North Carolina Rivers!
Lesson Plans and Maps

Edited by Steve Pierce

North Carolina Geographic Alliance
2001
Preface

The first publication of the North Carolina Geographic Alliance, *North Carolina Water: Can We Keep It Fit For Life?*, was published in 1994 as a part of Geography Awareness Week. In that publication, Dr. William Imperatore wrote the background content, and lesson plans were written by NCGA Teacher Consultants Benjamin Dupree, Patsy Hill, and Steve Pierce. Over the years, that publication has been a resource of information and lesson plans for teachers.

Geography Awareness Week has evolved into Geography Action!, a more sustained effort to keep geography in the public eye. This year the theme is *Geography Action! Rivers 2001*. Rivers are important natural treasures that people rely on for many purposes. Rivers provide our drinking water, nourish our agriculture, and support many species of animals. We also depend on rivers for important transportation links. Rivers are also tied to our culture through literature and stories.

The background content and lessons contained in this publication are taken from the original Alliance publication of 1994. They are accompanied by an atlas section of maps that may be used in several classroom applications. Quoting from the preface of the original publication: “It is hoped that the lessons herein will heighten students’ awareness of water and its importance to us economically, aesthetically, and as a necessity for life that cannot be taken for granted.”

Steve Pierce
North Carolina Geographic Alliance
September, 2001

North Carolina Geographic Alliance, October 2001. Material may be reproduced for classroom use.
Distribution of the Earth's Water

Earth is unlike any other planet in our solar system. One important difference is that we have an abundant supply of water. In fact, 71% of the Earth's surface, approximately 140 million square miles, is ocean. The Pacific Ocean alone, with an area of 64 million square miles, is larger than all land areas combined (57.5 million square miles).

Unfortunately, most water on the planet is not suitable for human consumption. The oceans and their various bays, gulfs and straits are used for transportation, fishing, recreation, and as a source of products like seaweed and certain minerals. However, we can't drink the water or use it to grow our crops because it is full of mineral salts. Only a very small percentage, about .01% (one hundredth of one percent), is fresh water. This water keeps humans, animals, and plants alive. Without it, only a limited number of life forms could exist.

Some parts of the Earth, like the deserts, have almost no water. Other areas, like the tropical rain forests and some mountainous areas, receive large amounts of fresh water in the form of rain or snow. The Great Lakes in the United States and Canada contain approximately 16% of all the fresh water on Earth. However, the total amount of fresh water is small. We must learn to conserve and protect the quality of Earth's fresh water supplies. Our continued existence depends on it.
Lesson Plan
Topic 1

Distribution of the Earth's Water

Objective:
This activity will show students how much of the Earth's water is fresh water and how much of the water is usable by people.

Geographic Theme:
Location, Human-Environment Interaction

Geography Standards:
Standards 7 and 8

Materials:
One gallon container for water, smaller containers, a tablespoon, teaspoon, and an eyedropper.

Procedure:
Begin by asking students how much of the Earth's surface is covered by water. (Their answer should be 71 percent.) Ask, "Where is this water?" Answers students should volunteer may include: oceans, lakes, rivers, ground water, ice caps, glaciers, and the atmosphere.

Start with a one gallon container of water. Use the chart below to measure out the fresh water in its various forms, placing each amount in the smaller containers.

Distribution of Water on Earth
Based on total water = 1 gallon

<table>
<thead>
<tr>
<th>Source</th>
<th>Percent of total</th>
<th>Amount from 1 gallon (3.8 liters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oceans</td>
<td>97.25 %</td>
<td>15 1/2 cups + 1 Tbs. (3700 ml)</td>
</tr>
<tr>
<td>Ice caps and glaciers</td>
<td>2.05 %</td>
<td>5 Tbs. + 1/2 tsp. (78 ml)</td>
</tr>
<tr>
<td>Ground water</td>
<td>0.68 %</td>
<td>1 Tbs. + 2 tsp. (25 ml)</td>
</tr>
<tr>
<td>Lakes</td>
<td>0.01 %</td>
<td>about 8 drops</td>
</tr>
<tr>
<td>Atmosphere</td>
<td>0.001 %</td>
<td>about 1 drop</td>
</tr>
<tr>
<td>Rivers and streams</td>
<td>0.0001 %</td>
<td>about 1/10 of a drop</td>
</tr>
</tbody>
</table>

