**LAB MODULE 19: COASTAL ENVIRONMENTS**

**Note:** Please refer to the GETTING STARTEDmodule to learn how to maneuver through, and how to answer the lab questions, in the Google Earth (GE.gif) component.

**KEY TERMS**

You should know and understand the following terms:

|  |  |  |
| --- | --- | --- |
| Barrier island | Lagoon | Sea stack |
| Bay mouth bar | Littoral drift | Spit |
| Beach drift | Marsh | Tides |
| Groynes (groins) | Protogradation | Tombolo |
| Headlands | Retrogradation |  |
| Hooked spit | Salt flats |  |

**LAB LEARNING OBJECTIVES**

After successfully completing this module, you should be able to the following tasks:

* Identify erosional processes and features created by coastal waters
* Identify depositional processes and features created by coastal waters
* Examine the processes which create coastal landforms
* Interpret topographic maps
* Calculate elevation from topographic maps

**INTRODUCTION**

In this module you learn about some fundamental concepts of coastal environments. Topics covered include coastal erosion and deposition processes and features, the tides, and jetties. The module starts with four opening topics, or *vignettes*, which are found in the accompanying Google Earth file. These vignettes introduce basic concepts and tools on which geographers rely. Some of the vignettes have animations, videos, or short articles that will provide another perspective or visual explanation for the topic at hand. After reading the vignette and associated links, answer the following questions. Please note that some links may take a while to upload based on your internet speed.

Description: Description: Description: GE.gif Expand the **INTRODUCTION** folder and then double-click on **Topic 1:**

 Read **Topic 1: Introduction**.

**Question 1**: What are some reasons people live near or on the coast?

 Read **Topic 2: Tides**

**Question 2**: What is the height of a typical high tide in the Gulf of Mexico?

 Read **Topic 3: Human Interaction**

**Question 3**: Describe two structural and two non-structural methods humans use to protect a shoreline

 Read **Topic 4: Coastal Landforms**

**Question 4:** In the Lake Ellesmere reading, the Banks Peninsula headlands are not eroded as intensely as other headlands. Why?

 Collapse and close **INTRODUCTION**

**GLOBAL PERSPECTIVE**

GE.gif Double-click and select **GLOBAL PERSPECTIVE**.

This map shows the location of major coastal cities located throughout the world. At present, coastal cities are increasing in population numbers, population density, and spatial extent, with many coastal areas becoming more urbanized.

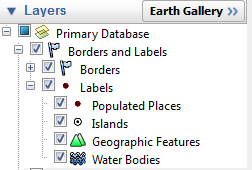


Figure 1. Google Earth Layers pane.

For Questions 5 to 8, type the information provided into the **Search** tab in Google Earth and press Enter. When you arrive at your destination, find the information to fill in the blanks below. You might have to zoom out to see the label for the body of water. Verify that the **Water Bodies** line item is selected (Figure 1).

**Question 5:** Buenos Aires, Argentina

Latitude/Longitude: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Population: \_\_\_\_\_

Body of water: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 6:**  Los Angeles, CA

Latitude/Longitude: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Population: \_\_\_\_\_

Body of water: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 6:** 31 13 49 N, 121 28 25 E

City: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Population: \_\_\_\_\_

Body of water: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 8:** 19 01 41N 72 51 22E

City: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Population: \_\_\_\_\_

Body of water: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Collapse and close **GLOBE PERSPECTIVE**



**EROSIONAL FEATURES**

**GE.gif** Expand **EROSIONAL FEATURES**. Double‑click and select ****.

**Question 9:** What is the name of the feature where letter A is located?

GE.gif Double‑click and select **Newport North, OR**.

**Question 10:** Use the contour lines to estimate the elevation of the highest point of this feature (near the radio symbol).

**Question 11:** What other land uses can be found on this feature?

**GE.gif** Double-click and select **Agate Beach**. At the bottom of the screen, click the **1994** date (1994.png) to activate the historical imagery tool. Examine the beach in 1994.

