

# Lab: Mystery Marsh Water

(modified from NC Coastal Reserve)

## Overview

In this activity, students will explore the density of several different salt solutions. The solutions demonstrate the changes in salinity that occurs as freshwater and salt water mix in estuaries.

## Background

Estuaries are places where rivers meet the ocean. In North Carolina, the land slopes gradually to the sea, so incoming tides can push salt water miles inland or large rains can push freshwater out into the ocean.

Water has a specific density, which is the mass per unit volume. Many things can change the density of water, including temperature and salinity.

Ocean water has dissolved salts, mostly NaCl, that make the water salty to taste. Salt is more dense than water, so when combined, salt water is more dense than freshwater. The salinity of ocean water is measured as parts per thousand, or ppt. Ocean water averages about 35 ppt. Humans, on average, can taste the saltiness of water that is greater than 8-10 ppt.



For this lab, a team of scientists have collected a series of water samples from a freshwater stream, a tidal creek, the sound, and the ocean. The team was interested in studying the salinity of the water. On the way back to the laboratory, the labels came off some of the samples. Can you figure out which sample came from the stream, the tidal creek, the sound and the ocean? Food coloring has been added to help you see the different water samples.

## Pre-Lab Questions

1. Where would you expect to find the densest water?
2. How does the tide affect salinity in an estuary?
3. How might weather affect salinity?
4. Is it easier for you to float in a freshwater lake or in the ocean? Why?

## Lab

- a. Create a test tube holder by pressing the short straws into a strip of modeling clay.
- b. Test each of the water combinations below by adding 10 drops of each colored water sample to the straw "test tube" and record your results in the table provided.

	Test Tube 1	Test Tube 2	Test Tube 3	Test Tube 4	Test Tube 5	Test Tube 6
<b>1<sup>st</sup> 10 Drops</b>	Blue	Blue	Blue	Clear	Clear	Clear
<b>2<sup>nd</sup> 10 Drops</b>	Green	Red	Clear	Blue	Red	Green
Layered or Mixed?						
If Layered, Which on Top?						
	Test Tube 7	Test Tube 8	Test Tube 9	Test Tube 10	Test Tube 11	Test Tube 12
<b>1<sup>st</sup> 10 Drops</b>	Red	Red	Red	Green	Green	Green
<b>2<sup>nd</sup> 10 Drops</b>	Blue	Clear	Green	Blue	Clear	Red
Layered or Mixed?						
If Layered, Which on Top?						

- c. Now place the large straw into the modeling clay.
- d. Based on your results in the table above, layer all four unknown samples into the large straw and record your results in the table below.

	Color	Location
<b>Top sample (least dense)</b>		
<b>Next to top</b>		
<b>Next to bottom</b>		
<b>Bottom sample (most dense)</b>		

- e. Verify your results with Mr. Rush

### Post-Lab Questions

5. Explain how this lab demonstrates the changes in salinity as you move from a freshwater stream to a tidal creek to the sound to the ocean.
6. How might these changes in salinity affect organisms that live there?
7. What would you expect the salinity of the Green Hope Wetland to be?
8. Describe one way in which the salinity of the Green Hope Wetland would increase.
9. Name one body of water, other than an ocean, that has a high salinity.
10. Imagine you have a salt water aquarium at home. How would the salinity change as water evaporates?

