Head to the Coast!

Objective: Students will identify the four major river basins of South Carolina, define watersheds, explore the relationship among topography and river flow, and model water flow in a watershed.

SC Science Standards:

7-4.5 Summarize how the location and movement of water on Earth's surface through groundwater zones and surface water drainage basins, called watersheds, are important to ecosystems and to human activities.

CAROLINA CLEAR

A Public Service of Clemson University

Tag-a-Toxin Lesson Plan

Focus Question: How are all regions of South Carolina connected?

Overview:

This lesson is broken into two parts: Part I, students pretend to be SC highlanders living on the tallest mountain in the colony, Sassafras Mountain, in the mid 1700's. They will find the different routes to get to SC's coastline without crossing rivers. Students will learn the boundaries of our four major watersheds in SC. Next, in Part II, students will model how topography affects water flow. As a result, the students will understand that high topography serves as a boundary separating one watershed from another.

Duration: 100 minutes

Materials:

Part I (per group of 3 students)

- ✓ Laminated state map (i.e., roadmap, SC Map from SC Maps program, if available, or black line masters found within this activity.)
- ✓ Water soluble marker (two colors)
- ✓ Paper towels

Part II (individual or groups of 2)

- ✓ Square of waxed paper
- ✓ Baking dish, cookie sheet, wash basin, etc.
- ✓ Non-toxic, permanent *brown and *blue marker (*preferred)
- ✓ Spray bottle filled with *colored water (*should be different than the color of the marker)
- ✓ Plastic trash bag to protect work surface

Vocabulary:

Headwaters- the source of a river, most commonly found in the higher elevations

Topography- the physical features and landforms found on Earth's surface and their relative elevations

Watershed -- a land area drained by a common river system where all the streams flow to a common outlet.

Advanced Preparation:

- Load Interactive White Board Lesson
- Copy & laminate maps of SC
- Create colored water and place into spray bottles
- Safeguard any books, equipment which can be damaged by water
- Cut squares (8.5" x 11" or larger) of wax paper
- Prepare distribution center of supplies

Procedures:

Addressing Prior Knowledge:

Part I:

1. Write the year 1700 on the board inside the outline of SC's boundaries. Briefly recall some of the key events in American history:
   - South Carolina becomes one of the 13 original English colonies
   - New settlers = tension among Native Americans and immigrants
   - During the mid-late 1700's the Revolutionary War
   - The United States of America is created.

2. Explain the following challenge to students:

Ahoy, students: You are in a race to be the first mountain merchant company to arrive at the SC coast to sell your Native American (Cherokee) goods overseas. There is one problem: your wagons are filled with heavy merchandise. If caught in a wetland or waterway, the wagons' wheels will become stuck and you may lose the opportunity to be the first ones abroad. For this reason, you must navigate the state's landforms to avoid water. Don't worry; there is enough water and food packed on the wagons to supply the students and horses.

But wait! There is good news! Any areas showing lakes, such as Lake Greenwood, Jocassee, Murray, Moultrie, Thurmond, Wylie, Hartwell, Keowee, Marion, Russell and Wateree are all **man-made** lakes built well after the 1700's. In other words, they don't exist yet, so you can cross over these landforms with ease!

Making Observations:

3. Present the Challenge to the class, calling for the sale of Native American goods. Project a map of SC on the board or overhead. Ask students to identify the following landmarks: Sassafras Mountain (the highest point in SC) and coastal towns such as Georgetown, Charleston, and Beaufort. What is now called Myrtle Beach can be identified as a community in the Grand Strand. Circle these on the map.

a. Introduce the map's legend and the symbols for water, such as rivers and swamps. Tell students that as a class, they will find the variety of pathways to get to Beaufort, SC beginning at Sassafras Mountain. Meanwhile they cannot cross over rivers or streams. Provide time for each group to find at least one path. Share their responses. (Hints: they may go outside of SC's border, they can travel across swamps due to the decade of unseasonably dry weather).
b. Next, divide students into groups with each group assigned a different port city. Distribute each group a map and markers. Tell students that they will trace their routes on the map.
c. Challenge the students to find at least two routes from Sassafras Mountains to coastal SC without crossing rivers in less than 15 minutes.
d. If time allows, provide students with time to find routes to other cities before sharing their results. Note: there will only be two routes within SC's border that connect these points. Do not tell students; encourage them to try a variety of routes.
e. *Allow time for students to share the paths that successfully brought them from the mountains to the sea.*

Teacher's Notes: The two solutions are:

- (Route 1) the divide between the Savannah River and the Santee River and the divide between the Savannah and ACE Basin
- *(Route 2)* the divide between the Santee River and the ACE Basin. Note: The ACE Basin (Ashepoo- Combahee- Edisto Basin is the only basin entirely in SC) and does not extend to the mountain region.
- NOTE: The PeeDee River extends from NC so a student must venture out of state and back again to reach our SC coast.

4. Ask students to describe their route/s:
   1.) Are there any manmade features that you seemed to follow?

   2.) Are the routes following high or low landforms?

   Railroad lines most often are built on the topographic highs that often serve as watersheds divides.

5. Applaud the group who where the first to find the most routes.
6. Summarize the activity by introducing/reviewing the four main watersheds in SC: (PASS: P= PeeDee; A=ACE Basin; S=Savannah; S=Santee). Have students label these on their maps.