**GE.gif** Double-click and select ****.

**Question 12:** Using the ruler tool to measure, what is the distance (in meters) from **** to the water?

**GE.gif** Advance the time slider to 2005 and examine the beach.

**Question 13:** Using the ruler tool to measure, what is the distance (in meters) from **** to the water?

**Question 14:** What is the average change in the width of the beach from 1994-2005? (**Hint:** Calculate the difference in distance divided by the number of years)

**Question 15:** Assuming both images were captured at low tide, is this part of Agate beach experiencing progradation (expansion) or retrogradation (contraction)?

GE.gif Double-click and select **South Beach**.

**Question 16:** Identify a feature that mitigates the erosional power of waves.

**Question 17:** In which general direction is littoral drift moving?

GE.gifDouble-click and select **Jump‑off Joe**.

You will see a section of Nye Beach.

Double‑click the **Newport North, OR** map again to verify the location of the Jump‑off Joe symbol. Use the **Adjust Opacity** tool Transparency_tool01 to compare the aerial photograph to the topographic map. As you can see, there is not much at this location other than a sandy beach.



GE.gifDouble‑click **Jump‑off Joe** again. To read more about Jump-off Joe, type the following URL into your browser to go to the USGS web site: http://walrus.wr.usgs.gov/pubinfo/jump.html

**Question 18:** What coastal feature used to be at the Jump‑off Joe symbol?

 Collapse and close **EROSIONAL FEATURES**

**DEPOSITIONAL FEATURES**

**GE.gif** Double-click **DEPOSITIONAL FEATURES**.

This is a typical view of a landscape in which transportation and subsequent deposition of material is common along the southeastern coast of the US.

