

Lab 7: Surficial deposits and Soils of the Seacoast Region, NH

The surficial geology of New Hampshire and the Seacoast region is a direct result of an episode of continental glaciation that ended about 12,000 years ago. The thick glacial ice shaped the landscape via erosion, and deposition of glacial sediments.

This laboratory is composed of two sections which will give you an understanding of the glacial sediments of southeastern NH and associated soils that have developed since ice withdrawal as the Ice Age drew to a close.

Our goals are to gain an understanding of:

1. The types of glacial sediments which exist in the area;
2. The characteristics of each of the sediment types (i.e. grain size, sorting...)
3. The distribution of sediment facies (types) and their stratigraphic relationships
4. Some of the landforms associated with the glacial sediments
5. Which soils are associated with different parent materials
6. What factors control how a parent material is transformed into soil

Surficial Deposits

The surficial deposits of New England are an important resource. These deposits supply approximately 90% of our groundwater. They control the distribution of our soils, and thus the developments or land uses which can take place. They are the recipients of our waste – both directly and indirectly. They are a major economic “mineral” resource.

We will direct our attention to the Dover West Quadrangle. Some of the hills in this quad are oblong or egg-shaped hills called “drumlins”. These are composed primarily of glacial till that were formed at the base of a continental glacier as the ice smeared a water/sediment mixture across an uneven bedrock surface. Consider the classic drumlins on the New York sample map provided.

Four drumlins can be seen on the Dover West Quad. Can you find and name all four?

Drumlin #1:

Drumlin #2:

Drumlin #3:

Drumlin #4:

Describe the materials of which the drumlins are made.

What direction of ice movement do these features suggest?

How are the Dover drumlins different from those on the New York map? What might explain these differences?

Draw a topographic profile of one of the drumlins along the direction of ice motion.

Find Pudding Hill on the topo map. Draw/trace the (general shape) 120' contour line below.

The shape of Pudding Hill suggests a depositional feature such as a delta. Where would the mouth of the river be at Pudding Hill? Mark this location on your outline.

What kind of materials would you anticipate make up Pudding Hill? Would they be distributed homogeneously, or would you expect any kind of gradation? Why or why not?

Deltas form at sea level. Compared to modern sea level, how large was the relative change in sea level here at the time that these deltas formed?

Pudding Hill is a major source of Dover's water supply. What are the characteristics of Pudding Hill that would make it a good aquifer (see your text)?

Note the many sand and gravel quarries in Pudding Hill. Extraction of the sand and gravel is stopped when the floor of the quarry intersects the water table (see your text). Given the existence of boggy land just north of Pudding Hill (suggesting the level of the water table), estimate the total amount of sand and gravel that could be removed. Make your estimate in cubic yards. Show your work.

What is the estimated value of this resource if sand and gravel currently has a price of \$10 - \$20 per cubic yard? One yard of aggregate weighs approximately 1.5 tons.

Using Pudding Hill as a guide, locate other deltas in the map region. These deltas represent "standstill" times for the glacier during its retreat. If you draw an imaginary line connecting these deltas, what direction would it indicate that the glacier was retreating?

How does this compare with the direction of glacial advance indicated by the drumlins?

Why are the deltas separated instead of connected together as one massive feature?

As the continental ice retreats (or wastes), large blocks of ice may become stranded beyond the retreating ice front. These blocks eventually melt, leaving depressions called kettles/ kettle lakes, which may or may not become filled with water. Locate kettles in the map area. Indicate their names below, and estimate the ice block size from the size of the kettle.

What type of deposit are kettles found in?

Sketch a cartoon that shows how they have formed.

Locate Winkley Pond and the Mallego Plains. How would you characterize the topography of the Mallego area? Why is the land near Winkley Pond boggy?

Were the surficial deposits that underly Mallego Plains laid down during glacial advance or retreat? In streams, lakes, or an ocean?

Use superposition to determine the order in which local surficial parent materials were deposited. What is the oldest map unit? Youngest? Put these units in order of deposition: marine silt/clay, till, stratified drift, alluvium.

Soils

A primary objective of this lab is to determine what influence the underlying geology has on soil characteristics. We can begin by examining three examples of common surficial deposits found in the map area.

For each sample, describe its grain size and sorting, and on the Surficial map, describe the topographic features where each is commonly found.

A. Glacial Till

B. Marine silt/clay

C. Stratified Drift

Compare the Dover West Surficial map to the Dover West Soil map.
What seems to control differences in soils within the Glacial Till unit? Marine silt/clay?
Stratified Drift?

What factors are important in generating a diversity of soils in the NH Seacoast?

Brief Description of Soil Series – You fill in the blanks!

Buxton Series: The Buxton series consists of deep, moderately well drained to somewhat poorly drained soils that form in _____ deposits. These soils are level to gently sloping and lie on low knolls in the southeastern part of the county.

Charlton Series: The Charlton series consists of well-drained loamy soils that formed in thick, stony _____. Stones on the surface are common. Charlton soils have moderate permeability and moderate available water capacity.

Gloucester Series: The Gloucester series consists of somewhat excessively drained soils that form in thick _____. Stones and boulders on and below the surface are limitations to many uses of these soils.

Hinckley Series: The Hinckley series consists of excessively drained soils that formed in thick deposits of _____. Cobblestones are common in some layers. These nearly level to very steep slope soils are on kames, terraces, and outwash plains throughout the county.

Hollis Series: The Hollis series consists of shallow, somewhat excessively drained soils that formed in a thin mantle of _____. These soils are less than 20 inches deep over bedrock. Rock outcrops are a prominent feature of the landscape.

Suffield Series: The Suffield series consists of well-drained soils that formed in thick deposits of _____. Permeability is slow, and the available water capacity is high.

Scantic Series: The Scantic series consists of poorly drained soils that formed in thick _____. These soils are nearly level to gently sloping.

Windsor Series: The Windsor series consists of excessively drained, stone-free soils that formed in thick deposits of _____. These soils are mainly in areas next to the Cocheco and Salmon Falls Rivers.

Homework:

Write a 1 page paper on soil. All sources must be properly cited, including internet resources. Choose one of the following topics:

1. Describe a state soil of your choice. Look up a state soil at the USDA. Once you have the name and type of your soil, surf around for additional information. Describe it's properties, parent material, and associated uses/problems.
2. Find out about composting – what is it, uses and benefits, barriers to composting, etc...
3. Find out about soil erosion in the US – its' causes, history, and ways to reduce soil loss, etc...
4. Urban soils have different problems from rural areas. Summarize one key soil problem facing urban people – its' causes and potential remediation measures
- 5.
6. The U.S. Department of Agriculture (USDA) is a great place to start.
<http://soils.usda.gov/>