Creating A Model of Landscape Features:

Part II:

1. Tell students that they are going to create a model of the landscape and what happens when it rains. Ask students to make predictions and share with the class. Accept all answers.
2. Distribute a piece of waxed paper. Model crumpling the paper into a ball, then direct students to follow. Note: some may crumple it tightly, others loosely. All are acceptable.
3. Now uncrumple the ball with students. Direct them to leave some areas bumpy to represent landforms found in SC, such as mountains, the rolling hills of the Piedmont and Sandhill regions. Draw students' attention to other landforms, such as valleys and canyons. Introduce students to the word "topography."
4. Place the topographic model within a container such as a basin or cookie sheet. (This will catch water as it runs off the wax paper.) So this is about runoff
5. Using a brown marker, students should trace the high points. These are called *topographic highs*. Now have students predict where they think water may pool or puddle using a blue marker, mark these areas with an X. These are called *topographic lows*.
6. Tell students that they will get to gently "rain" on the surface using spray bottles. Review safety and classroom rules.
7. Gently spray 10 pumps of water onto the paper with water representing rain. Ask students if water pooled in the areas that they predicted. Are there any low-lying regions where water puddles that they did not predict? What separates one pool from the other? What caused the water to stop flowing? Students should respond that each pool is separated from the other pools by a topographic high such as a ridge, hill or mountain. Each pool is considered a reservoir or lake, while the pool, surrounding landscape and defining ridge is the watershed.
8. Have students predict what would happen if another rainstorm occurred. What will happen to the individual watersheds and to the reservoir? Have students spray 10 more pumps onto their landscape and record their results.

Close the Activity:

1. Distribute watershed puzzle of SC. Have students cut out the pieces and label each watershed (PeeDee, ACE, Santee, Savannah)
2. Ask students what separates each watershed from the other? Students should respond - High points such as ridges, hills or mountains

3. Extension of this Activity: Lead discussion so that students make inferences about what happens to water that is polluted by residents living close to the mountains (the *headwaters*) of the watershed? (For instance, if an oil spill occurred on Sassafras Mountain, could it affect Charleston? How?

Evaluation:

Head to the Coast! Student Sheet

Head to the Coast! Curriculum Connection

Student Behavior Rubric

Credits:

Adapted from Hydroponic Horse and Build a Watershed, SC Maps, Clemson University.

Student Name/s: _____

Date: _____ Class/Period: _____

Head to the Coast! Part I

Student Sheet

Ahoy, students: You are in a race to be the first mountain merchant company to arrive at the SC coast to sell your Native American (Cherokee) goods overseas. There is one problem - your wagons are filled with heavy merchandise. If caught in a wetland or waterway, the wagons' wheels will become stuck and you may lose the opportunity to be the first ones abroad. For this reason, you must navigate the state's landforms to avoid water. Don't worry, there is enough water and food packed on the wagons to supply the students and horses.

But wait! There is good news! Any areas showing lakes, such as Lake Greenwood, Jocassee, Murray, Moultrie, Thurmond, Wylie, Hartwell, Keowee, Marion, Russell and Wateree are all **man-made** lakes built well after the 1700's. In other words, they don't exist yet, so you can cross over these landforms with ease!

1. What port city/cities did you find routes to from Sassafras Mountain?

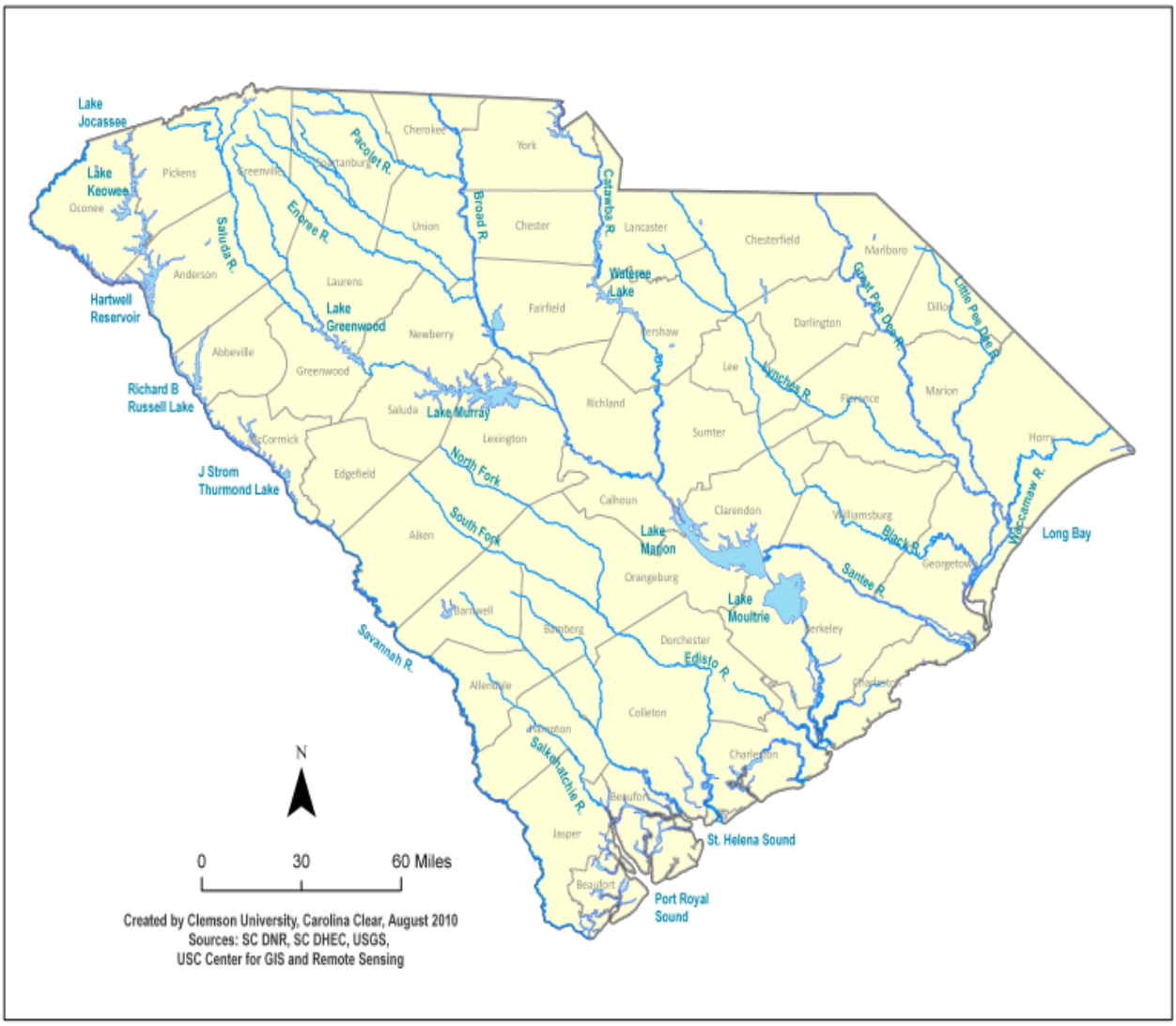
2. How many routes did you find that **do not** require you to leave SC's borders? Describe the rivers that are close to these routes.

