. Mosquitofern



C. Watermeal

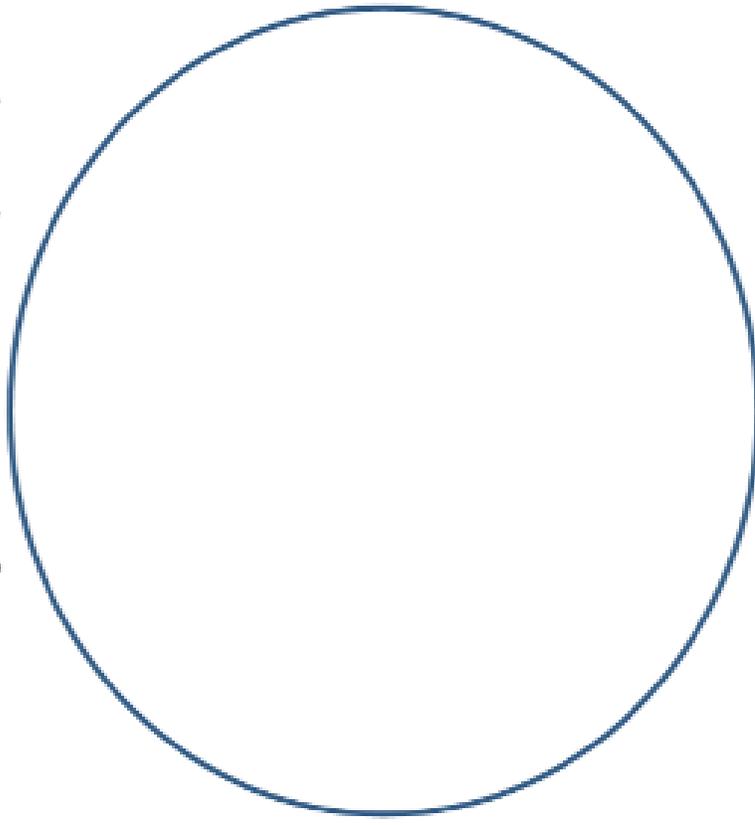


D. Cross-hatching



E. Stippling

2. Illustrate a specimen you observed using a magnifying glass. Use more than one color and one of the shading techniques identified below (D or E).



pH

Salinity (ppt)

Notes:

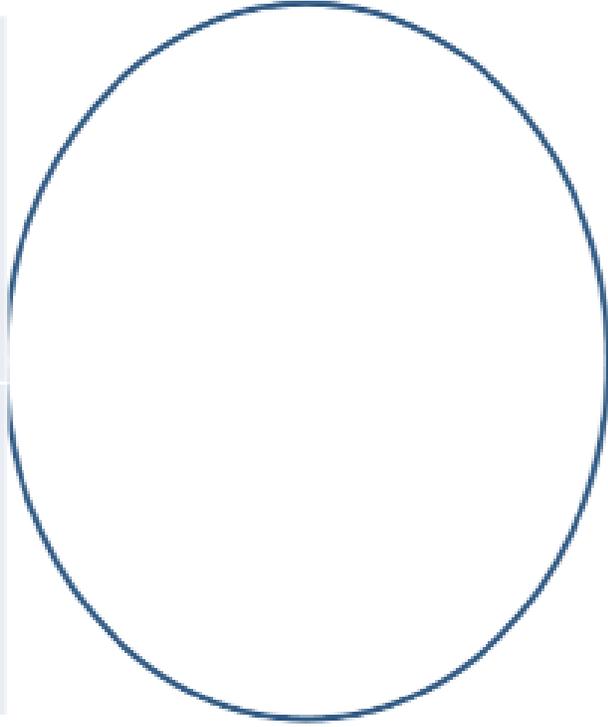
NAME \_\_\_\_\_

# What's that in the marsh?

Bin Number \_\_\_\_\_

1. Use the table below to tally the *different species* of plants and animals you observe.

Type	Tally
Plants	
Birds	
Invertebrates	
Litter pieces	



2. Illustrate a specimen you observed using a magnifying glass.

pH	Salinity (ppt)

3. Compare and contrast by adding a  $>$ ,  $<$ , or  $=$  in the blank for the following observations:

Pond	$>$	$=$	$<$	Marsh
Plant diversity				Marsh plants
Animal diversity				Marsh animals
pH pond				pH marsh
Salinity pond				Salinity marsh
Litter				Litter

**Notes:**

## Activity 2: Saltwater Pond Lesson

- Students analyze quantitative data to compare freshwater and saltwater ecosystems.
- Students analyze qualitative data to determine the suitability of the environment for sustaining diverse animal and plant populations.
- Students observe a trunk system and learn how man-made structures use similar technologies to harness water.
- Students learn the ingenuity of enslaved Africans who brought essential knowledge of irrigation to South Carolina rice fields.
- Students learn the importance of water management for wildlife refuges.

### Materials

- Model of trunk, showing functionality
- One large tub for rope float
- Magnifying glass
- Refractometer
- pH strips
- Bucket tied to a rope

This activity will require students to visit the trunk system out at Stono Preserve. Students can guess what the wooden trunk does and what it was used for. A model can be used to demonstrate the function of the trunk after students have guessed its purpose. Connect the trunk system to the process of rice cultivation that was completed by slaves in the past. In the early days of South Carolina's history, growers wanted the rice to be flooded to kill weeds, but the salt would kill the rice. At high tide, when the water slows down before it switches directions, the salt water would sink to the bottom, allowing for the entry of just freshwater on top to come in through the trunk.

Students can then brainstorm some plant species that, like rice, might not like saltwater. Then explain to students that they are going to see some plant species that do like saltwater.

### Procedures:

1. Use the bucket to get a good amount of water into the tub.
2. Lift up rope and float and submerge it in the water.
3. Spend a few minutes getting students to observe with magnifying glasses.
4. Meanwhile, pass around the refractometer for students to record reading.
5. Give students the drawing sheet and let them fill out the display boxes for their favorite critters if they wish.

As students finish up, questions to review include: What differences did they observe between the two water systems? If anyone saw litter, how do they think it got there? And where do they think it came from? How can we care for our ecosystems to make sure it stays healthy for the critters living in them?

### Additional Resources

- [Inland Rice Cultivation \(website\)](#)