
Lesson 4.2

SHIFTING COASTLINES

Subjects: science, mathematics.

Skills: application, analysis, evaluation, knowledge.

Strategies: problem solving, mapping, scientific inquiry, computation, graphing, using scale.

Duration: 45 to 60 minutes.

Class Size: any.



Clovis spear point from North Carolina, ca. 10,000–9000 BC.

Objectives

In their study of North Carolina’s changing coastline during the Paleoindian and Archaic periods, students will:

- determine the positions of the coastline at different times;
- decide what types of archaeological information has been lost due to rising sea levels.

Materials

For the teacher, transparencies of “North Carolina’s Continental Shelf” and “Shifting Coastlines” activity sheet for projection. For each student, a copy of the “Shifting Coastlines” activity sheet; assorted color pencils or markers.

Vocabulary

Barrier islands: a line of islands that run parallel to the mainland coast and are separated from the mainland by a body of water known as a sound.

Beringia: the name of the land bridge that connected Asia and North America during the last Ice Age.

Climate: the general weather conditions of an area.

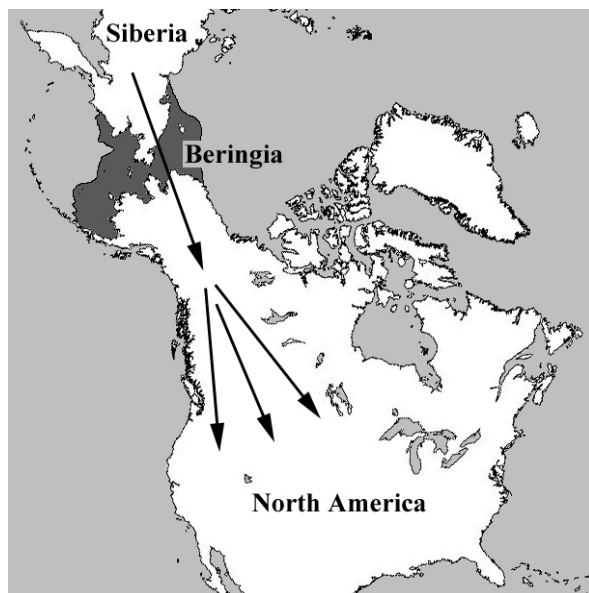
Continental Shelf: the part of the continent beyond the current shoreline that is submerged in relatively shallow seas.

Nomadic: a way of life in which a group of people have no permanent residence, but move from place to place.

Sea level: the water level of the sea at a point midway between low and high tide.

Background

The earliest peoples living in North Carolina, known as the Paleoindians, arrived here by 11,500 years ago. Their ancestors had traveled from what is now the continent of Asia across a land bridge that connected Alaska and Siberia. This land bridge, called *Beringia*, was exposed during the last Great Ice Age, which lasted from 2 million to 10,000 years ago. Because so much ocean water was frozen into glaciers during that period, sea levels were much lower than they are today. Land that is now underwater was dry ground, and, thus, the continents were shaped very differently than they are now. For example, the continents of Asia and North America were



Beringia.

connected by the Beringia land bridge. Before people crossed over the land bridge from Asia, there had been no people living in what is now North and South America. It took many years for the descendants of the first North American Paleoindians to travel across the continent and reach what is now North Carolina.

The earliest residents of North America were hunters and gatherers and moved around to be near herds of game animals and seasonal plant foods. In fact, many archaeologists believe that early North Americans crossed the land bridge as they followed herds of large grazing animals, such as mammoth and bison. When Paleoindians lived in North Carolina, the *climate* was different than it is now. The weather was cooler and wetter, with harsher winters than we experience today. As the weather grew warmer over time, larger grazing

animals, such as mammoths and caribou began to be replaced by smaller animals. These animals included deer, rabbits, squirrel, and raccoons, which were abundant in the forests of hickory, elm, and oak that replaced the cold-loving boreal forests at the end of the Ice Age.

The land itself was also very different during the Paleoindian period. Today the Atlantic Ocean meets the shore of North Carolina at the Outer Banks, a line of *barrier islands* that runs parallel to the mainland. During the Paleoindian period, however, the *sea level* was lower because so much evaporated seawater fell to freeze into glaciers that reached from the North Pole down through Canada. Scientists estimate water levels were 125 feet below the present water surface around 14,000 years ago. Most of the now-underwater *Continental Shelf* was exposed land. This meant that, in some places, the ancient coastline was more than 50 miles east of the modern shore!

As thousands of years passed (between 12,000 and 9,000 years ago); the climate slowly warmed and the ice caps began to melt, causing the sea level to rise. By 10,000 years ago, at the end of the Paleoindian period, the water levels were about 92 feet below current levels. Water levels continued to rise slowly throughout the next few thousand years, and by 7,000 years ago, sea level was about 46 feet below its current level.

Archaeologists know very little about the daily life of Paleoindians because they probably lived in small *nomadic* groups. Because they moved around frequently, they did not leave behind traces of villages like Native Americans from later times. Some Paleoindians may have lived along the coast, but where they camped and any evidence they left documenting their stay would now be under at least 100 feet of water. Consequently, archaeologists know little about the places coastal Paleoindians lived, what types of food they ate, and how big the groups were in which they traveled and lived.