3. How many routes did you find that **do** require you to leave SC's borders? Identify the rivers that are close to these routes.

4. Are there any cities that do not connect to Sassafras Mountain through unless a river is crossed?

5. What are the four major river basins of South Carolina?

6. Draw the four river basin boundaries and label them on the above map.



Student Name/s: _____

Date: _____ Class/Period: _____

Head to the Coast! Part II

Student Sheet

1. Draw and label a birds-eye view of your topographic model. Mark the locations where you predict water to pool.

2. a. How does the pooled/puddle water compare to your prediction.

3. What causes water to pool in these locations?

4. What landforms separate one pool of water from the other?

5. How do landforms affect the movement of water?

6. How would another rainstorm affect your area or the water stored in other pools?

   a. Were your predictions correct? What effect could this have on people living in these areas?

Student Name _____

Date _____ **Period**_____

Head to the Coast!

Curriculum Connection

1. EXTENSION –What happens to water that is polluted by residents living close to the mountains (headwaters) of the watershed? Where does it go?

2. Imagine that you are a raindrop that fell on top of Sassafras Mountain. On a separate sheet of paper, describe the ways that raindrop may move through our environment. If a raindrop continues to runoff from the mountain, describe the path it takes as it moves from one place to another. What may happen to the quality of the raindrop as it moves from Sassafras Mountain? to the coast? Explain your answer.

3. Use evidence from today's activity to answer the Focus Question: How are the regions of South Carolina connected, using examples from today's lesson?

Will pay
BIG $$$$
on the spot
at the dock!

Wanted:

Native American Goods
from the New World:

Beaded jewelry, leather goods and skins, such as moccasins, pottery, pipes, blankets, headdresses, weapons, such as arrowheads and tomahawks, and other artifacts!

Must deliver to key SC ports by month's end:

- Georgetown,
- Charleston,
- Beaufort,

Or, new port opening in Grand Strand.

The Ava Elizabeth will depart from key ports to Liverpool, England where items will be auctioned.