Extending the Lesson:

Of this water, how much is freshwater? Of the freshwater, which sources are readily available for people to use? Have the students name the threats to this small amount of fresh water. What are some ways we can safeguard this supply? What are some conservation methods we can use to ensure there will be pure fresh water for future generations?
Water and the Five Themes of Geography

Geographers use the Five Themes of Geography as a framework for studying the landscapes of the Earth. These themes have been incorporated into the North Carolina Social Studies curriculum. The Five Themes are: location, place, human-environment interaction, movement, and regions.

Location
The theme of location can be used to study physical features like North Carolina's water resources. For example, the relative and absolute location of a water feature can be identified. The South Fork of the New River begins just east of Grandfather Mountain and just north of Blowing Rock (relative location). Or, the mouth of the Cape Fear River is at latitude 34 degrees N, longitude 78 degrees W (absolute location).

Place
Place refers to the physical and cultural characteristics of a city, state, country, or region. This theme can be used to study a water feature. How long, deep, or wide is a stream? Does it have waterfalls and rapids? Is it a recreational site or a navigable waterway?

Human-Environment Interactions
Human-environment interaction can be used to show the many ways people have interacted with a water feature. People build dams across streams, pump water out of streams and lakes for irrigation, and build houses and resorts along the shore. Some streams serve as the boundary between counties, states, and countries.

Movement
Movement can be illustrated by mapping the direction in which a stream flows. Streams in the western mountains of North Carolina flow west into the Mississippi River basin. Streams east of the mountains flow south and east into the Atlantic Ocean. People and goods move on some waterways, such as the Intracoastal Waterway and the Cape Fear River.

Regions
There are regional characteristics to North Carolina's water features. The Eastern Divide separates the region of east flowing streams from the region of west flowing streams. The Coastal Plain is a region where most people get their water from aquifers or underground sources. The Piedmont and Mountains form regions where most towns pump their water out of the streams. The Coastal Plain is the region of North Carolina where natural lakes occur. Most lakes in the Piedmont and Mountains are reservoirs made to store water.
Water and the Five Themes of Geography

Objective:
Students will be introduced to the Five Themes of Geography. Students will use the Five Themes to study North Carolina's water features.

Geographic Themes:
Location, Place, Human-Environment Interaction, Movement, Regions

Geography Standards
Standards 7, 8, 15, and 18

Materials:
5 blank 3x5 cards for each student.
Color markers, pencils or crayons
Postcards, slides, pictures and/or photographs of North Carolina water features
Magazines, scissors, and glue

Procedure:
Explain the Five Themes of Geography to the students. Provide examples by use of the slides, pictures and photographs you have gathered. Some images might be used to illustrate more than one theme. Have students analyze an example to find features that illustrate other themes.

Show some postcards illustrating North Carolina's water features. Ask the students to identify the themes illustrated. Tell them they are going to make postcards to show examples of the Five Themes as they relate to water.

Distribute the 3x5 cards and coloring materials. Instruct them to make a postcard illustrating each of the Five Themes. They can draw and color their cards or they can cut pictures of water features out of magazines and paste them to the cards. On the back of each card they should explain how the picture illustrates one of the Five Themes. Check completed postcards to see if objectives have been met.

Extending the Lesson
Divide the class into groups. Assign each group a river to research. Instruct the groups to use their river to illustrate the Five Themes of Geography.
The Hydrologic Cycle

Water in North Carolina, as everywhere, is part of the hydrologic cycle. Water enters the atmosphere by evaporation and transpiration from the various storage areas (reservoirs, lakes, rivers, oceans, plants). Transpiration is the process by which plants release water vapor into the atmosphere after taking it from the soil and using it to move food to the leaves.