Setting the Stage

The Cape Hatteras lighthouse was in danger of being swallowed by the sea. To prevent its destruction, the lighthouse has been moved inland. Ask students this question: If the lighthouse

had stayed in its old location and the sea had destroyed it, would anybody living five hundred years from now know about it if no records existed? Why would this knowledge be important? Discuss the role lighthouses play in maritime history.

Procedure

1. Go over the background material with students.
2. Project the transparency “North Carolina’s Continental Shelf” and point out features of the coast, such as the barrier islands known as the Outer Banks. Indicate on the map the edge of the Continental Shelf, showing students the extent of land around 14,000 years ago. Ask them: If people lived on the coast 14,000 years ago, where would their sites be? How would this location affect what archaeologists can learn?
3. Distribute the “Shifting Coastlines” activity sheet to each student. Project a transparency of the activity sheet, drawing attention to the cross-section diagram of the North Carolina coast. Point out the current sea level, as shown by the horizontal line drawn across the top of the cross section. Direct the students to use the vertical scale that appears along the left-hand side of the cross section to determine sea levels for the periods listed in Question 1. You may want to go through an example with the students.
4. Direct them to use rulers and colored markers to draw lines for the sea levels in Question 1. Use a different color marker for each level, and label each with the time period represented.
5. Direct students to answer the remaining question on the activity sheet.

Closure

Explain to students that climatic and other environmental changes are occurring constantly. Shoreline activities will continue to erode the coast in some places and build it up in others, while storms like hurricanes can create or destroy coastal lands and barrier islands. You may wish to use the example of Topsail Island. Before Hurricane Fran in September of 1996, Topsail Island was one body of land. The winds and waves of the hurricane created a new channel of water through the land, cutting the island in half.

Evaluation

Have students turn in their activity sheets for evaluation.

Links

Lesson 3.1: “The Pathfinders.”

Lesson 1.3: “Observation and Inference.”

Sources

Blackwelder, Blake W., Orrin H. Pilkey, and James D. Howard. 1979. “Late Wisconsin Sea Levels on the Southeast United States Atlantic Shelf Placed on In-Place Shoreline Indicators.” *Science* 204, pp. 618–620.

DePratter, Chester, and James D. Howard. 1981. “Evidence for a Sea Level Lowstand between 4,500 and 2,400 Years Before Present on the Southeast Coast of the United States.” *Journal of Sedimentary Petrology* 51(4), pp. 1287–1295.

Hargrove, Thomas H., Dennis Lewarch, Scott Madry, Ian Von Essen and Charlotte Brown. 1984. *A Cultural Resource Survey at U.S. Marine Corps Air Station, Cherry Point, North Carolina.*

Report submitted to the Archaeological Services Branch, National Park Service, Atlanta. Chapel Hill, N.C.: Archaeological Resource Consultants. [The illustration on the “Shifting Coastlines” activity sheet is adapted from Figure 2.1, courtesy of Thomas Hargrove.]

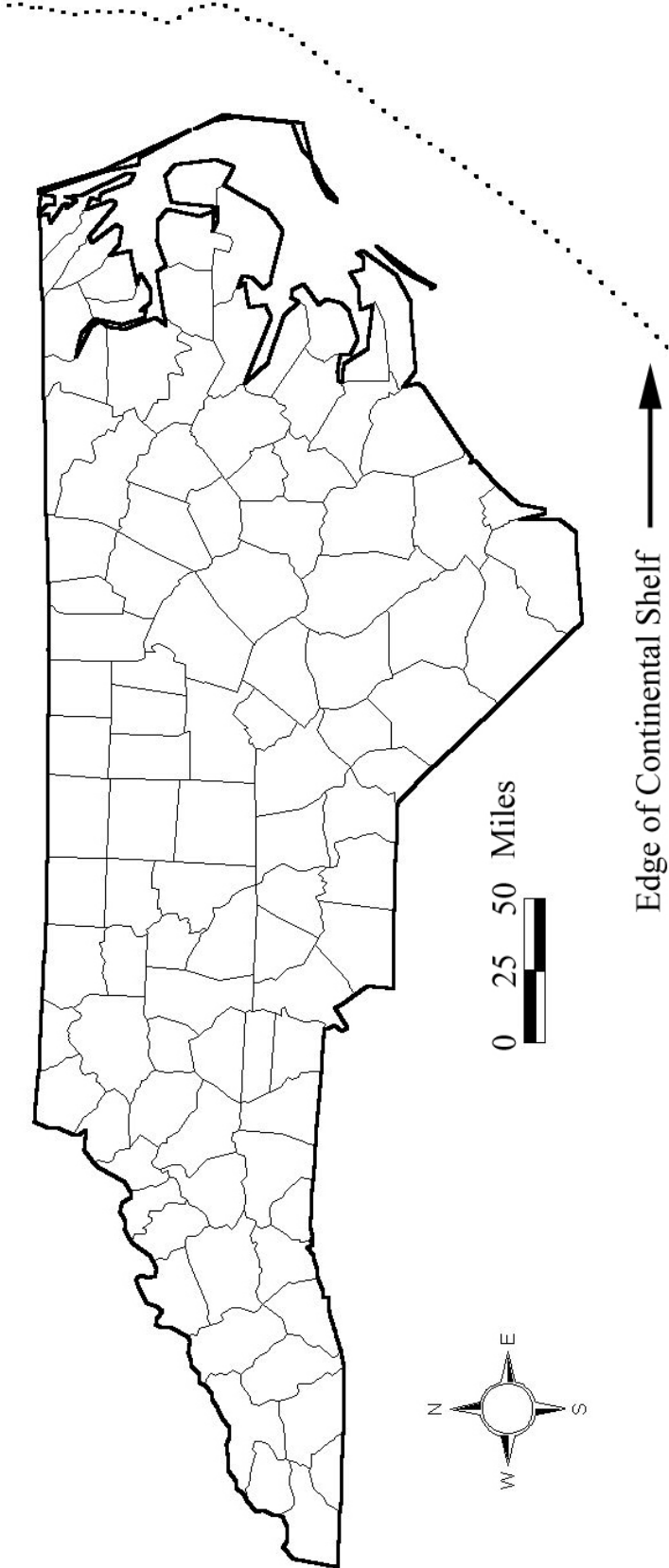
Newton, John G., Orrin H. Pilkey, and Jackson O. Blanton. 1971. *An Oceanographic Atlas of the Carolina Coastal Margin*. Raleigh: North Carolina Department of Conservation and Development.