**GE.gif** Double-click and select **Hampstead, NC**.

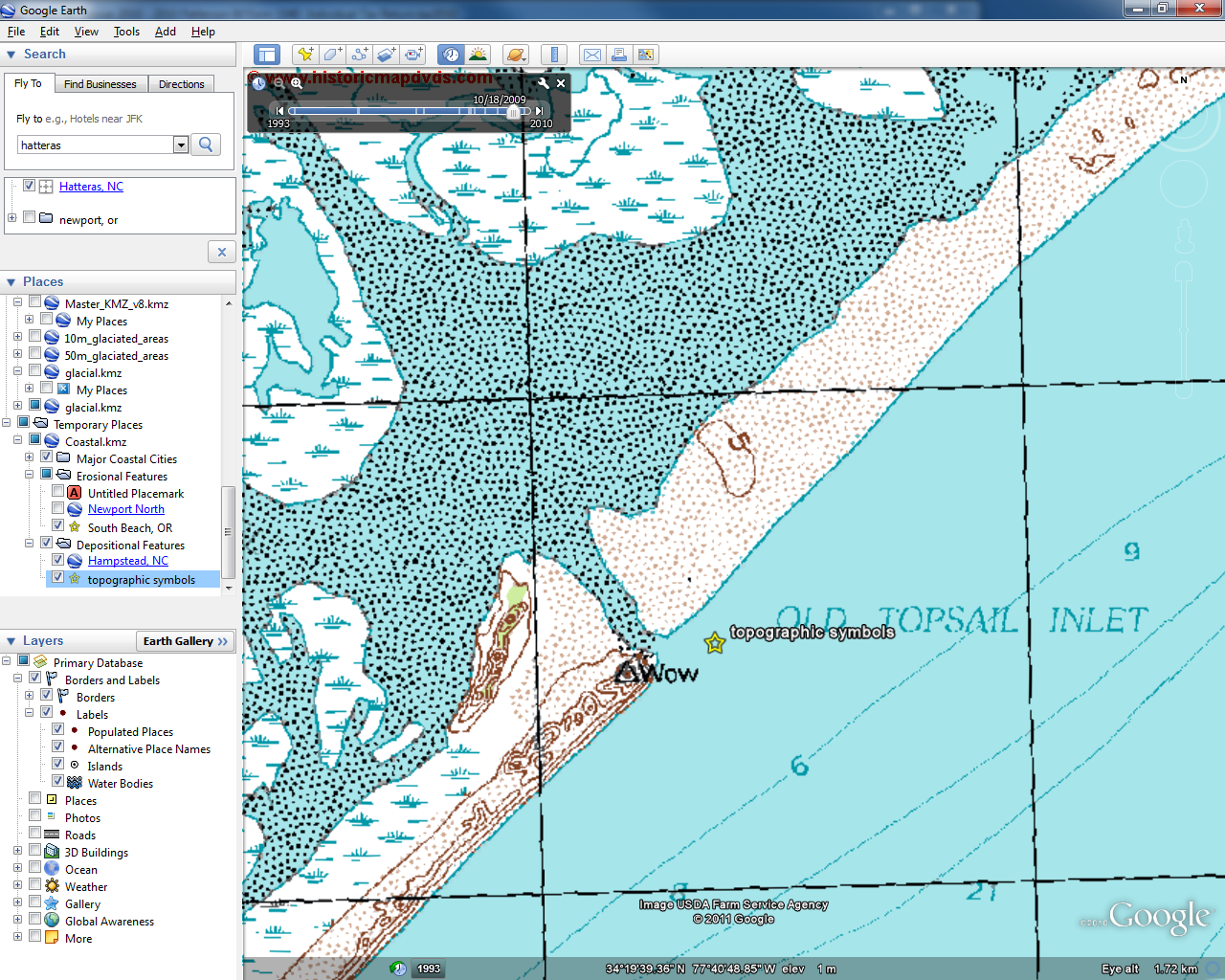


Figure 2. Wow, Hampstead, North Carolina, USA (Google Earth Library).

The map shows a series of islands off the coast of North Carolina.

**Question 19:** What coastal feature are these islands?

Several topographic features can be found within this coastal feature. If you need help understanding the topographic symbols, type the following URL into your browser to go to the USGS web site:

http://egsc.usgs.gov/isb/pubs/booklets/symbols/topomapsymbols.pdf

**Question 20:** What feature is represented by the brown dots?

**Question 21:** What feature is represented by the black dots?

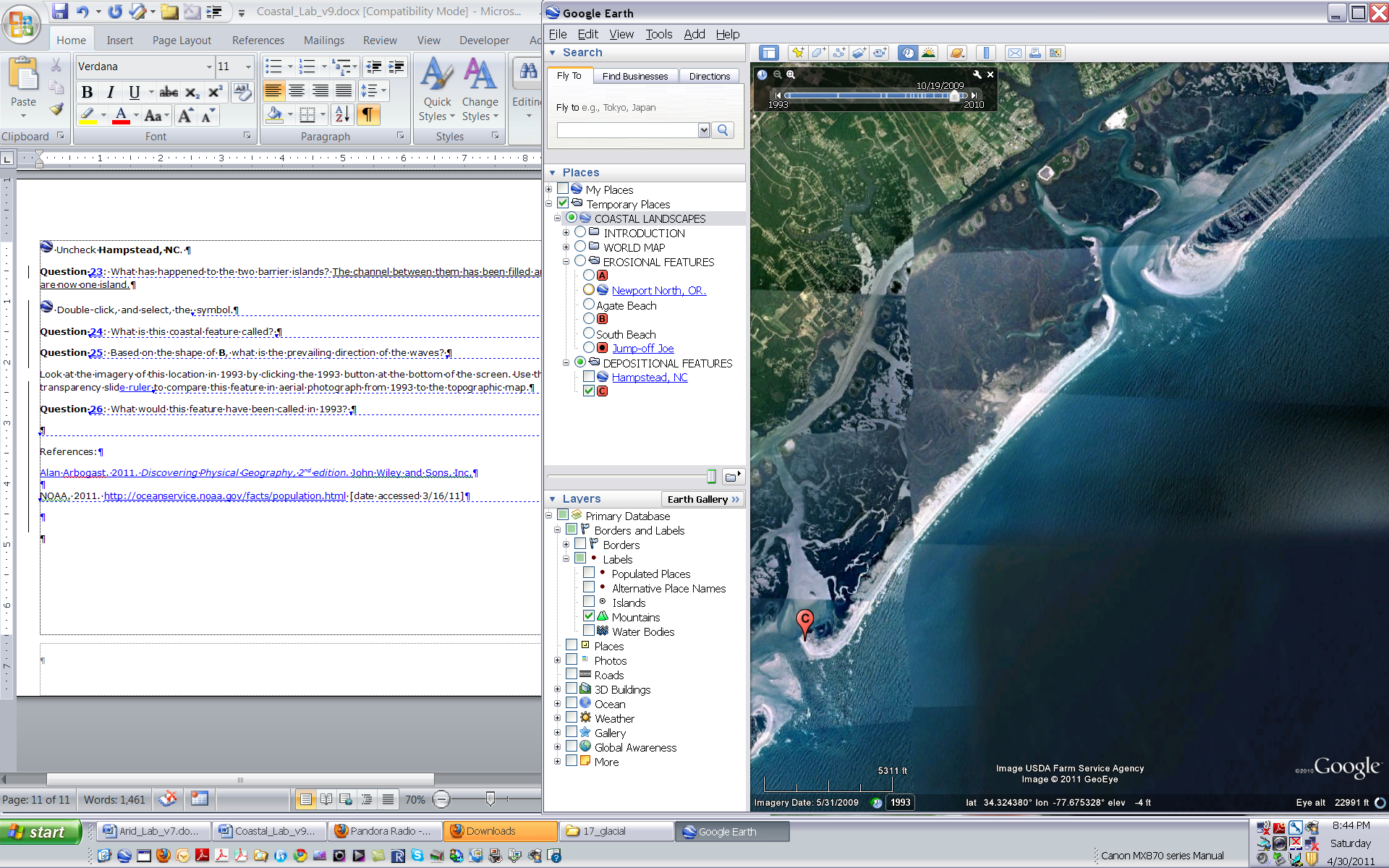
**Question 22:** What is represented by the blue clumps of vegetation?

