Summer Educational Interns: Training Future Teachers to Utilize the Natural Environment as a Laboratory for Student Research Projects

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Introduction

During the summer of 1997, The Earth Science Educational Resource Center (ESERC) of the Center for High Pressure Research (CHiPR) initiated a Summer Educational Interns program with the following goals:

- Provide college level students who are training to become science teachers with research experience tailored toward presenting science to secondary school students as a process of discovery.

- Develop, test with students, and disseminate to teachers, lesson plans for learning experiences in scientific investigation for secondary school classes.

- Enhance the skills of future teachers who demonstrate an interest in contributing to the quality of science education in schools with large populations of African-American students.

- Encourage members of demographic groups that are under-represented in the sciences to consider careers in science education.

CHiPR is an NSF Science and Technology Center, and ESERC is an educational outreach center of CHiPR whose mission is to facilitate inquiry-based science education in schools and through extra curricular science programs. Strategies aimed toward this goal include teacher workshops, honors Earth Science programs at local schools, research-oriented undergraduate courses offered in collaboration with other units on campus, a computer programming course for Geoscience graduate students, and a science education program for pre- and elementary school children, in addition to the Summer Educational Interns program.

The Summer Educational Interns program is conducted in parallel with CHiPR's existing Summer Scholars Program. Accordingly, participants are provided with room and board on the SUNY Stony Brook campus for ten weeks during the summer, and receive a stipend, and a travel allowance. The core of each intern's experience during the ten weeks is to conduct a research project that can be tailored for educational use. Subsequently, the interns derive lesson plans from their work. They also work with CHiPR educators to engage a group of pre-selected

secondary schools students in their projects. Toward the end of their ten-week experience, the interns integrate their lesson plans into CHiPR's Research Projects for Earth Science Classes teacher workshop.

In 1997, two students participated in the Summer Educational Interns program. Keisha Rhines, from Delaware State University, based her project on the study of the chemistry and flow dynamics of the Nissequogue River, while Jennifer Keller, from SUNY Stony Brook, focused on glacial erratics as evidence of the direction of glacial movement in the local area during the Pleistocene.

As was the case in 1997, two students participated in the program again during the summer of 1998. Trudy Hyde from Delaware State University, who is interested in biology, studied the invasion of woodlands by exotic plant species. Toward this end, she compared three different types of forest at the David Weld Preserve in Nissequogue. Linda Selvaggio from SUNY Stony Brook studied the stratigraphy of the coastal bluffs at the David Weld Preserve, where she found major evidence of glacial tectonics in the form of folds and faults.

CHiPR Summer Educational Interns' Individual Projects

The core of each intern's experience during the ten weeks was to conduct a research project that could be tailored for educational use. Subsequently, the interns derived lesson plans from their work. They also worked with CHiPR educators to engage a group of pre-selected secondary schools students in their projects. Toward the end of their ten-week experience, the interns integrated their lesson plans into CHiPR's Research Projects for Earth Science Classes teacher workshop. Two students participated in the program during the summer of 1997. They were Keisha Rhines from Delaware State University and Jennifer Keller from SUNY Stony Brook. Two more students participated the summer of 1998. They are Trudy Hyde from Delaware State University and Linda Selvaggio from SUNY Stony Brook. The following describes their interests and provides a synopsis of their individual research projects.

Keisha

Jeni

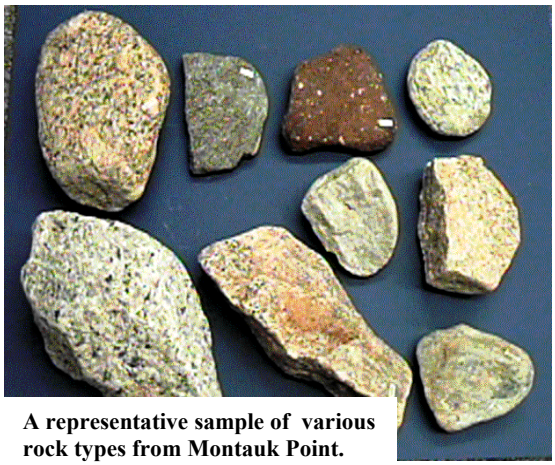
Trudy

Linda

Long Island's Glacial Geology

Jennifer Keller, an Earth Science MAT student, chose to research glacial geology of Long Island. She felt that because of the crucial role glaciers played in the formation of Long Island, many intriguing questions arise. For example, "from what direction did the glaciers come and how can we show that? What glacial processes formed the shape of the land? How did parts of Long Island develop their features and how can we show this?" Jennifer focused her research on the question "what direction(s) or path(s) did the glaciers follow". Her project is based on the knowledge that as glaciers advance over a region, they scrape up and acquire many rocks indigenous to that region. Jennifer assumed that by looking at the rocks left here by retreating glaciers, and by looking at bedrock from areas north of Long Island, she could determine where the glaciers came from.