Storage areas include streams, lakes, oceans, soil, snowfields and glaciers. The following table gives the approximate percentage of free water stored in various ways.

**Earth's Free Water Storage**

<table>
<thead>
<tr>
<th>Storage Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oceans</td>
<td>97.25 %</td>
</tr>
<tr>
<td>Ice caps and glaciers</td>
<td>2.05 %</td>
</tr>
<tr>
<td>Ground water</td>
<td>0.68 %</td>
</tr>
<tr>
<td>Lakes</td>
<td>0.01 %</td>
</tr>
<tr>
<td>Atmosphere</td>
<td>0.001 %</td>
</tr>
<tr>
<td>Rivers and streams</td>
<td>0.0001 %</td>
</tr>
</tbody>
</table>

Under the right conditions the water vapor in the air condenses to liquid water or cloud droplets. If cloud droplets coalesce and get large enough, they overcome air currents and other motions in the atmosphere that keep the droplets suspended, and they precipitate to the Earth's surface. Water moves through this cycle over and over. Unfortunately, water is not always available when, where, and in the amount we need. This is especially true of water in the soil that is critical for plant (crop) growth.
The Hydrologic Cycle

Objective:
The students will be able to draw and label a diagram, construct a model, or create a mural of the hydrologic cycle.

Geographic Themes:
Human-environment interactions, Movement

Geography Standards
Standards 7, 8, and 15

Materials:
Paper, pencils, clay, construction paper, cotton balls
Hot plate, tea kettle, metal pan, ice, water
The book Follow the Water from Brook to Ocean by Arthur Dorros
Diagram of the hydrologic cycle for each student

Procedure:
Read aloud the book Follow the Water from Brook to Ocean.
Distribute the diagrams of the hydrologic cycle. Emphasize the terms evaporation, transpiration, condensation, precipitation, storage and runoff. Review the meaning of the terms.

Demonstrate components of the cycle using any or all of the demonstrations included with this lesson

Divide the students into five groups. Have three groups draw and label a diagram of the hydrologic cycle. A fourth group will construct a model of the cycle using clay, construction paper and cotton balls. A fifth group will create a mural of the hydrologic cycle.

Have the groups share what they have done.
Demonstrating the Water Cycle

**ACTIVITY ▲▲▲**

**The World In Two Jars**

Materials: Two jars, masking tape, water, a small rock.
Activity: Demonstrate the hydrologic cycle simply by placing some water and a rock in a jar, taping a second jar of the same size upside down to the top of the first jar, and placing the model in the sun. Soon, water evaporating from the pool will condense and form droplets on the sides and top of the upper jar - the same process by which water vapor changes to clouds and rain.

**ACTIVITY ▲▲▲ ▲▲▲**

**Watch Water Cycling**

Materials: A clear bowl, a small cup, plastic wrap, a small weight, tape, water.
Activity: Place an empty cup in the middle of the bowl. Pour water into the bowl until it surrounds the cup, but not so much that the cup floats. Cover and seal the bowl with clear plastic wrap, using tape if necessary. Allow the wrap to sag in the center. Place a small weight, such as an eraser or a small rock, on the plastic wrap above the cup. Set the bowl in the sun. As water evaporates from the bowl, it will condense on the plastic wrap, then trickle down the plastic and collect in the cup - the hydrologic cycle in action.

**ACTIVITY ▲▲▲ ▲▲▲**

**From Liquid To Gas And Back**

Materials: Electric kettle, cookie sheet (with sides), ice cubes, water, kitchen mitts.
Activity: Boil water in an electric pot or kettle. Using kitchen mitts, hold the cookie sheet full of ice cubes over the steam coming from the spout. The steam will quickly condense on the bottom of the cookie sheet, demonstrating the process by which water vapor condenses in the atmosphere. Note 1: Be sure to wear kitchen mitts while handling the cookie sheet to avoid being scalded. 2: Cover the desk or table with newspaper or plastic to catch the "rain" that falls from the cookie sheet.

