



The Syllabus and Schedule

HONORS 270 ***Science and the Connecticut Coast: Investigations of an Urbanized Shoreline***

Class Location: Jennings Hall Room 335
Class Time: Wednesday 9:10-11:00 am; Friday 9:00-12:00 pm

Instructors

Dr. James Tait, *Department of Science Education and Environmental Studies*
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Rationale

This course focuses on the shoreline of southern Connecticut and Long Island Sound. A variety of coastal environments are examined in detail including sandy beaches, salt marshes, estuaries and coastal dunes. We will explore the geological, biological, physical and chemical processes at work along the shoreline and relate them to environmental as well as social, economic and political issues. Impacts of storms and hurricanes, the threat to local wetlands by sea level rise, and generation of dead zones on the sea floor of the sound are among the issues the class will address.

Students will examine and discuss topics including the historical development of New Haven harbor; the aesthetic value of natural settings and habitat; the economic value of natural and coastal resources, and the environmental degradation resulting from improperly designed and managed industrial and residential development in harbor ecosystems. We will explore questions including: How do we balance the need for economic development with the desire for open space preservation? How have past development/industrial activities affected the quality of New Haven Harbor ecosystems? How can seemingly thriving natural habitats exist within a commercially active urban harbor?

Students will participate in classroom, laboratory and field activities (including a boat trip in the harbor to collect water, sediment and biological samples) to arrive at answers to these questions.

Course Goals:

This course is designed to teach science by pursuing the following goals:

- 1) Doing science using scientific methodology,
- 2) Emphasizing field experience,
- 3) Conducting quantitative analyses,
- 4) Writing for clarification of thinking and communication of ideas, and
- 5) Stressing the societal relevance of scientific investigation.

Specific Objectives:

On completion of this course, students will be able to:

- 1) Use the scientific method to examine questions concerning their observations of the coastal environment, including the formulation of testable hypotheses and the collection of field and laboratory data to evaluate their hypotheses,
- 2) Recognize and discuss the unique aspects (geological, biological, and chemical) of inland and coastal habitats including sandy beaches, salt marshes and coastal dunes,
- 3) Identify and quantify specific sources, fates and impacts of pollutants (primarily metals and floatable debris) entering coastal waters, and
- 4) Identify the causes and consequences of global climate change, including the social, economic and environmental impacts due to hypothesized increased storminess and coastal flooding.

Grades

Three quizzes (announced/unannounced) will be given during class and will address material presented during lectures, readings, and field/lab activities and

will count towards 25% of the course final grade. Students will also be expected to submit written reports concerning the field and laboratory activities (50% of final grade). Specific format of these reports will be addressed during class. All reports must be typed! Participation will account for 25% of the final grade (includes attendance, participation in class discussion, quality of effort in field and laboratory work, being on time to class and excursions, etc.).

Class Policies

Due to the hands-on nature of this class, attendance is mandatory. We expect students to attend all class sessions and be prepared to participate. Missed classes will result in a loss of 5% of your total grade (half a grade). If you miss more than 3 sessions, this will result in failure of the course. We realize that genuine emergencies arise. If you must miss class due to a serious emergency, please notify an instructor *before* class (phone, email, FAX). Written assignments must be submitted on when due.

Students should also be aware of the SCSU policy concerning academic honesty (SCSU Student Handbook). Cheating/Plagiarism will not be tolerated! Violators of this policy will fail this course.

If you need course adaptations or accommodations due to a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please notify an instructor ASAP.

HON 270 Course Schedule

September **Topic/Activity**

Module 1 **Connecticut Landscapes and Watersheds**

Week 1 Introduction to Class; Plate Tectonics and the Wilson Cycle;
Geology, Rocks and Minerals

Lab Activity - Rocks and Minerals

Readings: Press and Siever, Chapter 3 (pp. 1-8).

Week 2 Tectonic History of CT, Ice Ages, Long Island Sound, and
Connecticut's Coastal Landscape

Lab Activity – Rocks and Minerals Continued

Readings: Bell, Chapter 8 (pp. 9-39).

Week 3 Weathering and Watersheds: Undoing Tectonics

Field Trip – Geology of CT Coast

Coast Week – West Haven Beach Debris and Data Collection

12-4 pm. (*Mandatory*)

Module 2 Coastal Processes and Environments (Habitats) of Long Island Sound

Week 4 Tidal Wetlands: Physical Processes and Ecology

Field Trip – West Haven marsh (HT 11:50 am)

Readings: Dreyer and Niering, Tidal Marshes of Long Island Sound (booklet).

