Lesson 1: Where Do Rivers Go? Let's Find our Estuaries

Focus Question:
How is the water near our school connected to the ocean?

Objectives:
- To develop the concept that creeks and rivers form a watershed that drain into an estuary.
- To gain map skills using a road map.
- To infer rivers can carry pollutants to the estuary.

S.C. Curriculum Standards:
5-3.6 Explain how human activity (including conservation efforts and pollution) has affected the land and the oceans of Earth.
7-1.2 Generate questions that can be answered through scientific investigation
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.
8-3.9 Identify and illustrate geologic features of South Carolina and other regions of the world through the use of imagery (including aerial photography and satellite imagery) and topographic maps.

Purpose: This map-based lesson will engage students to identify the watershed in which they live and trace the flow to the coastal estuary. Students will determine key uses of the land in the watershed and infer the impact of land uses on the estuary's water quality and its inhabitants.

Time Duration: 1-2 hours

Materials:
Classroom:
- KWL Chart (Appendix 1)
- River Basin Maps (Appendix 2 and 3)
- Presentation What is an Estuary, located at www.cosee-se.org

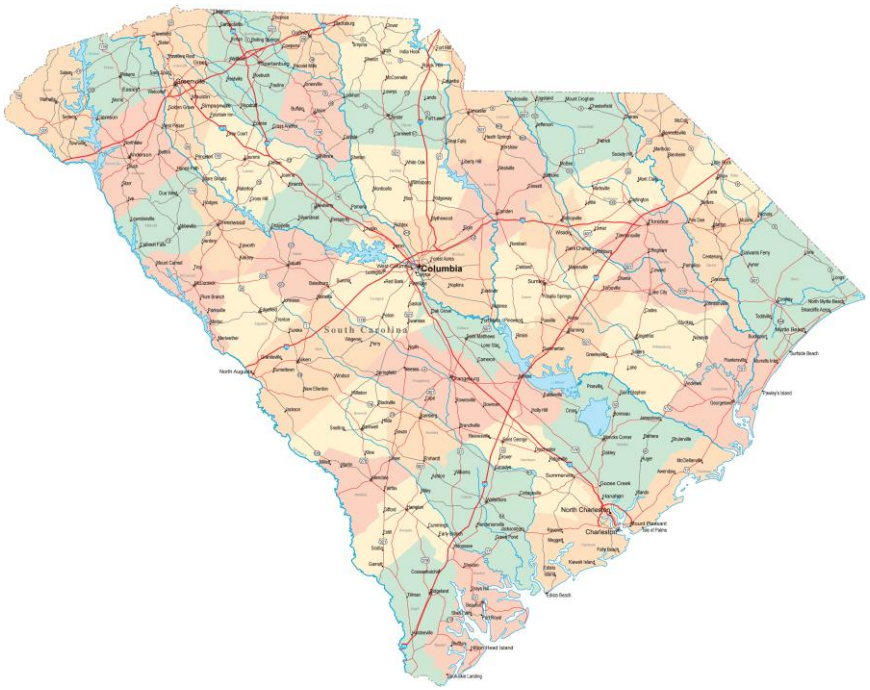
Each student:
- Worksheet (Appendix 4)
- Student Journal

Each student group of three or four students:
- 1 Laminated SC Highway Transportation map (available for request at http://www.scdot.org/getting/maps.shtml#maprequest)
- Blue, green and black washable markers

Vocabulary:
River Drainage Basin- land where water from rain and melting snow or ice drains into small creeks, rivers, lakes, and finally into coastal waters, such as an estuary, wetland, or directly to the sea .
Estuary – downstream "sink" where rivers drain before reaching the sea.
Headwater - upland source of a river
Stormwater Runoff- the flow of water from heavy rainfall that flows over land surfaces, picking up debris, oil, farm or residential chemicals or sediment.
Watershed- or the *river drainage basin* is the area of land where all creeks and rivers flows together in the same location.

Procedure:

Hooking Students



1. Project or post a map of the state on the Interactive Whiteboard (IWB), projector, or overhead (depending upon available technologies) with this focus question: **"**How is the water near our school connected to the ocean?"
2. Students explore the flow of rivers on the map, tracing where they start and end.
3. Use a KWL Chart to find out students' knowledge about *rivers, especially the rivers closest to their school.* Ask students where they think the water in this river ends up? Each student writes initial response to the focus question in their journal. Record student responses on the KWL chart in the "K" column of the KWL Chart.
4. Each student writes a question in their student journal about what they want to know. Teacher records responses in the "W" column of the KWL Chart.
5. At the end of the student engagement, complete the "L" column of the KWL Chart.

<u>Student Engagement:</u>

Divide class into smaller groups of 3-5 students.

Distribute highway map and using washable markers to each group.