**ACTIVITY ▲▲▲ ▲▲▲**

**A Condensed Demonstration**

To demonstrate evaporation, transpiration, and condensation quickly, lay plastic wrap over grass on a sunny day. Vapor evaporating from the soil and transpiring from the grass will condense on the plastic wrap. Also try this on bare soil nearby. This will indicate how much of the condensed vapor comes from the soil alone.

Source: 1992 Geography Awareness Week Teachers' Handboek
North Carolina's Surface Water Resources

North Carolina has abundant surface water resources. Surface waters include streams, natural lakes and reservoirs. Although surface waters are abundant, some areas of the state are using these resources heavily, and in dry periods the use of water is restricted. As the population of North Carolina continues to grow, especially in the Piedmont region, ever increasing demands will be placed on these resources.

There are differences in surface water resources from region to region. Natural lakes are found mainly in the Coastal Plain. (Some geographers divide this region into two regions: the Coastal Plain and the Tidewater.) Many are Carolina Bays, oval shaped lakes which some scientists believe were created by fragments from a disintegrating meteor. The largest natural lake is Lake Mattamuskeet. The Coastal Plain region also contains several sounds. These are areas of relatively shallow water between the barrier islands and the mainland. Although this water is salty, sounds are important for fishing and recreation.

Several river systems, including the Haw, Neuse, Tar, and Cape Fear Rivers, are entirely in North Carolina. Other river systems, such as the Roanoke and Chowan rivers, originate outside our state. River systems such as the Catawba and Yadkin/Pee Dee Rivers have their sources in North Carolina, but flow into another state.

All large reservoirs, such as Lake Norman, and many smaller ones are in the Piedmont and Mountain regions. Lake Norman is the largest manmade lake in North Carolina. Reservoirs serve as the water supply for some communities and are used for recreation, sources of irrigation water, and for generating hydroelectricity.

The Blue Ridge Mountains form a drainage divide. Ridgelines within the Blue Ridge Mountains separate rivers that flow east into the Atlantic Ocean (such as the Cape Fear and the Catawba Rivers) from rivers like the New River and the French Broad River, which are part of the Mississippi River watershed.

Almost one-half of all people in North Carolina depend on surface waters for their personal needs. Many farms and industries also depend on these water resources. The amount of surface water is not the problem in North Carolina. The main problem is the declining quality of our waters due to pollutants of various kinds.
North Carolina's Surface Water Resources

Objective:
The student will identify and label the major surface water resources on a map of North Carolina.

Geographic Themes:
Location, Regions

Geography Standards
Standards 1, 3, 7, and 8

Materials:
Physical map of North Carolina
Colored pens or pencils
Outline map, North Carolina's Surface Water Features (provided in lesson)

Procedure:
Have students research (or provide for the students) a list the major surface water features of North Carolina. Distribute the maps of North Carolina's physical features and have the students study the names and locations of surface waters. Identify with the students those rivers that are entirely within North Carolina; those that flow into our state from another state; and those that start in North Carolina and flow into another state. Identify Lake Mattamuskeet and the major reservoirs in North Carolina. Point out the drainage divide created by the Blue Ridge Mountains. Name the two largest sounds.

Distribute the map of *North Carolina's Surface Water Features*. Have students write the name of each water feature by the numbers at the bottom of the map.

Distribute the colored pencils. Instruct the students to lightly shade in the Coastal Plain (green), Piedmont (yellow), and Mountains (brown) on their maps. Compile a list of rivers found in each of the regions.