Ward, H. Trawick, and R. P. Stephen Davis, Jr. 1999. *Time Before History: The Archaeology of North Carolina*. Chapel Hill: University of North Carolina Press. [The image in this lesson’s main heading is taken from Figure 2.1.]

“Shifting Coastlines” Activity Sheet Answers:

1. The approximate distances from the current shore of ancient coastlines are as follows: 14,000 years ago, 50 miles; 10,000 years ago, 32 miles; 7,000 years ago, 3 miles; and 5,000 years ago, less than 1 mile.
2. Examples of the kinds of information lost as a result of rising sea levels are where coastal Paleoindians lived, what sorts of shelters they built, what foods they ate, what tools they used, and how they buried their dead.

North Carolina's Continental Shelf

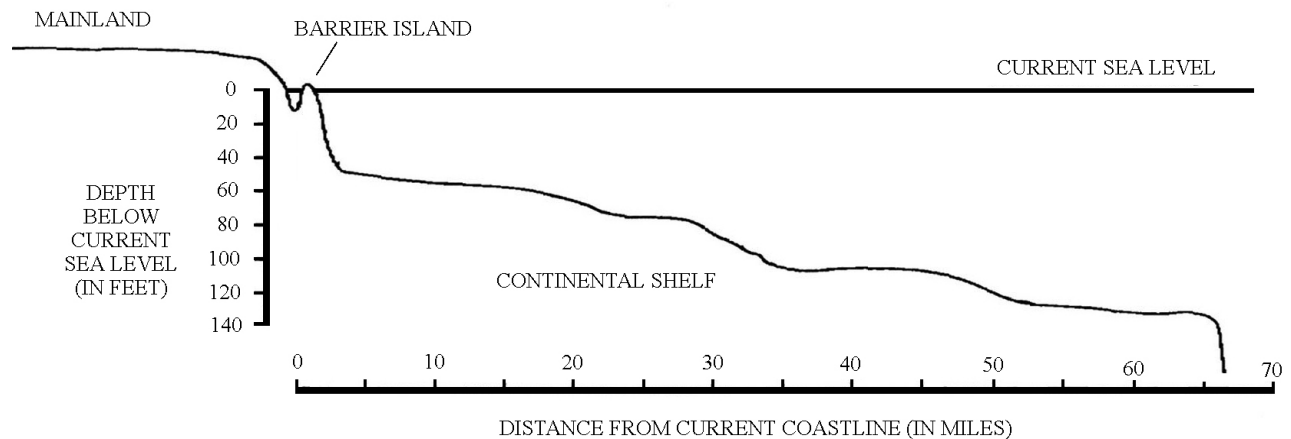


Shifting Coastlines

Name: _____

1. The diagram below shows a cross section of the North Carolina coast. This diagram can be used to reconstruct where the coastline was during Paleoindian and Archaic times, when the sea level was lower than it is today. Shown below are the sea levels at various times in the past. (Remember: current sea level is 0 feet and is shown as a horizontal line near the top of the diagram.) Use colored markers to draw a line on the diagram showing the sea level for each date. Mark the date beside or on top of the line. How far from the current coastline was the coastline at each date in the past?

- 14,000 years ago, the sea level was 125 feet below current sea level.
- 10,000 years ago, the sea level was 92 feet below current sea level.
- 7,000 years ago, the sea level was 46 feet below current sea level.
- 5,000 years ago, the sea level was 5 feet below current sea level.



2. Sites where Paleoindians lived along the coast are now covered by the sea. What types of information about how these early peoples lived has been lost forever by the rising sea levels?