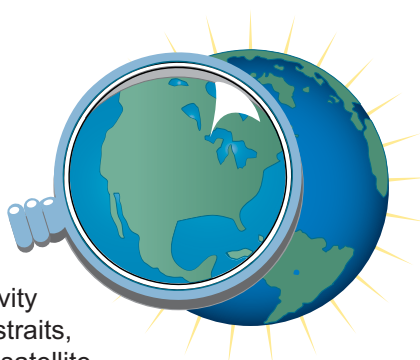




Water bodies, where are they?

Investigation Overview

This investigation introduces and defines different kinds of water bodies and examines their locations. The activity focuses on oceans, seas, gulfs, bays, straits, lakes, and rivers. Students use NASA satellite images and maps to study these water bodies, and they compare their state's water bodies to those of other states.



Time required: Two 45-minute sessions

Materials/Resources

NASA Images: (transparency or six copies of each)

Figure 1: Pacific and Atlantic Oceans

Figure 2: Mediterranean Sea

Figure 3: Gulf of Mexico

Figure 4: Chesapeake Bay

Figure 5: Susquehanna and West Branch Rivers, Pennsylvania

Figure 6: Lake Victoria

World outline map (six copies)

6 atlases

Globe

CD-ROM: *Visit to the Ocean Planet*, NASA educational product, optional

Log 1: Images of water bodies (one copy for each student)

Log 2: Water bodies (one copy for each student)

Log 3: Looking at the world's water (one copy for each student)

Log 4: Comparing our state (one copy for each student)

Content Preview

Geographers divide Earth's water bodies into three types: oceans, flowing water, and lakes. All three types are vulnerable to human impact such as oil spills, other pollution, and lessened flow; however, those water bodies close to large population concentrations are the most affected by human activities.

Classroom Procedures for Day 1

Beginning the Investigation

1. Have the students list as many types of water bodies as they can. Do this in small groups or as a class. If done in small groups, share with the class. Put the types on a chart or chalkboard and add types as the lesson progresses.
2. Tell the students that the world's water bodies can be divided into three major groups. Have them look at the list on the chalkboard and predict

Geography Standards

Standard 2: The World in Spatial Terms

How to use mental maps to organize information about people, places, and environments in a spatial context

- Identify major physical features at a variety of scales using maps, globes, and other sources of graphic information.

Standard 7: Physical Systems

The physical processes that shape the patterns of Earth's surface

- Explain how physical processes help to shape features and patterns on Earth's surface.

Geography Skills

Skill Set 1: Ask Geographic Questions

- Ask geographic questions—Where is it located? Why is it there? What is significant about its location? How is its location related to the locations of other people, places, and environments?

Skill Set 2: Acquire Geographic Information

- Make and record observations about the physical and human characteristics of places.

Skill Set 4: Analyze Geographic Questions

- Use texts, photographs, and documents to observe and interpret geographic trends and relationships.

what three groups that could be. Have students justify their choices. Write “Oceans, Flowing Water, and Lakes” on the chalkboard and share information from **Background** with the group.

Developing the Investigation

- Refer to the list above and circle the following water bodies. Tell the students that the project that they will be doing will focus on these: oceans, seas, gulfs, bays, lakes, and rivers. Give the definitions to the class, either verbally or on a slip of paper and ask them what water body is being defined. Use the following definitions.

ocean: a vast body of salt water that separates or surrounds continents

sea: a smaller division of the ocean, partially enclosed by land (or sometimes a very large lake)

gulf: arm of the ocean that reaches into land

bay: a body of water that is partly enclosed by land, smaller than a gulf

lake: a body of fresh water, surrounded by land

river: water that flows downhill in a natural channel

- Place one set of **Figures 1-6** and an atlas on each of six tables. Divide the students into six groups and give each student a copy of **Log 1**. Review the directions and note the definitions at the bottom of the page. (Alternative: Show transparencies of these figures instead of distributing copies. In this case, project two transparencies at a time on two projectors so that the students can move ahead at their own pace.)
- Ask each group to use the atlas to find the names of the water bodies in the images. Have each student record these names on **Log 1**, along with an interesting observation about the image.
- Have the students remain in their six groups and give each student a copy of **Log 2**. Explain that because most water bodies change over time, images taken from space in different years can be important tools that help us monitor the changes. Ask what kinds of changes such images might show. (*More or less water in lakes and rivers, flooding, changing sea level, etc.*)
- Have each group work with a different water body: oceans, seas, gulfs, bays, rivers, or lakes.