Extending the lesson:
Choose one surface water resource and a county it is in. Research the many ways in which people use the surface water resources of the county.
Figure A: North Carolina Rivers, Sounds, Lakes, and Reservoirs

1. Little Tennessee River
2. French Broad River
3. New River
4. Catawba River
5. Yadkin River
6. High Rock Reservoir
7. Lake Norman Reservoir
8. Pee Dee River
9. Lake Waccamaw
10. Cape Fear River
11. Haw River
12. Kerr reservoir
13. Neuse River
14. Pamlico River
15. Pamlico Sound
16. Tar River
17. Roanoke River
18. Chowan River
19. Albemarle Sound
20. Lake Mattamuskeet
North Carolina's River Basins

A watershed, or drainage basin, is the entire area that contributes water to a major river, or stream, which carries the water to the ocean. The largest drainage basin in the United States is made up of the thousands of small streams that flow into larger streams, then into yet larger streams, such as the Missouri and Ohio Rivers, which then flow into the Mississippi River. The Mississippi carries the water to the Gulf of Mexico and the Atlantic Ocean.

There are several drainage basins in North Carolina. These watersheds are smaller than the Mississippi basin, but still very important. Remember that almost one-half of all the people in North Carolina get the water they need from streams or surface water.

In recent years, government agencies, such as the North Carolina Division of Water Management, have begun to focus on the area within a drainage basin as a geographic region. New laws about water use and pollution are directed toward protecting water quality within a particular drainage basin. Some controversies have arisen; for example, the State of Virginia has requested that water be transferred from Lake Gaston in the Roanoke River Basin of North Carolina to Norfolk, Virginia as a supplement to that city's water supply.

The following table shows the major river basins in North Carolina.

<table>
<thead>
<tr>
<th>Gulf-Atlantic Watershed</th>
<th>Tennessee Watershed</th>
<th>Ohio Watershed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Neuse-Pamlico Rivers</td>
<td>2. Watauga River</td>
<td></td>
</tr>
<tr>
<td>3. Cape Fear River</td>
<td>3. French Broad River</td>
<td></td>
</tr>
<tr>
<td>4. Yadkin - Pee Dee River</td>
<td>4. Little Tennessee River</td>
<td></td>
</tr>
<tr>
<td>5. Edisto-Santee River</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
North Carolina's River Basins

Objectives:
The students will identify major river basins in North Carolina and understand the importance of surface streams and rivers as sources of water for many communities.

The students will identify the source of water for their community. If the water source is a surface stream or river, they can identify and locate their water source.

Geographic Themes:
Location, Human-Environment Interactions, Regions

Geography Standards
Standards 1, 3, 7, 8, and 11

Materials:
Map of North Carolina River Basins
Physical map of North Carolina
Physical map of your county or topographic map (these may be available from your County Planner's office)

Procedure:
Discuss with the students the meaning of the terms river basin and watershed. After students understand these concepts, distribute the Map of North Carolina River Basins (found in the Atlas section). Have the students identify the various river basins in the state.

Locate the river basin(s) for your county. Use a physical map of North Carolina to locate the river. Locate the source and the mouth of the river, and any major tributaries. Identify the cities and towns along the river.

Using a physical or topographic map of your county, locate the river and its tributaries. Have students research the source of municipal or county water. If it is from a surface source, locate it on the map. Is it on the river or a tributary?

Extending the Lesson:
Assign students to research other municipal water sources within the same river basin. In most cases several cities will share the same river basin. How many municipalities have water sources upstream from where they live? What impact may this have on the quality of their water? How many municipalities use the river as a water source downstream from where you live? What impact could this have on the quality of their water? Research or discuss the issue of waste disposal and sewage treatment.

For further activities on river basins refer to the River Basin Analysis lesson.
Lesson Plan 2
Topic 5

River Basin Analysis

Objectives:
The students will outline a river basin on a map to develop an understanding of what a river basin is, and why it is important.

Note: Teachers may wish to assign parts of this analysis to teams of students or assign teams of students different river basins. Teachers may also choose to limit some topics based on the level of students.