**Question 23:** Estimate the elevation of the highest point on Figure Eight Island (**Hint:** Look to the bottom of the historic map to determine the contour interval).

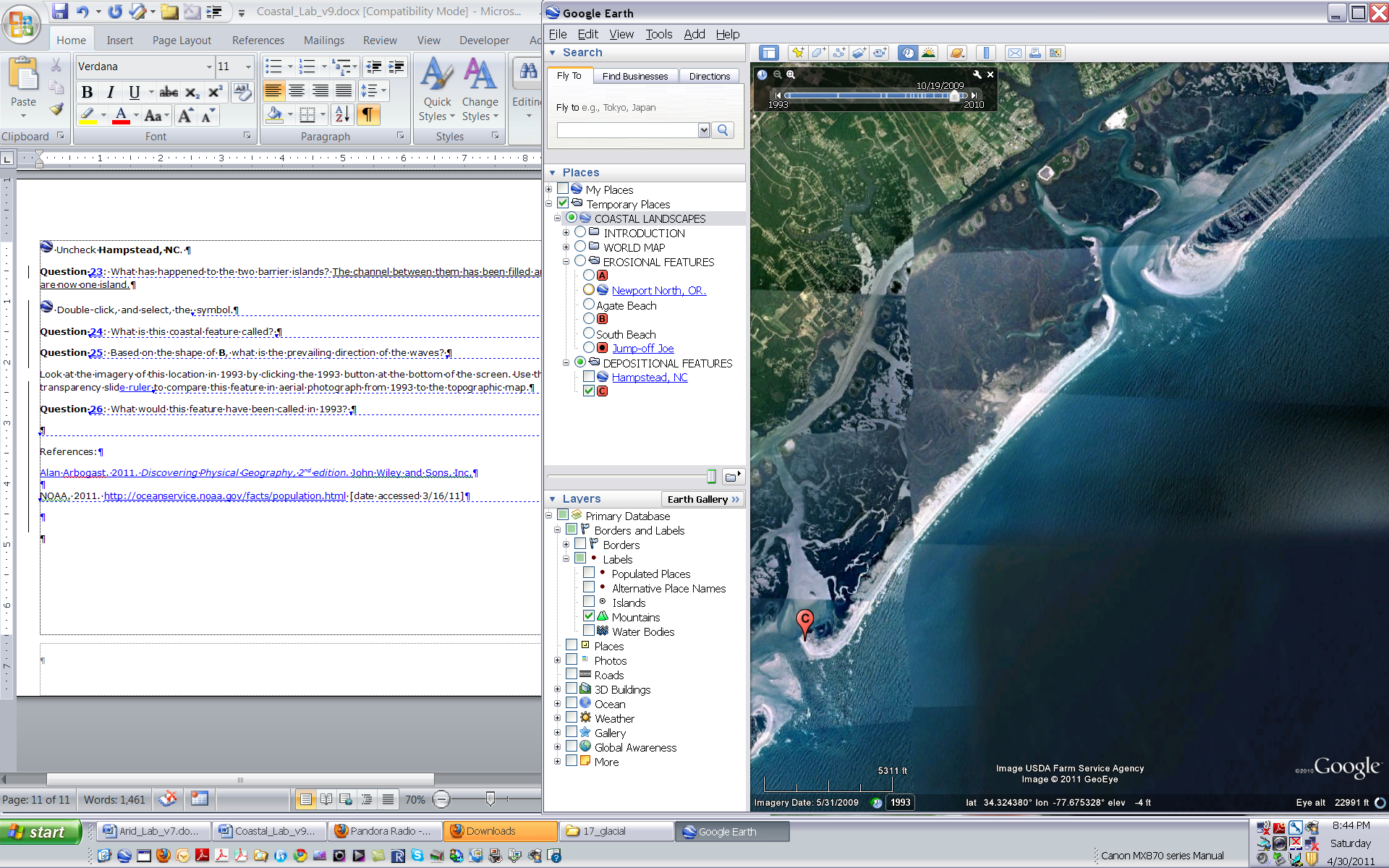
Zoom in and examine the break between the two islands near the horizontal control named **Wow**, as seen in Figure 2.