- Distribute atlases for the students to use. Have students complete the response sheet and share their choices with the group. Distribute a world outline map to each group and have them find and label the locations of their water bodies.

Concluding the Investigation

- Review reasons for monitoring changes in water bodies over time. Ask the following questions:

Which water bodies may experience oil spills?

(*Those nearest oil reserves, pathways of tankers, port cities.*)

Which water bodies may experience pollution from fertilizers used on farms? (*Those near farm land and downstream from farmland.*)

Which water bodies may decrease or increase size? (*Those being dammed or diverted, near the seacoast with rising or receding water levels, in places with decreasing or increasing precipitation.*)

Classroom Procedures for Day 2

Beginning the Investigation

- Begin by having students look at the globe, if possible. Maps can be used if globes are not available.

Have students locate the Equator and the northern and southern hemispheres. Write the following question:

- Is more of Earth covered by water in the southern or northern hemisphere?

- Have the students answer the question and tell them that they will be doing an activity that examines the distribution of land and water.

Developing the Investigation

- Cut a world outline map into six sections, horizontally, along the equator and the lines of latitude at 30 degrees and 60 degrees north and 30 degrees and 60 degrees south. Write the latitude at the top and bottom of each section. (For example, the southernmost section in the northern hemisphere would be marked 0 degrees at its lower edge and 30 degrees north at its upper edge.)
- Divide students into six groups. Give each group a section of the map and an atlas. Give each student a copy of **Log 3**. Read the instruction on **Log 3** together and have students complete the information.

14. Have the groups put the map back together, starting from either the North or South Pole. Have each group report from **Log 3** as the map is put back together.

Concluding the Investigation

15. Keep the students in their six groups. Have them use the atlas to find their state on a map large enough that it shows the main rivers. Assign each group another state with a significantly different climate. Have each group find a map of this state that shows a similar level of detail as the map of their own state. Distribute **Log 4** and have each student fill in the answers. Then discuss their findings with the class. List each state on the board and compare its water characteristics with those of the students' own state. Have the students draw conclusions about the impacts of water availability and water scarcity on people, animals, and plants.

Background

Earth supports a large and fascinating variety of water bodies. They can all be grouped into categories. The first, largest, and most important are the oceans. There is really only one, huge, interconnected body of ocean water. We divide it up into different oceans for descriptive purposes. The relative proportion of the globe covered by the sea varies only a little over geologic time, but the size, shape, and location of the ocean basin(s) is determined by the tectonic movements of the continental plates. The global ocean configuration is therefore dynamic over geologic time, but these changes can only be observed in human lifetimes with very sensitive instruments.

The second general type of water body is flowing water—rivers and streams. These channel water downhill to estuaries and oceans, or into lakes. The amount of flowing water in any region changes with changes in climate, land use, or vegetation. Rivers and

streams are extremely dynamic. They erode their channels in some places and deposit sediment in other places. Their channels sometimes flood, and they shift their locations over time.

The third general type of water body is lakes. Any kind of depression on Earth's surface that collects water can form a lake, including huge depressions excavated by glaciers (the Great Lakes), and river or stream valleys dammed by humans. Any process that can create depressions on Earth's land surface, or affect the amount of water and sediment entering or leaving them, can cause changes in the sizes of lakes. Very small lakes are called ponds; very large lakes are sometimes called seas.

Why is there more water in the southern hemisphere?

Most of Earth's land is concentrated in the northern hemisphere, so a disproportionately large amount of the ocean water is in the southern hemisphere. This is simply the result of the current location of Earth's moving tectonic plates. About 240 million years ago, most of the continental land masses were concentrated in the southern hemisphere, and most of the water in the northern. As the tectonic plates shifted, they carried most land masses northward, reversing the hemispheric allocation of land and water.