Geographic Themes:
Place, Human-Environment Interactions, Regions

Geography Standards
Standards 1, 3, 7, 8, 14, 15, and 16

Materials:
A physical or topographic map of a river basin
Reference books

Procedure:
1. Select a river basin of North Carolina. Determine the size of the river basin. One method is to use 10 x 10 grid paper (10 squares to the inch, 100 squares to the square inch), estimate the number of square inches covered on the map, and multiply by the square miles per square inch.
2. Research and record physical characteristics of the river.
   a. Length of river
   b. Elevations (highest and lowest) and slope
   c. Number of tributaries
   d. Annual average discharge
4. Inventory all dams and reservoirs in the basin.
5. Inventory population within the basin.
   a. County and/or state data
   b. Major cities
6. Identify all possible uses of the river and its major tributaries.
   a. Water supply
   b. Irrigation
   c. Fisheries
   d. Recreation
   e. Shipping/transportation
   f. Special industries
   g. Hydroelectricity
   h. Other uses
7. Identify the various types of dominant economic activities within the basin.
   a. Agriculture
   b. Mining
   c. Timber
   d. Manufacturing
   e. Urban centers
   f. Tourism
   g. Recreation
   h. Other activities
8. Determine how many political boundaries are included within the basin.
   a. State
   b. County
   c. Federal
   d. Other

   Note the use of basin boundaries as political boundaries.
9. Analyze the complexity of river basin planning. Consider how overlapping political
   units and agency boundaries affect water resources planning and management.
   (Example: efforts to regulate withdrawals from the river, or discharges of pollutants.)
   Also consider competing and contradictory interests of various economic activities.

**Extending the Lesson:**
Have student groups report to the class the results of their river basin analysis. Students
can graph information to compare and contrast river basins. River basins from regions
outside North Carolina can be compared. Fifth grade students could compare river basins
of major rivers in the Western Hemisphere (for example: Amazon, Mississippi, and
Mackenzie rivers). Sixth grade students could compare European rivers; seventh grade
students can compare rivers of Africa and Asia.

*Source: This lesson was prepared by Jerry Williams and Jeff Harvey for the 1992
Workshop on Water sponsored by the National Geographic Society's Geography
Education Program.*
Water Use in North Carolina

The idea that water is taken out of the system and never returns is incorrect. It is true that some water is stored in plants, animals, and underground storage systems where it is not presently accessible. For example, our bodies are 65% water; the greater the population, the more water is stored in living human tissue. As a second example, water from Lake Mead in Arizona is soaking into porous sandstone that forms the shore of the lake. For now, that water is not available for human or other uses.

Water is used, and it is usually returned to the system quickly. For example, the largest use of water in North Carolina is for generating hydroelectricity. The Catawba River is the most developed for this function. The water flows through a turbine, which turns a generator, and then the water returns to the stream. In many industrial applications, water is used as a coolant and is returned to the stream. Even in agriculture, only part of the water used to irrigate crops becomes part of the living cells of the plants. Some is transpired into the atmosphere, but some sinks into the soil and flows into a stream through the ground water system.

Our problem is whether or not there is enough water in a local system for everyone to do what the people feel they need to do with it. Another problem has to do with what happens to the quality of the water when it is used for various functions. It may become so contaminated with various pollutants that it becomes unusable for use for drinking, cooking, and irrigating crops. Even some industrial uses demand drinking quality water.
Water Use in North Carolina

Objectives:
Students will create graphs to show various aspects of North Carolina's water use and make comparisons with other states.

Geographic Themes:
Place, Human-Environment Interaction, Regions

Geography Standards
Standards 1, 7, 8, 15, and 16

Materials:
Graph paper, colored pencils or markers, ruler
Selected data on water use (provided in the lesson)

Procedure:
In this lesson students will create graphs to show water use in North Carolina. Students will also make comparisons with other states. The data for the graphs will be given in table form. Students can determine what type of graph would best show the information.

Questions for discussion and research follow the tables of data.

Table One
Per Capita Water Use

The data includes all uses of water: domestic, industrial, and agricultural.