October

Week 5 Beaches and Dunes

Field Trip - Hammonasset State Beach (LT 11:51 am)

Readings: Patton and Kent, Chapters 2-3 (pp. 40-86).

Week 6 Living with the Coast: Storms and Coastal Erosion

Lab Activity – Topographic Surveys

Reading: Patton and Kent, Chapter 1 (pp. 87-110).

Week 7 Review/Data Processing/Report writing

Field Trip - Storm Surge Surveys

Module 3 New Haven Harbor (Social, Science and Economics)

Week 8 New Haven Harbor – History, Economic Importance.

Field Trip – New Haven Colony Historical Society

Reading: New Haven: An Illustrated History, Chapters 4 and 5 (pp. 111-142).

Week 9 **Field Trip** – Harbor Cruise (*R/V Sounder*)

Sample sediments, organism and water collection

Split class sessions (9-12 pm and 1-4 pm)

Reading: Boehnke and Delumyea, Experiment 2 (pp. 143-152).

November

Week 10 Harbor Pollution – Sources and Solutions

Lab Activity – (Class split sessions [JE 314]: 10–1 pm; 1-4 pm). Prepare sediment for copper analysis, sediment classification.

Readings: Breslin and Sañudo-Wilhelmy (pp. 163-174). Boehnke and Delumyea, Experiment 10 (pp. 153-162).

Week 11 Marine Pollution

Lab Activity – Sediment analysis for copper

Reading: Sound Health 2001: Status and Trends in the

Health of

Long Island Sound (handout). EPA LIS Office Publication (pp. 1-15).

Module 4 Global Connections: Climate and Ecosystem Change

Week 12 Energy Use and Consequences of Global Climate Change
Readings: Botkin and Keller, Chapter 16, Fossil Fuels and the Environment (pp. 175-191). Mayer, Chapter 12, Global Climate Change (pp. 192-208).

Week 13 **Thanksgiving Recess**

December

Week 14 Global Warming and Sea Level Rise
Lab/Field Activity – LIS Sea Level Rise and Marsh Inundation
Readings: Warren and Niering (pp. 209-216).

Week 15 Student group research and practice presentations
Class Activity: Student led discussions

Final Exam Week Regional and Global Climate Change: Solutions and Consequences

Bibliography

Bell, Michael, The Face of Connecticut, Bulletin No. 110, State Geological and Natural History Survey of Connecticut, Hartford, CT, 1985.

Bohenke, N.D. and R. Del Delumyea. 2000. Laboratory Experiments in Environmental Chemistry. Prentice-Hall Inc. Upper Saddle River, NJ. pp. 279.

Botkin and Keller, Environmental Science: Earth as a Living Planet 3rd Edition, John Wiley and Sons, Inc. New York, NY. 2000.

Breslin, V.T. and S. Sañudo-Wilhelmy. High spatial resolution sampling of metals in the sediment and water column in Port Jefferson Harbor, NY. *Estuaries* 22:3 669-680. 1999.

Bush, M.B. Ecology of a Changing Planet. Prentice Hall, Upper Saddle River, New Jersey, 2000.

Dreyer, Glenn and Niering, William, eds., Tidal Marshes of Long Island Sound, Bulletin No. 34, Connecticut College Arboretum, New London, CT., 1995.

Kane, J. Will Global Warming Swamp Long Island? Newsday Editorial, July 30, 1995.

Mayer, R.J. 2001. Connections in Environmental Science, A Case Study Approach. McGraw-Hill Publishers, New York, NY, 2001.

Patton, Peter and Kent, James, A Moveable Shore: The Fate of the Connecticut Coast, Duke University Press, Durham, NC, 1992.

Press, Frank and Siever, Raymond, Understanding Earth, W. H. Freeman and Company, New York, 1994.

Rauber, P. Heat Wave, Sierra Magazine, September/October. 1997.

Schneider, David, The Rising Seas in *Scientific American*, March 1997, pp. 112-117.

Schumway, F. and R. Hegel. 1987. New Haven An Illustrated History. Windsor Publications. pp. 175.

Sound Health 2001, Status and Trends in the Health of Long Island Sound. US EPA Long Island Sound Office, Stamford CT. 2001.

US EPA. Global Warming and Our Climate Change, Answers to Frequently Asked Questions. Office of Air and Radiation, EPA 430-F-00-011, April, 2000.