**GE.gif** Uncheck **Hampstead, NC**.

**Question 24:** What has happened to the two barrier islands?

**GE.gif** Double-click and select the  symbol.

**Question 25:** What is this coastal feature called?

**Question 26:** Based on the shape of ****, what is the prevailing direction of the waves?

Look at the imagery of this location in 1993 by clicking the 1993 button at the bottom of the screen. Use the transparency slide ruler to compare this feature in aerial photograph from 1993 to the topographic map.

**Question 27:** What would this feature have been called in 1993?

Collapse and close **DEPOSITIONAL FEATURES**



**LITTORAL DRIFT**

Expand **LITTORAL DRIFT**, click **Littoral Drift Video**, and then click Play.



Dr. Mark W. Patterson demonstrates the concept of littoral drift.

Description: GE.gif Click **Littoral Drift Animation**.

Given what the video and animation demonstrated about littoral drift, answer the following questions.

Expand the **Littoral Drift Examples** folder.



Double‑click and select **Littoral Drift #1**.



**Question 28:** Which direction is the littoral drift moving? ­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 29:** How do you know it is moving in this direction?

Description: Description: Description: GE.gif Double‑click and select **Littoral Drift #2**.

**Question 30:** Which direction is the littoral drift moving? ­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 31:** How do you know it is moving in this direction?

Description: Description: Description: GE.gif Double‑click and select **Littoral Drift #3**.

**Question 32:** Which direction is the littoral drift moving? ­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 33:** How do you know it is moving in this direction?

Description: Description: Description: GE.gif Double‑click and select **Littoral Drift #4**.

**Question 34:** Which direction is the littoral drift moving? ­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question 35:** How do you know it is moving in this direction?

**Question 36:** Based on the animation, describe the impact that groynes have on littoral drift.

**Question 37:** Would a conservationist want groynes used? Why or why not?

**Question 38:** Would a homeowner whose house is on the beach want groynes used? Why or why not?

**References**:

Alan Arbogast. 2011. *Discovering Physical Geography, 2nd edition.* John Wiley and Sons, Inc.

NOAA. 2011. <http://oceanservice.noaa.gov/facts/population.html> [date accessed 3/16/11]

Sources

Page 2. Hong Kong, from Victoria Peak. (Nancy Hoalst‑Pullen)

Page 3. Photo: Tidal Marsh (Mark W. Patterson).

Page 4. Photo: Groynes (groins) and shoreline processes (Figure 19.39 in Arbogast 2011)

Page 5. Photo: South Island, New Zealand (NASA). http://disc.sci.gsfc.nasa.gov/geomorphology/GEO\_6/geo\_images\_C-10/PlateC-10.gif

Page 6. Photo: Coastal Erosion, Washington, USA (USGS). http://coastal.er.usgs.gov/cgi-bin/response.pl?site=wo&loc=24