Her project required collecting rocks from beaches across the North Shore of Long Island from Orient Point and Montauk Point in the east to Center Island Beach, Bayville to the west. Jennifer identified the rock type, labeled and documented each sample (see chart 1.). She discovered some trends in rock type pertaining to particular areas across the island. Is this a direct result of the bedrock types exposed in southern regions of Connecticut? A geologic map of Connecticut was used to provide information such as rock type, area of exposure and location. It was found that some rock types are more distinguishable and exposed in specific regions of Connecticut, while some are more common and exposed throughout the state. Jennifer needed to collect bedrock samples from across the state in order to accurately identify and match rock samples from the North Shore beaches to their parent rock.



A representative sample of various rock types from Montauk Point.

Due to the tremendous amount of work required for a project of this type, Jennifer was unable to answer her original question in the time allotted for the internship. She was able to create and categorize a collection of rock samples representative of Long Island's North Shore beaches, make some general conclusions about predominant rock types present in western, central and eastern Suffolk and begin a collection of identified Connecticut rocks. Jennifer has established a solid foundation from which to continue future research.

Chart 1. Sample data chart for collected Long Island rock samples.

Number	Date	Locality	Collector(s)	Origin ?	Type	Additional Info.

1. **Hartford Basin** 2. **Carbonate Shelf / Proterozoic Massifs *(Grenville)***
3. **Oceanic Terranes *(CT Valley Synclinorium, Bronson Hill Anticynclin., Merimack Synclin., Taconic Allochthons)***
4. **Avolon Terrane *(Continental)* Eastern CT** 5. **Fordham Terrane SW CT**

River Studies

Keisha Rhines, a Physics education major, was interested in doing research on a project that combined earth science and physics phenomena. She chose to research how the velocities of a river can affect the distribution of bottom sediment, water chemistry and aquatic life. She studied the effect tide has on river velocity and water chemistry. Her final fieldwork was conducted at Landing Avenue Park, Smithtown on the Nissequogue River.

Keisha marked off a transect using a Brunton compass, stakes and string and collected data to construct a river profile (figure 1). Along this transect the velocity was measured (using a flow meter) at four points over a period of 12 hours or one tidal cycle (figure 2). In addition, water samples were taken to measure salinity (using a refractometer) (figure 3) and relative depth measurements taken over the same period (figure 4). Sediment was sampled over an area and classified according to composition. A sediment distribution map was created and correlated with changes in depth and velocity.

Figure 1.

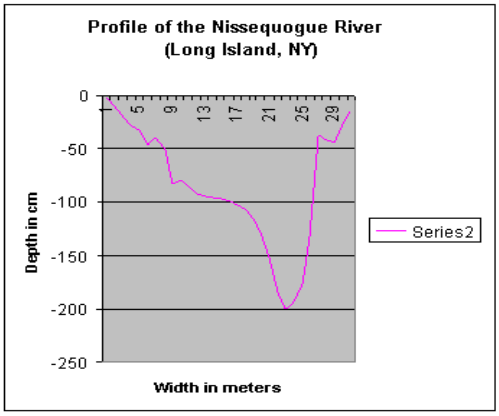


Figure 2.

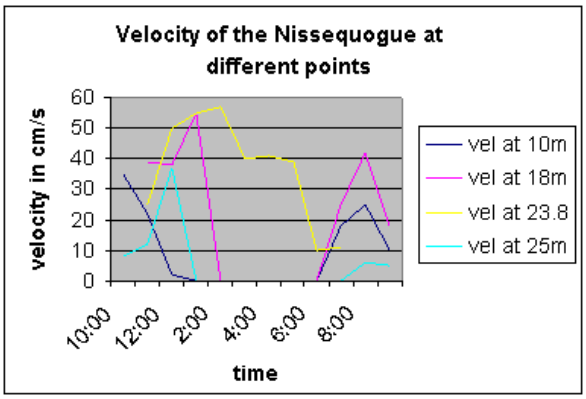


Figure 3.