Representative Assignments

Below are the primary course assignments, three written research papers and a group oral presentation corresponding to each of the four course modules.

Module 1 – Research Paper - Geologic History of Connecticut

Rules

- 1) Write well (good grammar and organization)
- 2) Re-write (first drafts are not good enough)
- 3) Think things through (don't be superficial)
- 4) Presentation counts (images, maps, etc)
- 5) Get it right (double check your interpretations and ask questions if necessary)
- 6) Meet deadlines (turn it in on time)
- 7) Don't plagiarize words or ideas (don't *borrow* text and reference often)

Format

I. Introduction

Should contain description of geologic history of Connecticut with referencing and brief discussion of terranes and associated rock types. Should also explain purpose of your investigation, i.e., to identify rocks of Connecticut shoreline in Branford and East Haven and to relate them to established terranes and the processes that created them.

II. Methods

Where did you go and what did you do?

III. Results and Discussion

You want to describe what you found (e.g. outcrops) at each stop. Describe and identify the rock and state what evidence (e.g., mineralogy and texture) you used to make that identification. Infer environment and processes of formation from the rock ID. Relate the rocks to tectonic terranes and explain why you think they belong to a specific terrane. If you think that there is more than one possible terrane, justify this. From the terrane, discuss what these rocks you found tell you about CT geologic history. Reference your readings from Press and Seiver, Bell, and the class lab handouts liberally.

IV. Figures

Adding a presentable map of your sample locations would be an excellent idea. A color copy of your geologic map would also be appropriate as would photos of the outcrops and rock samples. Figures should be neat and well-labeled. Each figure should have a figure number (e.g., Figure 3) and a caption summarizing the point being made with the figure.

V. Conclusion

Revisit your results and interpretations in the form of a coherent summary, i.e., explain the big picture.

VI. References

Follow a format from your readings.

Module 2 – Research Paper - Coastal Environments and Processes

Rules

- 1) Write well (good grammar and organization)
- 2) Re-write (first drafts are not good enough)
- 3) Think things through (don't be superficial)
- 4) Presentation counts (images, maps, etc)
- 5) Get it right (double check your interpretations and ask questions if necessary)
- 6) Meet deadlines (turn it in on time)
- 7) Don't plagiarize words or ideas (don't *borrow* text and reference often)

Format

I. Introduction

Should provide enough background for the reader to understand what you are doing, why you are doing it, and the significance of your results. The following things should be addressed:

- A brief characterization of the Connecticut coast
- A brief discussion of hurricanes and hurricane history on the Connecticut coast
- The purpose of your study
- A description of the study site(s)
- Include a location map
- Be sure to reference material you take from the readings, e.g., (Patton and Kent, 1992)
- Reference information from instructors as personal communications, e.g., (James Tait, personal communication)

II. Methods

Should address:

- How you obtained your survey results
- How you determined the flood zone elevation
- How you assessed the value of the properties at risk

III. Results

Should include:

- Street profiles (distance vs. elevation) for all three streets
- A flood zone map
- A description of each street in terms of its topography, location of the flood zone boundary, and the nature and numbers of structures.
- A description of natural habitats in the study area.

IV. Discussion

Should synthesize your results, describing the potential impacts of a repeat 1938-type event on the study site (nature and extent of damage). Also, discuss potential impacts on the surrounding natural environment (marsh and beach). The introduction should contain information about marshes and beaches that provide the foundations of such a discussion as part of your description of the Connecticut coast. Also address potential impacts on other areas of West Haven, for example, the flat-lying area around Beach Avenue (Captain's Galley) or the Sewage Treatment Plant. You may want to look a topographic map of West Haven and see where the topography is low-lying and where it is not. Try very hard to separate hypothesis or speculation from arguable fact. There is a place for both but they should not be mixed up.

V. Conclusions

Sum up your observations of potential impacts of a repeat of the 1938 event on the city of West Haven. Also, try to extend your comments to the Connecticut coast in general. You may wish to recommend further studies (but should be somewhat specific).

V. References

Follow a format from your readings

NOTE: When in doubt, discuss it with your instructors. We are here to help.