Evaluation

*Log 1

1. Pacific Ocean
2. Mediterranean Sea
3. Gulf of Mexico
4. Chesapeake Bay
5. Susquehanna River
6. Lake Victoria

Additional Resources

<http://pds.jpl.nasa.gov/planets/gif/ear/earthspn.gif> A nice "blue planet" photo from space

<http://images.jsc.nasa.gov/images/pao/AS8/10074963.jpg> One of the famous "earthrise" images from the Moon (in this case from Apollo 8), showing the lighted portion of Earth as blue and white from ocean and clouds

<http://images.jsc.nasa.gov/images/pao/AS4/10074815.jpg> A photograph from Apollo 4 showing Earth about half in darkness. The light portion is almost entirely blue water and white clouds

<http://www.fourmilab.ch/cgi-bin/uncgi/Earth> Images of Earth as though you were seeing it from the Moon, Sun, or an orbiting satellite, no portion of Earth in shadow or obscured by clouds

<http://fermi.jhuapl.edu/states/states.html> Climate, vegetation, the color landform atlas of the U.S. site

www.fs.fed.us/land/wfas Vegetation maps, greenness maps (produced from satellite images) at the forest service's wildfire assessment site

http://www.cgrer.uiowa.edu/servers/servers_references.html *Maps of the World*, glossary of map terms; Grolier Educational, Danbury, CT

Make It Work! Rivers: World Book, Chicago, 1996

Make It Work! Oceans: World Books, Chicago, 1997



Module 2, Investigation 3: Log 1

Images of water bodies

Your teacher will show you some NASA images of water bodies. Look at the water and the land surrounding it. Use an atlas or wall map to identify each water body.

Here are the directions:

1. Look at the water body and write down what type it may be. Be sure to match the number of the image with the number on your worksheet.
2. Write a definition for each water body after looking carefully at the image. Definitions are at the bottom of this paper.
3. Write an interesting observation that you made while looking at the image.

Image Shows a/an...	Definition of Water Body	Interesting Observation about the Image
1.		
2.		
3.		
4.		
5.		
6.		

bay: a body of water that is partly enclosed by land, smaller than a gulf

gulf: arm of the ocean that reaches into land

lake: a body of fresh water, surrounded by land

ocean: a vast body of salt water that separates or surrounds continents

sea: a smaller division of the ocean, partially enclosed by land (or sometimes a very large lake)

river: a long body of water that flows downhill in a natural channel



Module 2, Investigation 3: Log 2

Water bodies

You are scientists who will help NASA to identify water bodies that will be photographed from the Space Shuttle every year in order to monitor how they change. You will work in teams, and your teacher will assign each team a type of water body. Use an atlas to select five examples of your water body for NASA to study. Work together as a team to make your selections.

Your group's water body is a/an _____

Define your water body. _____

Names of the Water Bodies We Selected	Location (Continent or Country)
1.	
2.	
3.	
4.	
5.	

What kinds of changes might show up in the NASA images of your water bodies if rainfall decreases over the next several years?

How would these water bodies be affected if rainfall increases?



Module 2, Investigation 3: Log 3

Looking at the world's water

Directions:

1. Look carefully at your part of the map.
2. Answer the questions below. Use an atlas to identify the water bodies.
3. Plan to report your findings to the class.

Latitudes of our section: from _____ to _____ degrees.

Hemisphere of our section: (north or south) _____

Names of important water bodies: _____

Circle the most accurate: 1. more water than land 2. more land than water 3. about the same

