

Lesson 5: Island of Many Hills

Objectives:

- Students understand the extent to which people have changed Manhattan's topography over time
- Students translate 2-D information into a 3-D model

Vocabulary: topography, contour line

Materials:

- example of a contour map (optional)
- Mannahatta contour map*
- set of 11 1609 contour map sections*
- sheets of soft foam**
- scissors (1/student)
- markers in 4 colors (1/student)
- glue stick (1/group)



Northern sections of Mannahatta model.

New York State Elementary Learning Standards *Key Ideas* and *Performance Indicators*:¹

- Mathematics Key Idea MST3.NN2: Students use number sense and numeration to develop an understanding of the multiple uses of numbers in the real world, the use of numbers to communicate mathematically, and the use of numbers in the development of mathematical ideas.
- Mathematics Performance Indicator MST3.E.NN2A: Students use whole numbers and fractions to identify locations, quantify groups of objects, and measure distances.
- Mathematics Key Idea MST3.MM4: Students use mathematical modeling/multiple representation to provide a means for presenting, interpreting, communicating, and connecting mathematical information and relationships.
- Mathematics Performance Indicator MST3.E.MM4A: Students use concrete materials to model spatial relationships.
- Science Key Idea MST4.LE7: Human decisions and activities have had a profound impact on the physical and living environment.

[Lesson prep: For this activity, the map of Mannahatta has been divided into 11 8½" x 11" sections. In order to build the entire model, you must have 4 copies of section 1, 4 copies of section 2, 3 copies of section 3, 2 copies of section 4, 3 copies of section 5, 2 copies each of sections 6-10, and 1 copy of section 11. This adds up to 27 copies TOTAL.]

Introduction: Mannahatta map review

(5 minutes)

Tell students that today they are going to make a model of how the island of Mannhatta was shaped 400 years ago! They will make their model based on a contour map of Mannahatta in 1609. Ask if students know what a contour maps shows (it shows *contour lines* that represent different elevations; the closer the lines are together, the steeper the land, and the further they are apart, the flatter the land). (Optional: show students an example of a contour map, and let them take a look at what the lines represent.) Show students the contour map of Mannahatta 1609, and ask what they notice about it. Ask how such a map might be useful. Explain that they will work in groups, and each group will use one section of this map to work on making a model of one section of the

¹ From www.nylearns.org/standards. NY State learning standards encompass standards, key ideas, performance indicators and major understandings.

* All images/materials are available on our website, at www.wcs.org/mannahatta. Images can be printed out in color or black and white.

** Darice extra-thick foam sheets work well – make sure to use pieces that are at least 3 mm thick (search on www.darice.com).

island. When all the groups are done, they will put their sections together to form a big model of the whole island of Mannahatta!

Activity: Modeling the island of many hills

(30 minutes)

- Divide students into groups. Groups should have between 1 and 4 students, depending on which section of the map each group receives. Groups working with sections 1 and 2 should each have 4 students; the group working with sections 3 and 5 should each have 3 students; groups 4 and 6-10 should each have 2 students, and group 11 is just one student (this adds up to 27 students total; if you have fewer students, you can leave out a few of the southern sections of the model, or have some students do more work).
- Next, pass out the 1609 contour map sections. Each student should receive their own copy of the map section their group is working with. (That is, you should have four copies of section 1 so that all four students in that group receive their own section; but you only need two copies of section 6, since there are only two students in that group.)
- Review the maps with the students. Ask them to note the scale bar and north arrow. Ask what the highest elevation is (180 feet) and the lowest elevation (0, or the shoreline). Tell students that they will each pick one elevation to work on in their model. Groups 1 and 2 have all four elevations represented in their map; groups 3 and 5 have the three lower elevations represented in their map; groups 4 and 6-10 have two elevations represented in their maps; and group 11 has just one elevation represented (but this group also has an extra island).
- Pass out markers. Tell students that each color represents one elevation of land. The 11 students who are working on the 0 feet elevation line should all receive one color (e.g. yellow); the 10 students who are working on the 60 feet elevation line should all receive another color (e.g. orange); the 4 students who are working on the 120 feet elevation line should all receive another color (e.g. red); and the 2 students working on the 180 feet elevation line should all receive a fourth color (e.g. purple). Now, each student should color in EVERYTHING inside of their respective elevation lines.
- Once students have completed coloring their piece, pass out scissors, foam (or other modeling material), and glue. Explain that each student will now cut out her piece of paper along the line of the elevation she has colored in. She will then glue her cut-out elevation to the piece of foam, and trace around it with the marker. She will then cut out her foam along the traced line, so that that the piece of foam is the same size as the cut-out piece of paper. Once all the students in the group have cut out their foam pieces, they will layer their pieces on top of each other, from lowest elevation to highest, and glue them together,
- Circulate among students as they work.
- Once groups have completed their sections, ask them to bring them all together and piece them together to create one big model of the island of Mannahatta! (See pictures above and below in order to visualize how this will look.)



Wrap-up discussion:

(10 minutes)

Ask students to examine the model they have created as a class. Ask them how they think the topography of the island has shaped the ecological communities on the island (for example, prompt them to discuss how water flows, and how they might be able to see stream valleys in the topography). Show students the orthophoto image of Manhattan today. Which areas of the island have changed the most since 1609? Why do students think the topography has changed so much from 1609 to today? What are some of the effects of a changed topography?

Extension activities:

- Students go further back in time to study the effects glaciers had on the topography of Manhattan. What are the processes that shape the topography? How does topography shape ecological communities? See if students can connect what they have learned about Mannahatta's topography to the different species that lived on the island (referring back to the Muir Web lesson).
- Students build a topographic model of Manhattan today, and compare it to their model of 1609 Mannahatta.