Module 3 – Research Paper - Quality of New Haven Harbor

Rules

- 1) Write well (good grammar and organization)
- 2) Re-write (first drafts are not good enough)
- 3) Think things through (don't be superficial)
- 4) Presentation counts (images, maps, etc.)
- 5) Get it right (double check your interpretations and ask questions if necessary)
- 6) Meet deadlines (turn it in on time)
- 7) Don't plagiarize words or ideas (don't borrow text and references often)

I. Introduction

Should provide sufficient information for the reader to understand what you are doing, why you are doing it, and the significant of your results. The following points should be addressed:

- A discussion of New Haven harbor
 - o What is the significance (economic, social, etc) of the harbor to the state of Connecticut?
 - o Discuss the historical economic and industrial development of the harbor
 - o Summarize the current uses (often competing uses) and environmental importance of the harbor
- A discussion of how economic activity within a harbor can result in contaminated sediment
- A discussion of why we should be concerned about contaminants in harbor sediments
- The purpose of your study
- Include a location map
- Cite material that you take from your readings

II. Methods

Should address:

- How the sampling sites in the harbor were selected
- How the sediment samples were collected
 - o brief description of each sites location
- How the sediment samples were prepared for metal analysis
- The acid digestion procedure
- The use of reference material (NIST 2702)
- How visual characterization of the sediment samples was performed
 - o the criteria used to categorize the samples

- A brief description of the atomic absorption spectrophotometer for copper analysis
- A brief description of the calculations

III. Results

Should include:

- The locations (latitude and longitude) of the sampling sites
- A thorough description of the characteristics of the sediment samples at each location (grain size, loss on ignition, etc.)
- An assessment of the accuracy and precision of our techniques (recovery of the copper content of the standard reference materials)
- The calculated copper concentrations for each site

IV. Discussion and Conclusions

One of your readings (Branford Harbor) conducted a similar study. You should compare and contrast the results from the New Haven harbor study with those found in Branford harbor. Is the New Haven harbor sediment contaminated with respect to copper? Provide evidence to support your answer. Each of you developed a series of hypotheses concerning the extent of contamination of sediment at 5 locations in the harbor. Find locations in the current study similar to those you chose and re-examine those initial hypotheses. How did your expectations compare with the data? What are some of the specific sources of copper in the harbor? Do the physical properties of the sediment at the various locations in the harbor correlate with the copper contents of the sediment at these same locations? Does the copper content of the sediment vary with location? If there is variation, are patterns evident? You may wish to find copper contents of other Long Island Sound harbors or elsewhere for use in comparing to New Haven harbor sediment. Why should we be concerned about contaminated sediments in New Haven harbor? What environmental habitats and living marine resources are threatened? Is there anything that can be done to remediate contaminated sediment?

V. References

Follow a format of your choice from your readings.

Module 4 – Group Presentation - Energy Use and Global Warming

Global climate change is arguably one of the greatest threats to our natural environment and represents a tremendous challenge to politicians, citizens, environmentalists and educators to identify and implement equitable policies to reduce projected temperature increases. The combustion of fossil fuels for energy production results in the production of carbon dioxide (CO₂), one of several greenhouse gasses whose concentrations are increasing in the Earth's atmosphere. The recent United Nation sponsored Intergovernmental Panel on Climate Change estimated an average global temperature increase ranging from 1.5-4.5 °C by 2100 as a result of the projected increase in atmospheric

greenhouse gas concentrations. Temperature increases of this magnitude are expected to result in consequences including changing weather patterns, migration of ecosystems, sea level rise and coastal flooding. An international effort is underway (Kyoto Protocol) to try to reduce the production of CO₂ and other greenhouse gasses, however the fate of this agreement is uncertain.

Each group (5-6 students/group) is assigned the task of examining specific consequences of possible climate change in Connecticut/New England. The presentations will focus on the following topics: Human health effects, sea level changes, weather/storms and living marine resources in Long Island Sound. Focus your presentation on one or more major consequences of each possible outcome. In addition to describing possible consequences, each group should also present some ideas/strategies on how we may adapt/respond to the anticipated consequences of climate change. Finally, each group should present 3 or 4 suggested ways/strategies on how CT residents can reduce emissions of greenhouse gasses.

We will conduct a symposium where each group will present their findings and recommendations. These oral presentations should be practiced and professional (dress appropriately). We recommend (not required) that the presentations use PowerPoint software for preparation and presentation of the results of your research. Each group presentation should last 15-20 minutes maximum. This time will include several minutes for questions from the audience. Everyone is expected to participate in the questioning of the presenters. Each group will submit copies (disk or photocopy) of their PowerPoint presentation or lecture notes to the instructors as part of the final grade (group grade).