Amazing discoveries: _____



Module 2, Investigation 3: Log 4

Comparing our state with _____

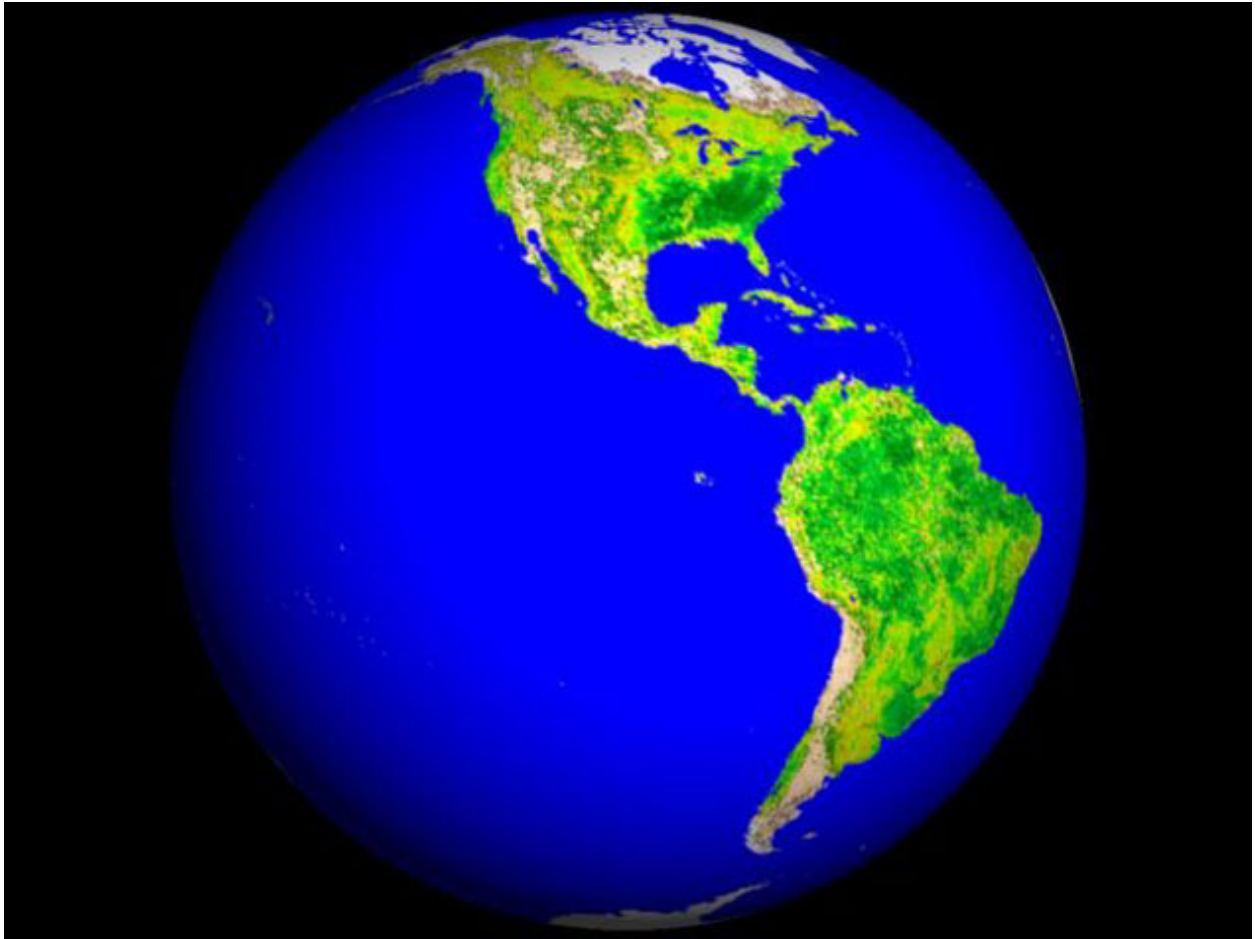
Your job is to compare water in your state with water in another state. Your teacher will assign you a state. Write its name and the name of your state at the top of the chart. Your mission is to look at the maps and images of water features in both states. Compare, as closely as possible, the availability of water in the two states. Good luck.

