Coastal Environments of Martha’s Vineyard

Instructor: Dr. Ilya Buynevich
Course Location: Nathan Mayhew Seminars, Vineyard Haven
Time: 8-21 August 2002
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Supplemental readings will be distributed in class

Course format: A typical day will consist of lectures in the morning (see list of topics on the next page) followed by field trips or lab exercises (e.g., coastal chart interpretation, construction of beach profiles, analysis of sea-level trends, examination of sediments and sediment cores). General information about the island can be found at www.mvol.com or www.mvy.com.

- Course Overview

Coastal environments are among the most dynamic natural systems. Over 60% of the world’s population live within 50 km of the shoreline and this number will increase in the near future. Understanding the behavior of coastal systems and their response to sea-level rise, erosion, and population pressures is based on our knowledge of the physical processes operating at time scales from seconds to millennia and encompassing areas from a few centimeters to regions hundreds of kilometers long. Only by appreciating the dynamic processes that shape the coast and examining the recent evolution of a particular shoreline will we be able to predict its future changes and manage our coastal resources properly.

This course will focus on the natural history of Martha’s Vineyard, including its glacial past and more recent evolution of the island’s dynamic shoreline. Its relatively protected northern coast featuring harbors and clam flats contrasts with the high-energy southern shoreline facing the high swells of open Atlantic Ocean and these will serve as ideal natural laboratories for studying this geologically young and ever-changing landscape. We will examine major landforms produced by melting glaciers at the end of the Great Ice Age, investigate the origins of large coastal ponds, and discuss the role of severe storms, sea-level rise, and human development in shaping the island’s coastline over the past 10,000 years. Short lectures will be complemented by field trips (rain or shine) to picturesque Gay Head Cliffs, Squibnocket shell middens, dune fields of Chappaquiddick, South Beach saltponds and other parts of the island. In the field, we will obtain sediment cores from beaches and wetlands to look at the record of recent environmental changes. Geologic maps, coastal charts, color slides and handouts will be used to provide hands-on experience on selected topics.

- Grading

Quizzes (2) - 20%  Exercises (4) - 30%  Final Exam - 25%  Term Paper - 25%

Quizzes and exam will include diagrams, short answers, true and false, and multiple-choice questions. Term paper should be double-spaced in 12-point font, 8-12 pages long (including figures) and is due before 12 July.
**Academic Policy Statement**  I emphasize the importance of your knowledge of, and adherence to, the Boston University’s *Metropolitan College Academic Conduct Code*, especially those portions concerned with plagiarism and cheating. You can familiarize yourself with the details of academic conduct at [www.bu.edu](http://www.bu.edu).

### COURSE SCHEDULE

- The lecture time is 9:00-noon, including 15 minute break and 30 minutes for slide show and/or discussion at the end, as well as two quizzes at 9:00-9:30 am. Field experience after lectures. Evening discussions and review daily after dinner.

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<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
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<tbody>
<tr>
<td>6/9</td>
<td>1. Introduction to Coastal Geology</td>
<td>Ch. 1</td>
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<td>Scope of Coastal Geology. Plate Tectonics.</td>
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<td>6/10</td>
<td>2. Types of Coasts</td>
<td>Ch. 1, 6, 7</td>
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<td>Global distribution of coasts. Erosional vs. depositional coasts. Coastal features.</td>
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<td>6/11</td>
<td>3. Glaciated Coasts</td>
<td>Ch. 2 &amp; 7</td>
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<td>Formation and evolution of Cape Cod and the Islands. Glacial geology of the Vineyard. 1:00 – 4:00 pm - Field experience to Gay Head, Squibnocket Cliffs, and Stonewall Beach</td>
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<td>6/12</td>
<td>4. Hydrographic Regime and Barrier Coasts</td>
<td>Ch. 6</td>
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<td>Wave-dominated, mixed-energy, and tide dominated coastlines. 1:00 – 3:00 pm - Exercise #1: Chart Interpretation: coastal environments</td>
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<td>6/13</td>
<td>Quiz #1 (topics 1-4 covered)</td>
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<td>6/13</td>
<td>5. Waves and Tides</td>
<td>Ch. 3</td>
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<td>Wave generation, propagation, and breaking. Origin and distribution of tides.</td>
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<td>6/14</td>
<td>9:00 am – 2:00 pm - Saturday study to Chappaquiddick</td>
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<td>6/15</td>
<td>Sunday review</td>
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<td>6/16</td>
<td>6. Beaches: Composition, Form, and Processes</td>
<td>Ch. 6</td>
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<td>Beach morphology. Longshore sediment transport. Rip currents. 2:00 – 5:00 pm Field experience to South Beach. Exercise #2: Beach profiling</td>
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<td>6/17</td>
<td>7. Tidal Inlets</td>
<td>Ch. 6</td>
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<td>Inlet types. Ebb- and flood-tidal deltas. Sediment bypassing 1:00 – 4:00 pm - Field experience to Lobsterville Beach and Menemsha Inlet</td>
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6/18 8. Behind the Barrier – Estuaries, Marshes, and Tidal Flats  
Estuary types. Saltmarsh development. Significance of coastal wetlands. 
1:00 – 4:00 pm - Field experience to the east shore. Exercise #3: Marsh 
stratigraphy.

6/19 Quiz #2 (topics 5-8 covered) 
9. Coastal Storms  
Types of low-pressure systems. Storm surge. Geological and economic impacts. 
2:00 – 5:00 pm Field experience to island locations impacted by 1938, 1954, and 1991 storms

6/20 10. Sea-Level Rise and Coastal Erosion  
Causes and trends of global and local sea-level changes. Sea-level curves. 
12:00 – 1:00 pm - Exercise #4: Sea-level trends and coastal response 
4:00-5:30 p.m.: Final Exam (cumulative)

BIBLIOGRAPHY

Underlined items are pre-class reading assignments  
Literature available in class is in bold.