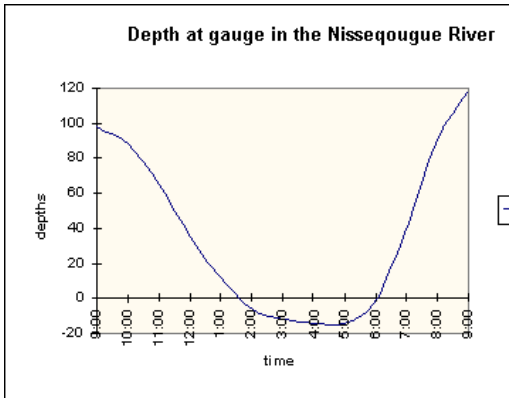
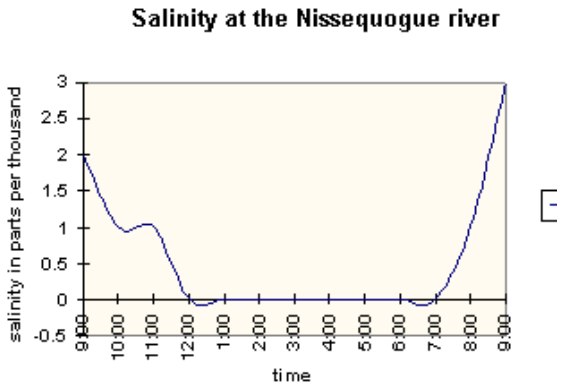


Figure 4.



Comparing the Presence of Indigenous and Exotic Species

in a Plant Community

Trudy Hyde, is a Biology education major and her goal is to teach Biology on the secondary school level. Trudy investigated and compared the presence of indigenous and exotic species in a plant community. The forest area used for this study is located at the David Weld Sanctuary in Nissequogue (Smithtown), Long Island.

The forest at the David Weld Sanctuary was at one time climax woodland. However, it was cut as a pasture for cattle grazing in the early 1900's. Cattle grazing was later abandoned in the 1920's and the area was left free for the natural process of succession. The sanctuary consists of numerous sites and features. Particularly, of interest to Trudy's project were the northern mixed mesophytic forest area, the swamp forest area, and the American Beech forest area.

The David Weld Sanctuary is managed by the Nature Conservancy. The Nature Conservancy is dedicated to preserving natural habitats and the biodiversity of these habitats. However, some exotic species of plants pose a threat in conserving the native plants of these natural habitats. These exotic species of plant can sometimes overwhelm or displace the population of indigenous species present in the plant community. The relevance of this research is that it can be used to determine if a forest has been subjected to invasion, and if so, how much of an invasion has occurred.

The goal of the research project was to compare the presence of indigenous (native) and exotic plant species in a plant community. However, a method of quantifying the coverage of each species of plant had to be developed. Counting each individual plant and specimen numerically did not give an accurate description of the coverage of each species. Thus, the method of measuring the proportion of basal area covered by a plant species was developed. Once the method of quantifying flora coverage was determined, three objectives had to be met. The objectives of the research were formulated to meet the Earth Science Syllabus of the State of New York under the topic Observation and Environment (1970 curriculum).