1. Locate their community and circle its using the Black Marker.
2. Locate the nearest river and trace its flow from its *headwaters* to the *estuary* and sea, using the BLUE Marker;
3. Locate the watershed boundaries that include your community and circle with BLACK marker
4. Locate the coastal estuary from the nearest river and circle its boundaries using the GREEN Marker.
5. Locate and label the 5 major cities in the state, both coastal and inland.
6. Locate the rivers closest to each of these cities and trace the flow from the headwaters to the sea, using a BLUE marker.
7. Students refer back to the KWL Chart and respond to the "W" column and see if they have an answers to what they wanted to know.
8. Distribute the Student Worksheet for students to complete
9. Close the lesson by completing the KWL and identify what students have learned.

Student Reflection:

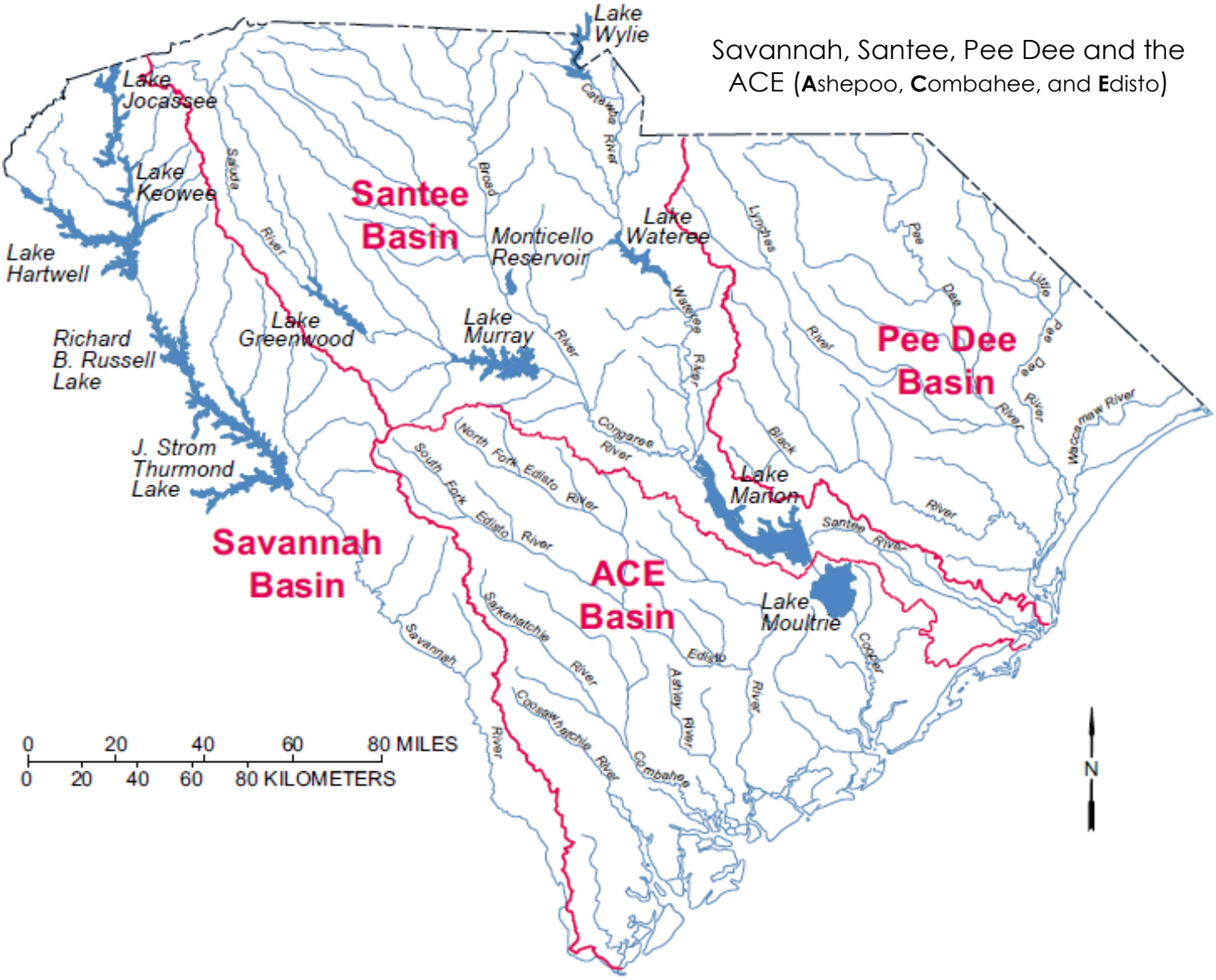
1. Each Student Group chooses a watershed and discusses what might drain into creeks and rivers and eventually the estuary from the land, towns, industry, cities or farms. What do they think the consequences might be? How would they find out? Record in journal.

Review the focus question: How is the water near our school connected to the ocean?

