

9/11 MEMORIAL

UNIT: History of the World Trade Center

GRADE LEVEL/S: 6-8

TIME NEEDED: 1 session

TEACHER: Karen H. Levine

LESSON TITLE: THE GEOLOGY OF LOWER MANHATTAN

Common Core Standards

SL 4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

SL 5 Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

Key Questions/ Issues Addressed

How does geology influence our land use?

How do we adapt land for different uses?

How do different forces change and reshape land?

Lesson Goals/ Objectives

Students will be able to use various maps of lower Manhattan to make inferences about the World Trade Center.

Students will be able to analyze the topography of lower Manhattan.

Students will be able to understand the geologic history of lower Manhattan.

Key Terms

Geology: The science dealing with the physical history of the earth.

Topography: The shape of the earth's surface.

Manhattan schist: A mica-based, metamorphic rock that serves as the bedrock underneath most of Manhattan.

Skyscraper: Term used to describe tall buildings.

Reclamation: The manmade creation of new land (land fill) from bodies of water. Not to be confused with landfills (a site for the disposal of materials).

Lower Manhattan: The southernmost section of Manhattan, the central of five boroughs that make up New York City (NYC). The World Trade Center (WTC) is located here.

Slurry wall: A wall constructed around the perimeter of the original World Trade Center to keep the adjacent Hudson River from flooding the site.

Materials

Computer with internet access

Interactive map: gizmodo.com/watch-new-york-city-s-boundaries-expand-over-250-years-496440467

Image of Manhattan Schist: See <https://www.911memorial.org/wtc-history>

Image of the New York City skyline pre-9/11: See [Appendix A](#).

Geological map of Lower Manhattan: img.docstoccdn.com/thumb/orig/123283447.png

Image of the Slurry wall: www.911memorial.org/museum-exhibition-design

Background for lesson

Students should have an understanding of the events of 9/11.

Instructional Activity/ Procedures

1. Ask students: *What changes might alter an area's topography?* Answers might include natural events like water and wind erosion, natural disasters such as earthquakes and tsunamis, as well as man-made events such as dams and infrastructure development. Discuss how examples change the land.
 2. Ask: *How and why might an area grow in size?* Show students the following website: www.racontrs.com/stories/NYC-land-reclamation/. After viewing the interactive map, ask: *How has lower Manhattan changed over time?*
 3. Explain that fill, largely from the excavation of the WTC site, was used to create the land for areas adjacent to the complex.
 4. Research the geological map at <http://research.amnh.org/eps/nycgeology>. Ask students to identify the bedrock in lower Manhattan. Visit www.911memorial.org/wtc-history to view an image and information about Manhattan Schist. Ask students: *Why is Manhattan Schist necessary to build skyscrapers?*
 5. Show students a picture of the NYC skyline before 9/11. (see [Appendix A](#)). This image was taken atop the South Tower, looking north towards Midtown Manhattan. Ask: *What do they notice about the location of the skyscrapers?* Knowing that bedrock shifts underneath the surface so it descends very deep in some locations and exists closer to the surface at others, and that level bedrock close to the surface is needed to build skyscrapers, *what can we infer about the location of the bedrock in Manhattan?*
 6. Assign students one of the following questions as an essay or presentation prompt:
 - Students research the design and construction of the World Trade Center to find information on the slurry wall and other features.
 - Students visit the 9/11 Memorial Museum website to listen to the story of Arturo Ressi, a World Trade Center engineer who discusses the importance of the slurry wall.
 - Students research maps of NYC from different times to examine the impacts of land changes on Manhattan during its history.
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Evidence of Understanding

Students' reading comprehension answers and final project will highlight their understanding of the lesson's goals.

Extension Activities

N/A

APPENDIX A *View from the South Tower Observation Deck.*
Gift of John and Catherine Lawrence/Richard Gross.
image: Collection of 9/11 Memorial Museum.



Looking north at Manhattan. The Empire State Building can be seen in the background.