East Atlantic

Trading

Imports **Co.** Exports

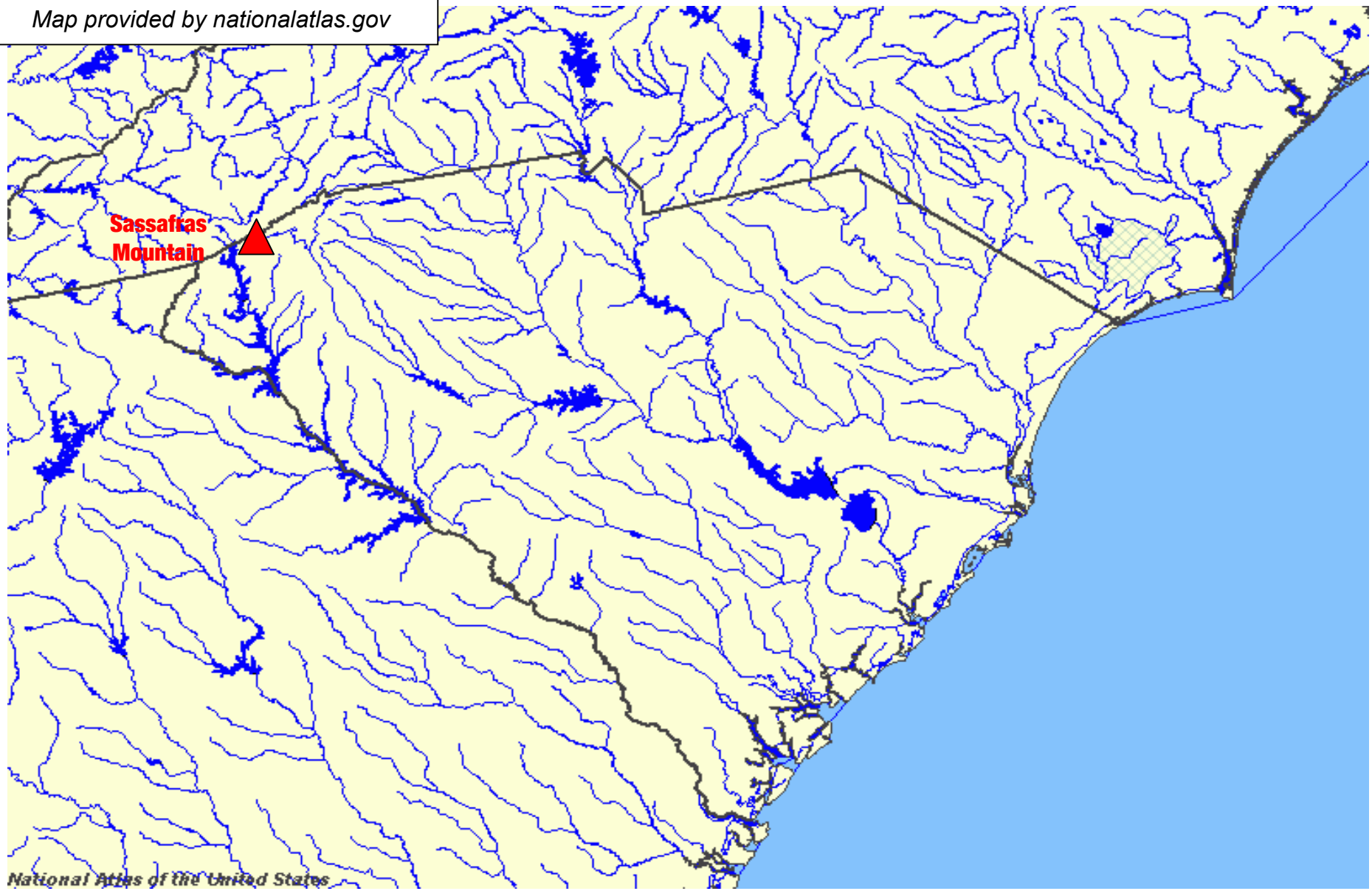
Trade **Est. 1680** Mark

East Atlantic Trading Company

Look for us in a harbor in your area.