	Our State: _____	Other State: _____
Borders ocean?	Yes _____ No _____ If yes, which ocean? _____	Yes _____ No _____ If yes, which ocean? _____
Rivers	My state has more _____ fewer _____. Name two rivers: 1. _____ 2. _____	This state has more _____ fewer _____. Name two rivers: 1. _____ 2. _____
Lakes	My state has more _____ fewer _____. Name two lakes: 1. _____ 2. _____	This state has more _____ fewer _____. Name two lakes: 1. _____ 2. _____
Bays	My state has more _____ fewer _____. Name two bays: 1. _____ 2. _____	This state has more _____ fewer _____. Name two bays: 1. _____ 2. _____
Other waterways (canals, creeks)	My state has more _____ fewer _____. Name two waterways: 1. _____ 2. _____	This state has more _____ fewer _____. Name two waterways: 1. _____ 2. _____

Conclusions after comparing states: _____



Module 2, Investigation 3: Figure 1

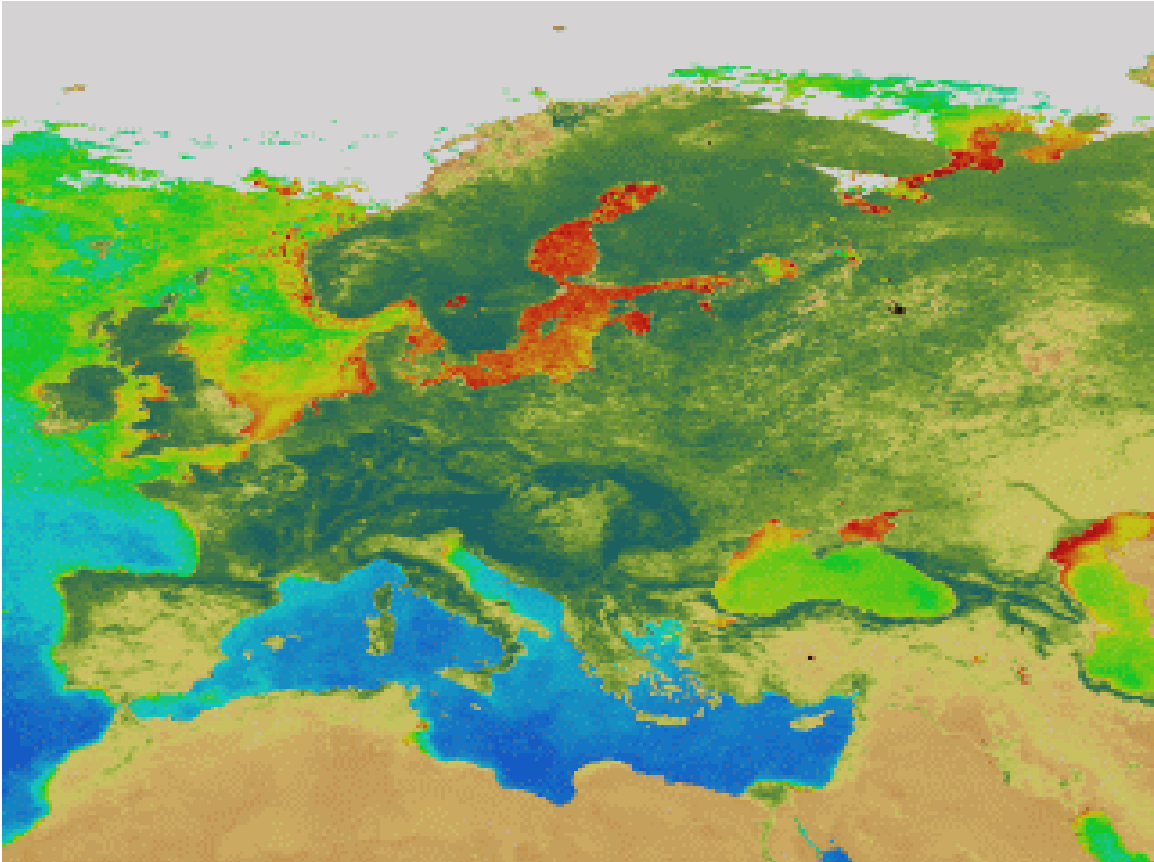


Source: <http://www.nasm.si.edu/earthtoday/ndvilg.htm>

Which ocean can you see on the western half of this view of Earth?