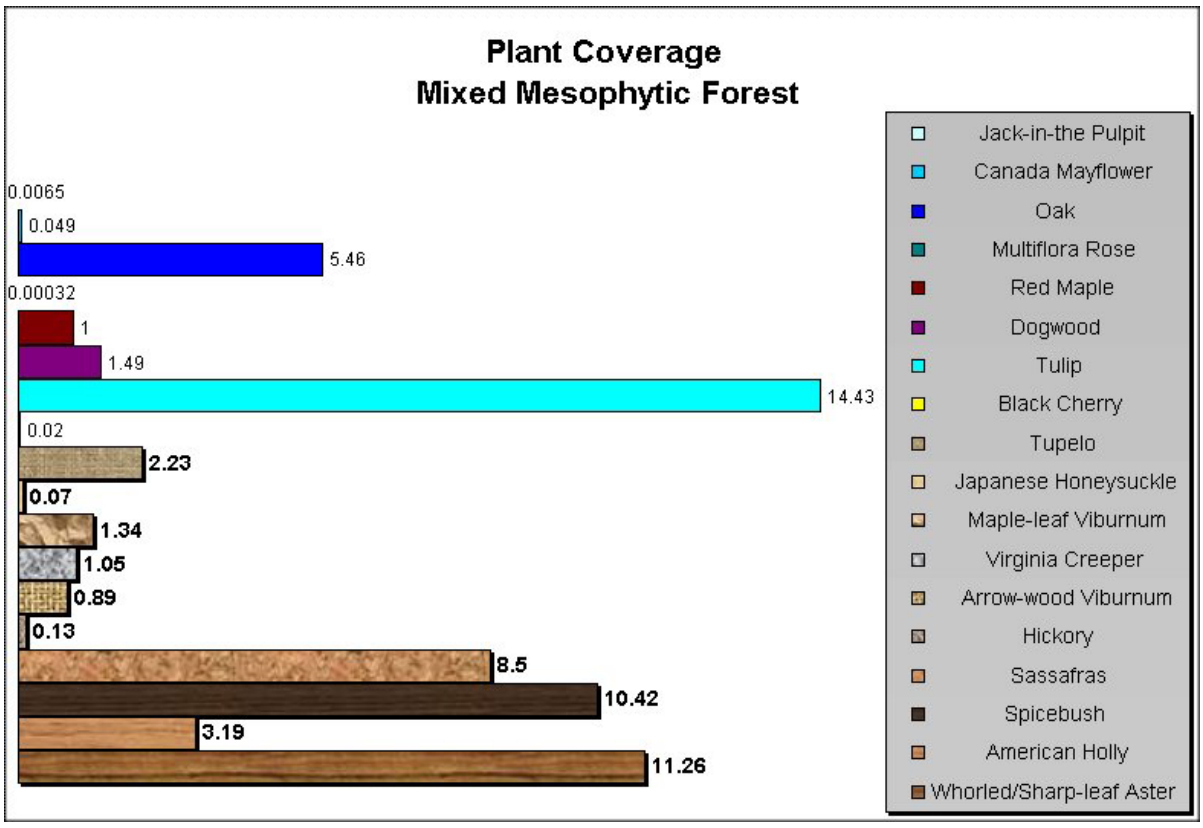
Canopy cover in the David Weld Sanctuary.

Project Objectives

1. Identify the various plant species present in the area.
2. Determine geologic factors that might influence plant distribution.
3. Determine the coverage of each plant species present in the area of study.

The first objective was met by conducting a plant survey of the forest area and constructing a herbarium. To meet the second objective, three different sites were selected based on the distinct geological features, such as topography and sediment type. The third objective was met by measuring the proportion of coverage by each species of plant. Results of the mixed mesophytic forest plant coverage investigation are shown in figure 5.

Figure 5.



Geology at the Bluffs of The David Weld Sanctuary…

Linda Selvaggio is an Environmental Geology major attending Stony Brook University and has recently enrolled in the M.A.T. program. Her goal is to teach earth science at a secondary education level. Linda's research focused on the sedimentary deposition of the material on the bluffs at the David Weld Sanctuary, Nissequogue. There is an enormous amount of geology to discover on the bluffs that face the Long Island Sound.

Sedimentology is the study of the transportation, deposition and lithification of sediments. By constructing a stratigraphic column and analyzing the composition of the various beds, the origin and the environment in which the sediment was deposited can be determined. Certain features (such as fossils) are excellent indicators of the age of the sediment. Other features (such as ripples and clast orientation) reveal the flow direction of the water which deposited the sediment. It is even possible to discover climatic conditions that existed during deposition. Linda is trying to verify that the sediment on these bluffs was deposited in a glacial lake environment. In addition to studying the composition of the sediment, it is important to look at the structural features incorporated within them. Faults and folds can tell us how this material was moved and deformed.

When trying to reenact events that occurred in an area it is important to look at the "big picture" and not base theories on an isolated spot. In the field, a sedimentologist will excavate several columns some distance from each other, using one column as a reference to compare to the others. Linda not only excavated three columns, but also excavated many "half columns" between the main ones. The purpose of this exercise was to "connect the beds" over a broad distance. This enabled her to isolate the minor events from the main one.

For further details on this investigation see "Evidence of Glaciotectonic Phenomena in a North Shore Coastal Bluff at Nissequogue, Long Island, New York", Selvaggio L.and G. A. Richard, *Geology of Long Island and Metropolitan New York: Long Island Geologists Program with Abstracts*, April 24, 1999.

Three dimensional cutout of the bluff at the David Weld. Fine scale alternating layers of coarse and fine sands, and evidence for cross-cutting and minor faulting are shown. (note penny for scale)