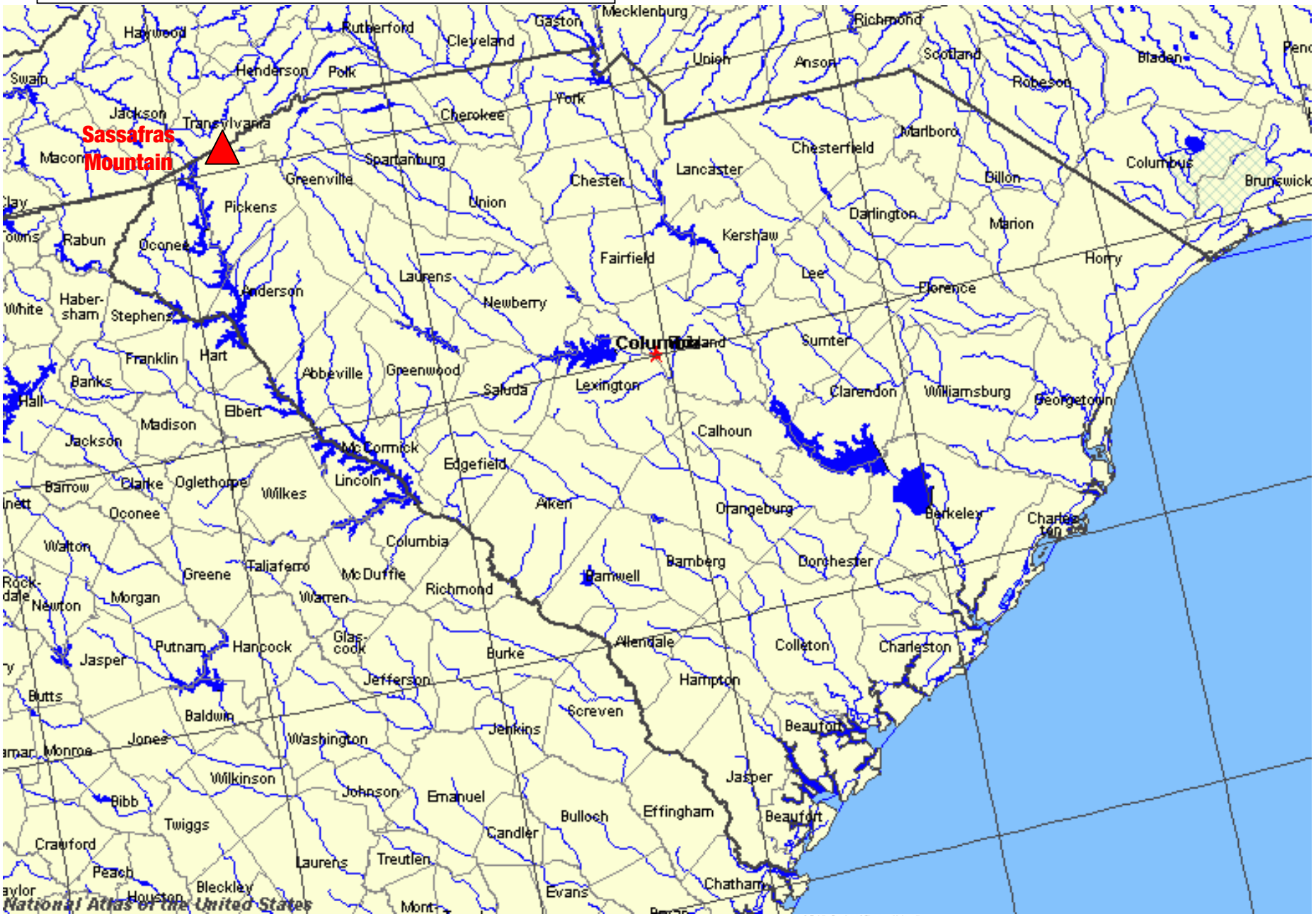
SC Rivers

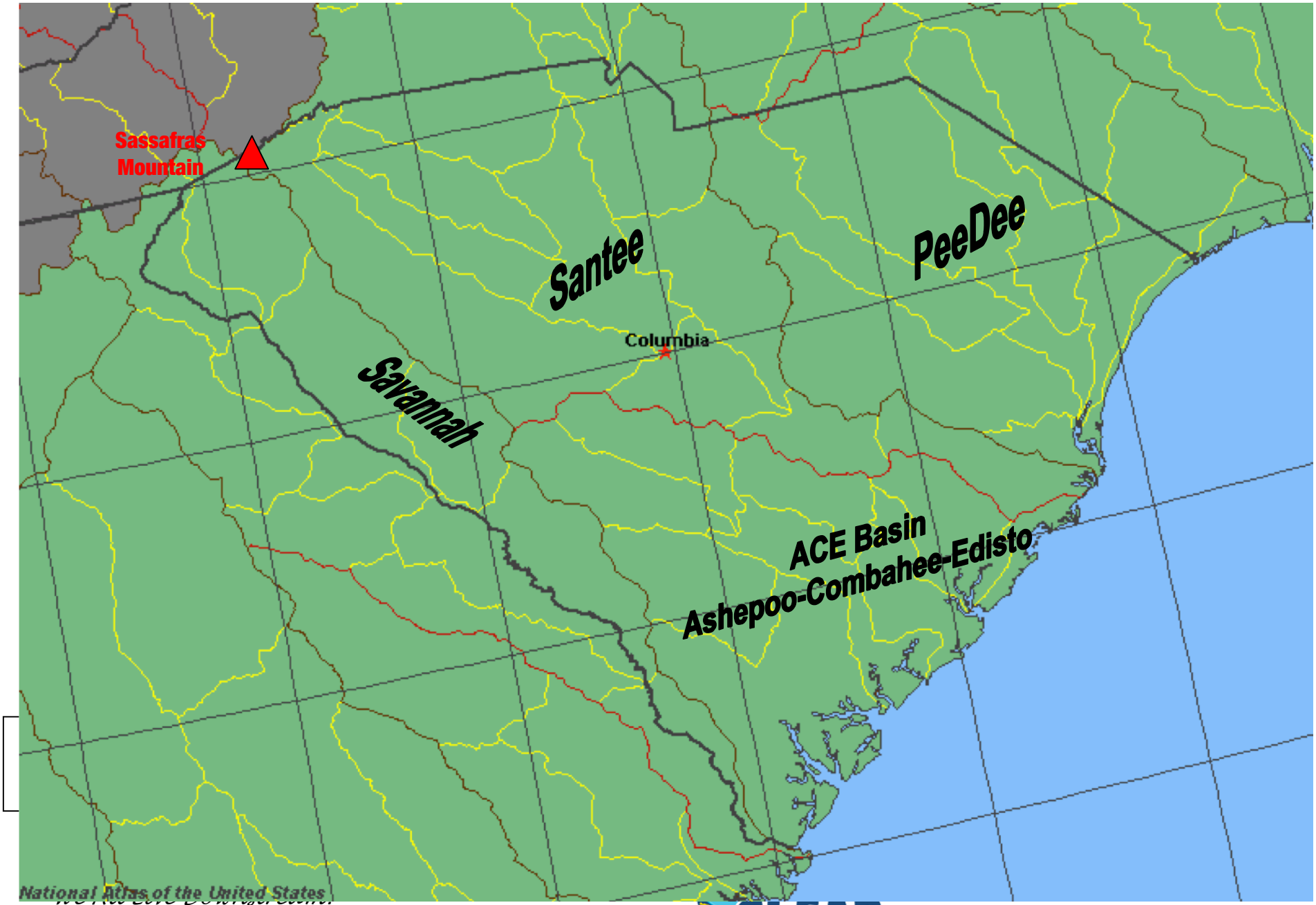
Map provided by nationalatlas.gov



South Carolina Counties and Rivers