Module 2, Investigation 3: Figure 2

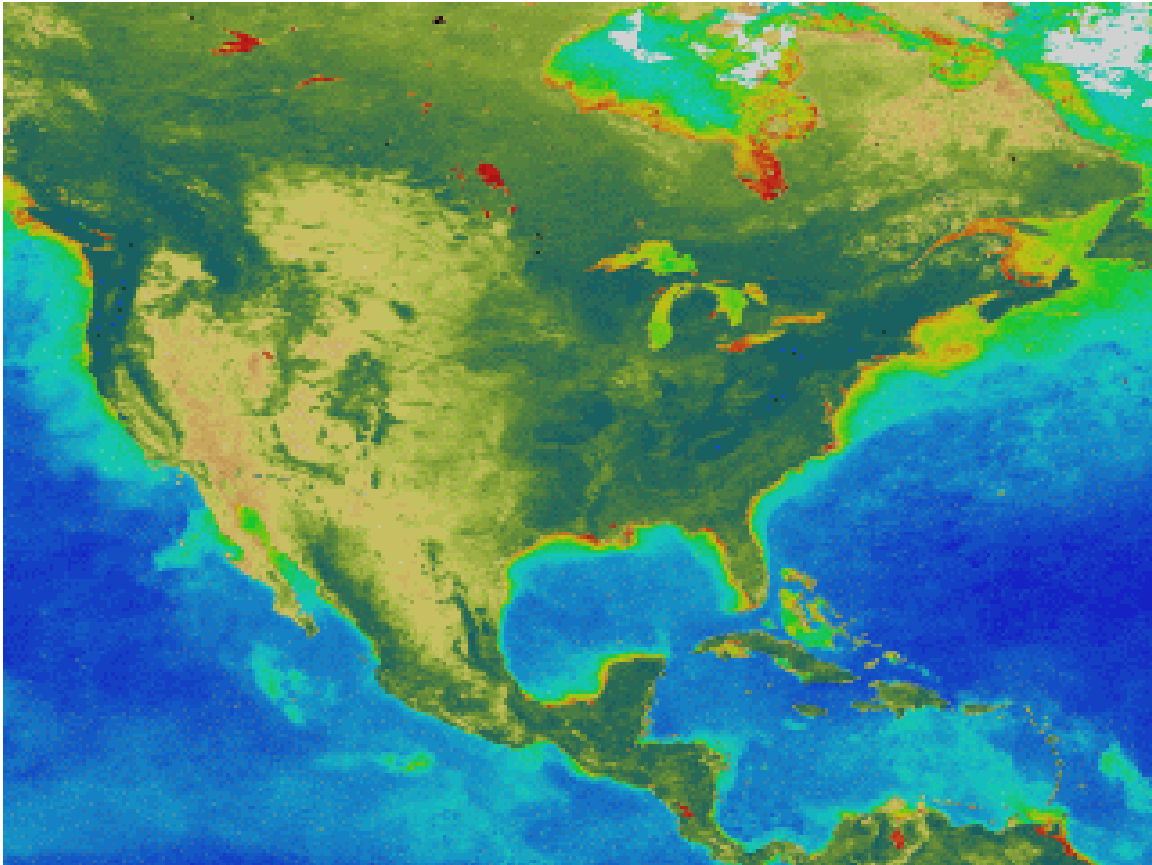


Source: <http://svs.gsfc.nasa.gov/imagewall/SeaWiFS/europe.html>

This is a sea between Europe and Africa. Can you name it?



Module 2, Investigation 3: Figure 3



Source: http://modis.gsfc.nasa.gov/MODIS/IMAGE_GALLERY/MODIS1000017_md.jpg

Can you identify the largest gulf in this image?