Appendix 1: KWL Chart

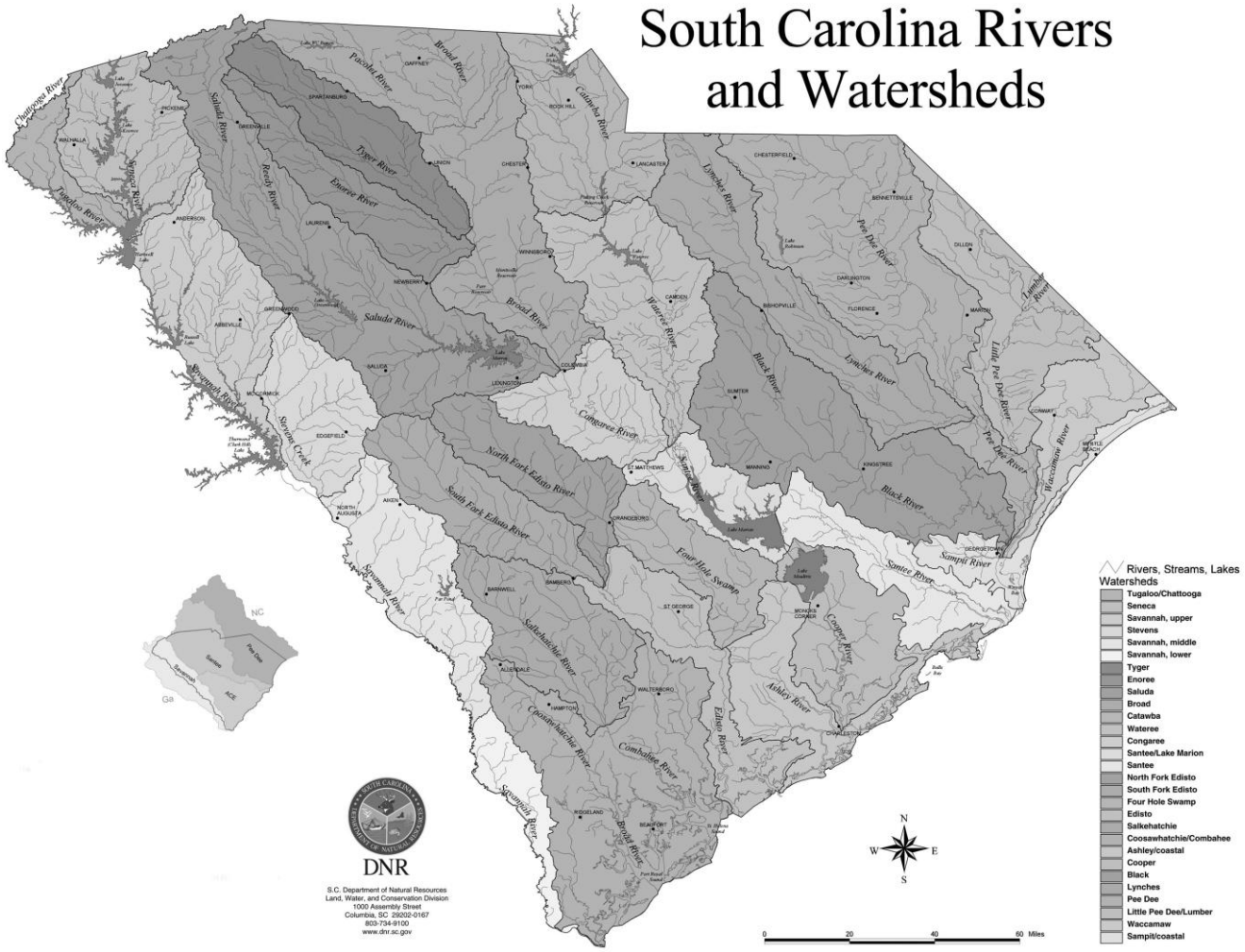
What Do I Know? **K**	**What Do I Want to Know?** **W**	**What Did I Learn?** **L**

Appendix 2: Major River Basins in SC



Savannah, Santee, Pee Dee and the ACE (**A**shepoo, **C**ombahee, and **E**disto)

Appendix 3: SC Watersheds and River Basins



Appendix 4: Student Worksheet (Teacher copy)

1. What estuary and rivers are associated with your community?
   Answers will vary.

2. Do all rivers in the state eventually flow together before reaching one estuary?
   No, each watershed or river basin, PeeDee, ACE Basin, Santee and Savannah Rivers, flow to different estuaries.

3. What landform separates one watershed from another?
   Elevation of the land, topographic highs, such as small ridges to high mountains, separate drainage basins.

4 How can the water flowing near a city in the middle of the state affect estuaries at the coast?
   The rivers collect drainage from cities, farms and roads that includes dirt, fertilizer, oil, residential and industrial wastes flow downstream

5. Take one river and write about what can happen to the quality of the water as it flows to the estuary.
   There are many farms within the Coast Plain of SC. Pollution in the forms of litter, sediment, pesticides and other chemicals from farms, bacteria from pet waste, oil from cars, etc. will flow downstream from the inland areas to the sea.

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Student Worksheet

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