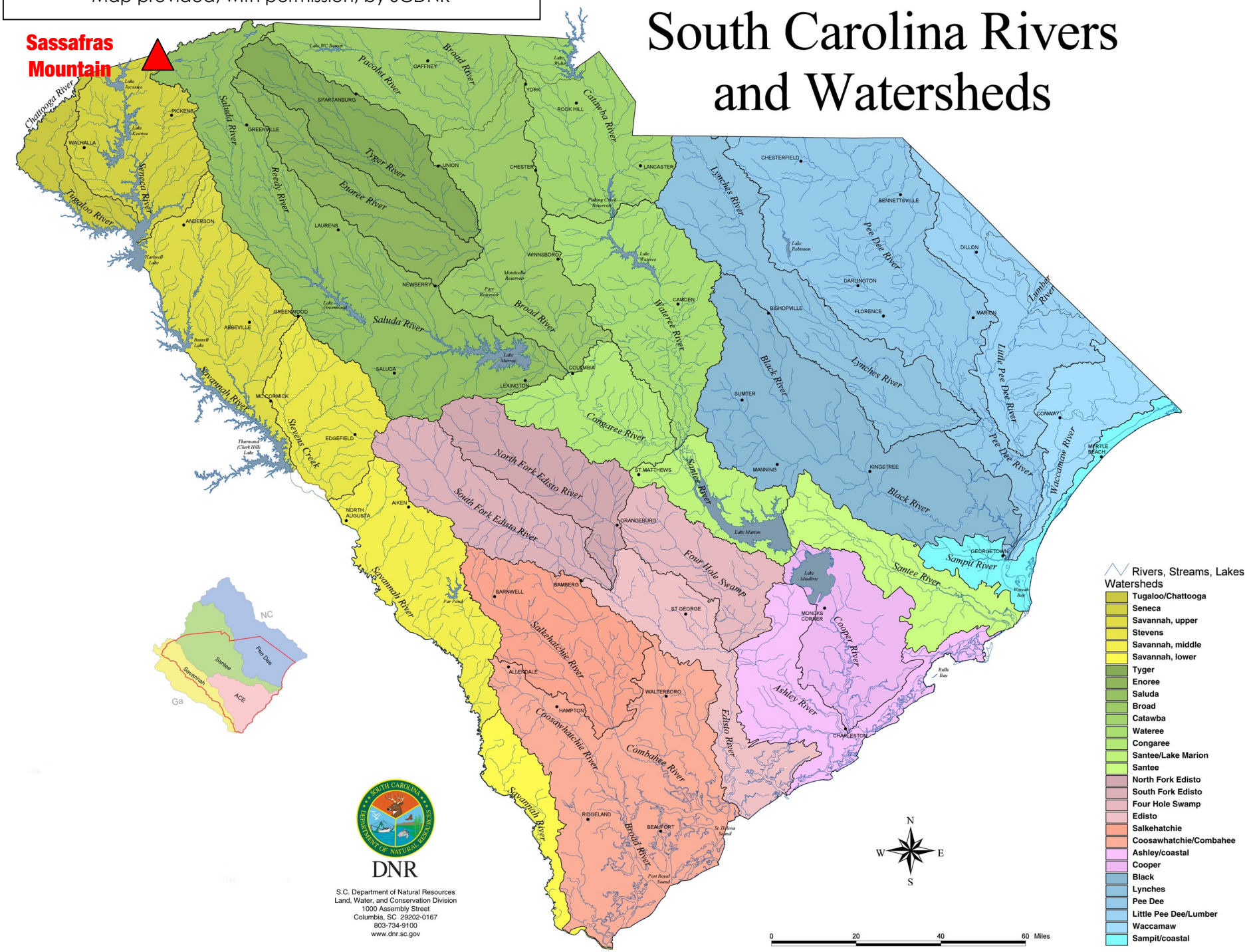
Map provided by nationalatlas.gov




Sassafras
Mountain
Santee
PeeDee
Columbia
Savannah
ACE Basin
Ashepoo-Combahee-Edisto
National Atlas of the United States

