

Water Quality and the Health of Long Islands Salt Marshes

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Background:

GEOCORE is a program that operates four weeks during the summer. The goal is to increase diversity, and establish a connection between, and interest in geological, marine, and atmospheric science. The institute consisted of grade school, middle school, high school, and geoscience college students, as well as high school teachers representing diverse schools across Long Island, New York. The activity presented below is based on topics covered and data collected during the marine science portion of the GEO CORE program.

Introduction:

The activity will focus on the connection between salinity, density, pH with the salt marshes that are present in various areas around Long Island. Many salt marshes were studied including ones in Great South Bay, Long Island Sound, and the Peconic River Basin. Salt marshes are vital to the health and life in the water all around the world. Salt marshes are spawning grounds for many small fish, Plankton, and other small organisms that provide food for all major bodies of water. The activity will be used in a high school chemistry class over 5 to 8 periods. Data collected from the Peconic River Basin will be used as a basis for the activity. Salinity, pH, and temperature were taken every 20 feet for nearly a third of a mile. The students will use this data to see the relationship between density and salinity. Additional activities will explore the relationship between temperature and density, as well as the importance of pH on water health.

Activity Goals

- 1. Students will understand the importance of salt marshes on Long Island Waterways.**
- 2. Students will develop awareness of the interconnection between different sciences.**
- 3. Students will develop awareness of job opportunities in GEOCORE.**
- 4. Students will be able to use computers to research a topic.**
- 5. Students will be able to communicate and work in small groups.**
- 6. Students will be able to graph data.**
- 7. Students will be able to evaluate graphical data.**

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8. Students will be able to calculate density.
9. Students will be able to evaluate density data conceptually.
10. Students will learn both qualitative and quantitative laboratory techniques.
11. Students will be able to compare and contrast different salinities of water solutions.
12. Students will be able to connect salinity, density, and its effect on the movement of water.

Materials Needed:

1. Computer Laboratory
2. Graph paper
3. Lined Paper / Notebook
4. Raw Peconic River Data
5. Colored Pencils
6. Beakers, Test tubes, Test Tube Racks
7. Salt Solutions
8. Droppers
9. Food Coloring

Part I Computer Laboratory Research *Time - One period*

Student will use the computer laboratory and other available tools to research, define, and answer the following:

1. Salt Marshes
2. Density (formula and conceptual knowledge)
3. Salinity
4. Salt Wedges
5. pH
6. Why Salt Marshes are studied?

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7. Who Studies Salt Marshes? (what profession?, What do they do?, What is their average salary?, etc...)
8. The local (Lond Island) opportunities for employment available by studying the area explored above

Part II Graphing Techniques

Time- one/two Periods

1. The teacher will review the techniques of graphing and the proper methods for graphing data.
2. The students will be provided the Peconic River Salinity Data and graph paper.
3. The students will graph the data of salinity versus distance. The teacher can have the students graph for depth as well or just construct three separate graphs for each foot of depth. Additionally, the teacher can group the class into three different depths and have each group graph at different depth.
4. The students will find the salt wedge using the graphs.

Part III Density

Time- one Period

1. The teacher will review density (most students have had some experience with density in Earth Science or General Science) and expand on its applications in Chemistry and other Sciences.
2. The teacher will review the density formula and provide some worksheets for practicing density calculations.
3. Students will calculate density problems.
4. The teacher will assess their student's results calculating density.

Part IV Qualitative Density Laboratory

Time- two Periods

1. The teacher will create at least four solution of different Salinity (Density) and color them using different food coloring.

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2. The solutions will be densities that mimic the salinities measured on the Peconic River Basin.
3. The students, in laboratory groups, will use their laboratory techniques to explore stacking solutions of different salinities in a test tube.
4. The students will determine the correct order of densities by showing the teacher a test tube with all the different colored solutions stacked in the proper order.
5. The students will record their results on paper to be collected by the teacher.

Part V Quantitate Density Laboratory

Time- One period

1. The teacher will now produce the five different solutions (with different colors from part IV).
2. The students, in laboratory groups, will now use quantitative techniques for determine the salinities of the solutions.
3. The students will measure the mass and volume of each solution and then calculate their respective densities.
4. The teacher will then show the students how to convert the densities to salinities.
5. The students will then record the salinities in their notebooks, and produce the proper order of the solutions.

Part VI Conclusion and Post Activity Questions

Time – One period

1. Teacher and students will discuss salt marshes, salinity, density, and its relationship with marine life and the health of Long Island Water systems.
2. The students will use their research to discuss employment opportunities in studying marine science, marine chemistry, pollution, and other Geo-Science areas on both Long Island and other parts of the country.

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3. The students will answer density questions, perform density calculations, and graph data provided by the teacher.
4. The teacher and students will discuss the importance of sea life on the local economy and ecosystem on Long Island.

Part VII Future Activities

Additional activities can be generated using the data from the Peconic River Basin. pH and its effect on marine life, water chemistry, and other biological systems. Temperature and density can be explored as well as temperature and its relationship to dissolved oxygen can be explored in future activities. Soil chemistry can be explored using samples collected in areas explored.