Module 2, Investigation 3: Figure 4

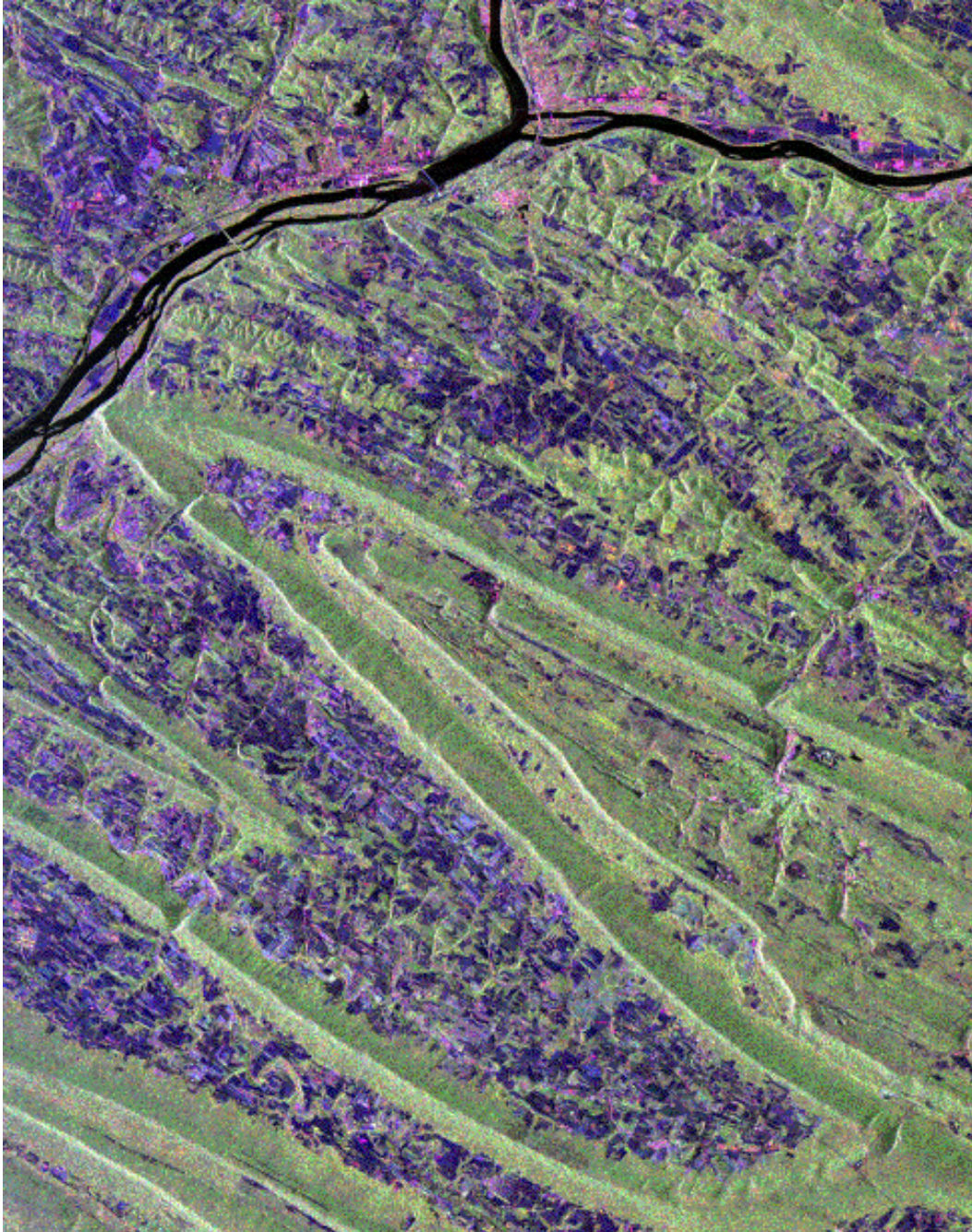


Source: <http://southport.jpl.nasa.gov/pio/srl2/sirc/srl2-sunbury>

This is a bay on the east coast of the United States. It extends from Virginia into Maryland. Can you name it?



Module 2, Investigation 3: Figure 5



Source: <http://www.nasm.si.edu/earthtoday/trclrlg.htm>

This is a famous river that flows through the Appalachian Mountains in Pennsylvania and empties into the Chesapeake Bay. Can you find it on a map and name it?



Module 2, Investigation 3: Figure 6



Can you see the rectangular lake in eastern Africa? Find it in an atlas and name it.