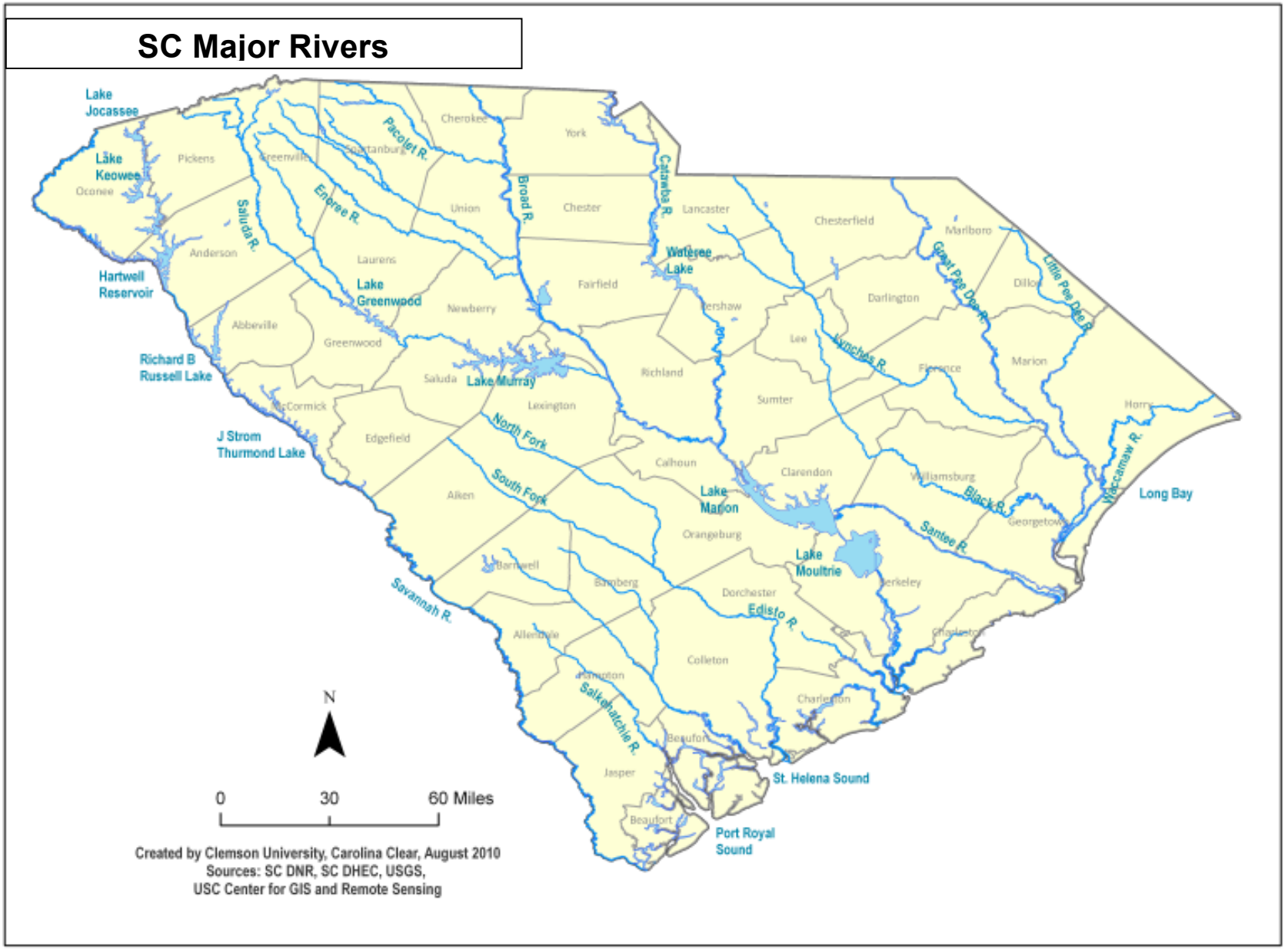
SC Major and Minor Watersheds

Map provided, with permission, by SCDNR



DNR

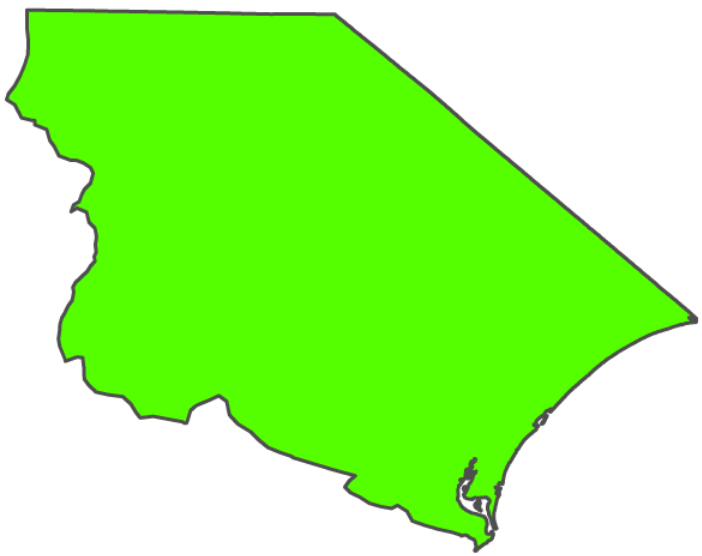
S.C. Department of Natural Resources
Land, Water, and Conservation Division
1000 Assembly Street
Columbia, SC 29202-0167
803-734-9100
www.dnr.sc.gov

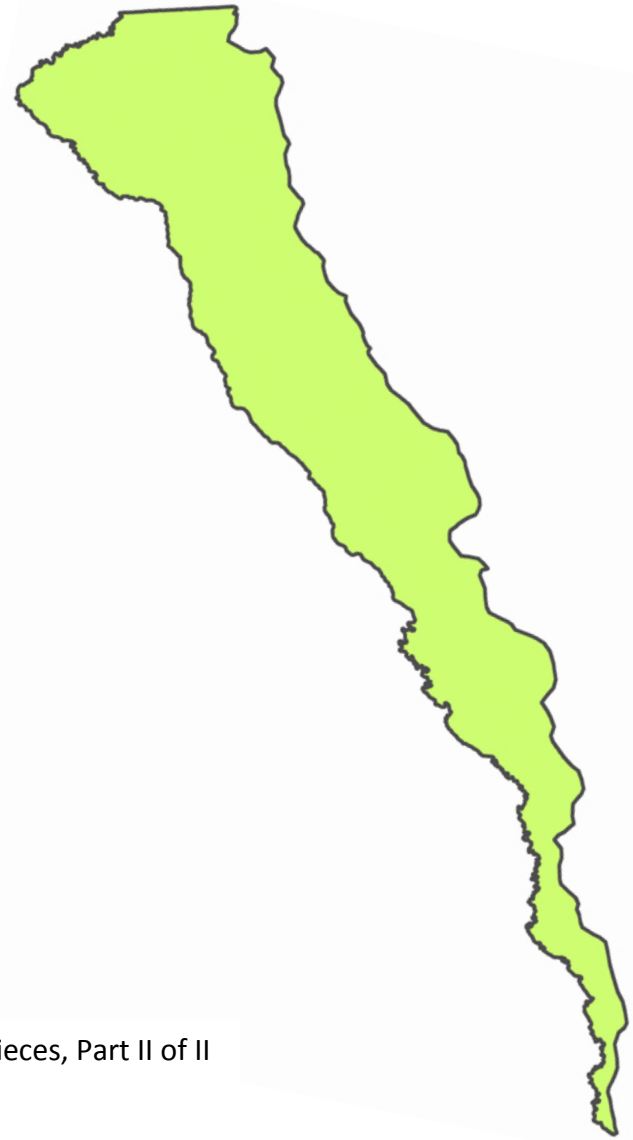


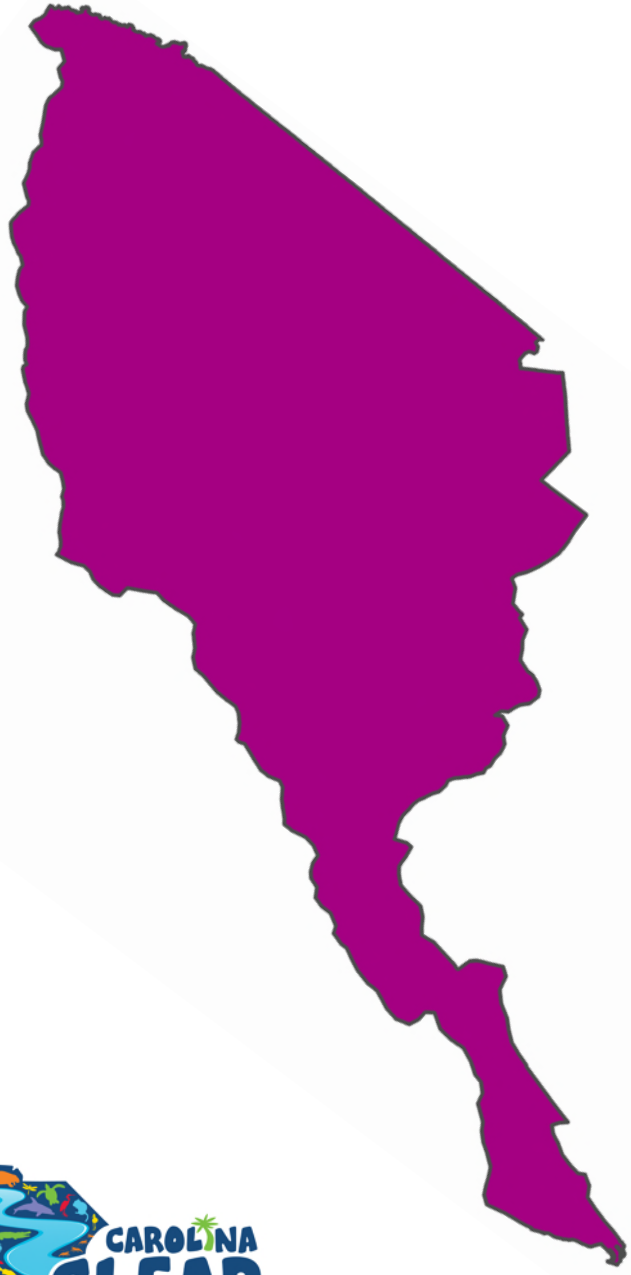
We All Live Downstream!

CAROLINA CLEAR
A Public Service of Clemson University

Puzzle Pieces, Part I of II

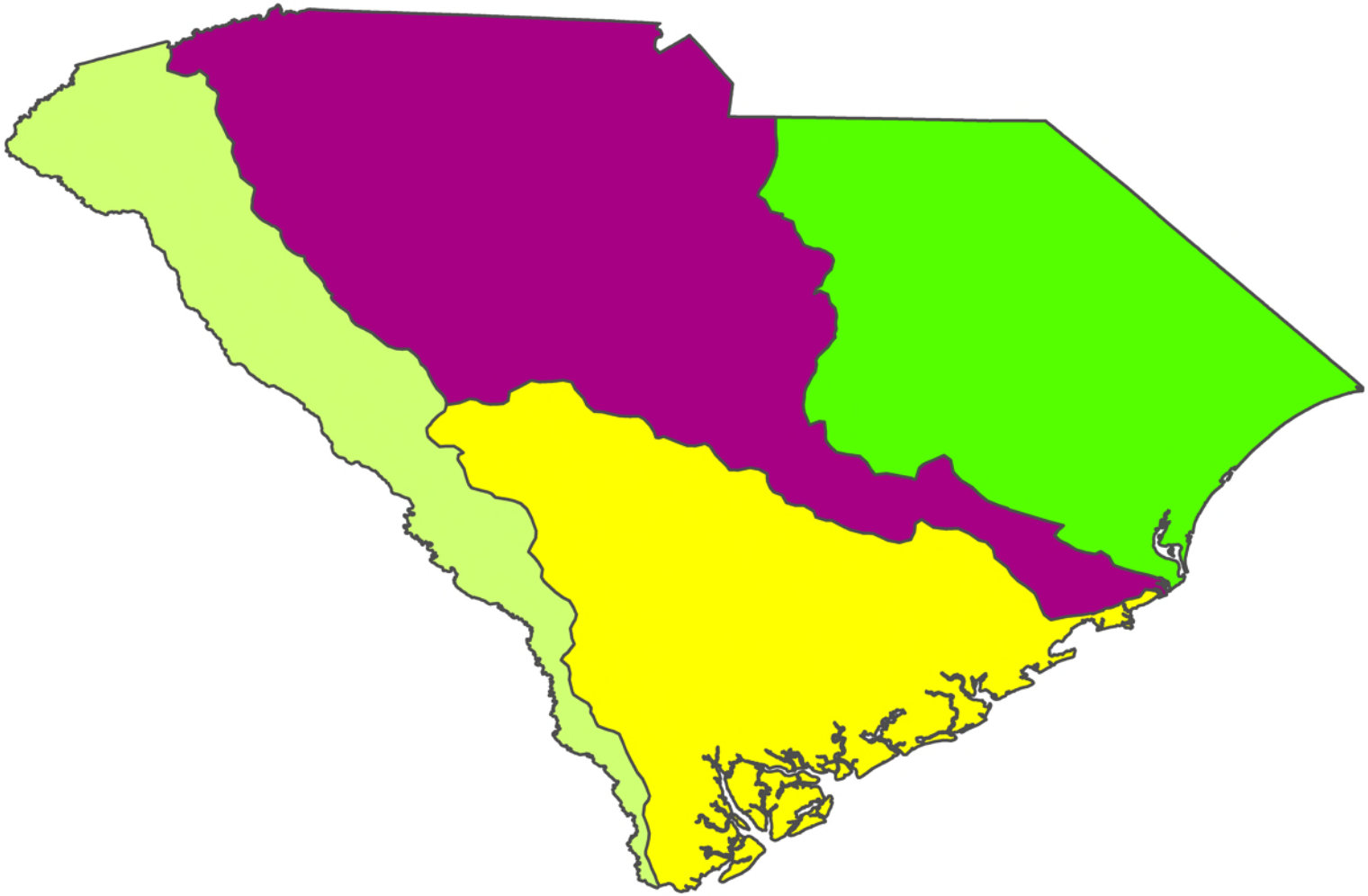






Puzzle Pieces, Part II of II

Puzzle Piece Answer Key




NC
Pee Dee
Santee
Savannah
ACE
GA

Class Behavior Rubric

Name	Follows Directions 35 points	Completes Task 35 points	Uses Appropriate Voice/Behavior 10 points	Cleans Space 10 points	Total Pts (out of 100)

Lesson Plan Information

Written by Ms. Elizabeth Joyner for Clemson University Carolina Clear program, a comprehensive stormwater education and public involvement program in South Carolina.

Published December 2010 and reviewed by S²Mart Center staff in November 2010.

An interactive whiteboard lesson does accompany this field activity and can be downloaded at www.clemson.edu/carolinaclear.

Please share your feedback and use information with us. This program would like to continue to offer educational resources for South Carolina citizens and would appreciate your feedback, photos, information and comments you would like to share.

For more information, please contact Katie Giacalone, kgiacal@clemson.edu. For more information about Carolina Clear, please visit our website.

Thank you!