<table>
<thead>
<tr>
<th>State</th>
<th>Rank</th>
<th>Per Capita Use (gallons per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Carolina</td>
<td>24</td>
<td>1,260</td>
</tr>
<tr>
<td>Tennessee</td>
<td>17</td>
<td>1,7701</td>
</tr>
<tr>
<td>Idaho</td>
<td>1</td>
<td>22,200</td>
</tr>
<tr>
<td>Colorado</td>
<td>5</td>
<td>4,190</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>27</td>
<td>1,210</td>
</tr>
<tr>
<td>New Jersey</td>
<td>47</td>
<td>554</td>
</tr>
</tbody>
</table>

Source: *1992 Environmental Almanac*, Houghton Mifflin Company

Questions
1. Why do you think Idaho uses more water per capita than any other state?
2. Does annual precipitation affect water use in a state?
### Table Two
**Water Use by Sector – Selected States**

<table>
<thead>
<tr>
<th>State</th>
<th>Total water used per day: 8,760 million gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Carolina</td>
<td></td>
</tr>
<tr>
<td>Type of Use</td>
<td>Percent</td>
</tr>
<tr>
<td>Domestic and commercial</td>
<td>9 %</td>
</tr>
<tr>
<td>Thermoelectric</td>
<td>83 %</td>
</tr>
<tr>
<td>Industrial and mining</td>
<td>6 %</td>
</tr>
<tr>
<td>Agriculture</td>
<td>2 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Idaho</th>
<th>Total water used per day: 22,300 million gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Use</td>
<td>Percent</td>
</tr>
<tr>
<td>Domestic and commercial</td>
<td>1 %</td>
</tr>
<tr>
<td>Thermoelectric</td>
<td>0 %</td>
</tr>
<tr>
<td>Industrial and mining</td>
<td>2 %</td>
</tr>
<tr>
<td>Agriculture</td>
<td>92 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minnesota</th>
<th>Total water used per day: 2,830 million gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Use</td>
<td>Percent</td>
</tr>
<tr>
<td>Domestic and commercial</td>
<td>21 %</td>
</tr>
<tr>
<td>Thermoelectric</td>
<td>52 %</td>
</tr>
<tr>
<td>Industrial and mining</td>
<td>16 %</td>
</tr>
<tr>
<td>Agriculture</td>
<td>7 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alaska</th>
<th>Total water used per day: 406 million gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Use</td>
<td>Percent</td>
</tr>
<tr>
<td>Domestic and Commercial</td>
<td>21 %</td>
</tr>
<tr>
<td>Thermoelectric</td>
<td>7 %</td>
</tr>
<tr>
<td>Industrial and mining</td>
<td>33 %</td>
</tr>
<tr>
<td>Agriculture</td>
<td>0 %</td>
</tr>
</tbody>
</table>

Source: *1992 Environmental Almanac*

**Questions**

1. Which state has the highest percentage of water used for thermoelectric use? Why?
2. Which state has the highest percentage of water used for agriculture? Which has the least? Give reasons for your answers.
3. Which state has the highest percentage of water used for industry and mining? Why?
Table Three
Water Use for Irrigation - North Carolina

<table>
<thead>
<tr>
<th>Year</th>
<th>Surface Water</th>
<th>Ground Water (in million gallons per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>7.6</td>
<td>1.4</td>
</tr>
<tr>
<td>1960</td>
<td>20</td>
<td>6.7</td>
</tr>
<tr>
<td>1965</td>
<td>20</td>
<td>9.1</td>
</tr>
<tr>
<td>1970</td>
<td>32</td>
<td>50</td>
</tr>
<tr>
<td>1975</td>
<td>34</td>
<td>53</td>
</tr>
<tr>
<td>1980</td>
<td>93</td>
<td>39</td>
</tr>
<tr>
<td>1985</td>
<td>123</td>
<td>10</td>
</tr>
</tbody>
</table>


Table Four
Water Withdrawals for Public Water Supply – North Carolina

<table>
<thead>
<tr>
<th>Year</th>
<th>Surface Water</th>
<th>Ground Water (in million gallons per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>260</td>
<td>34</td>
</tr>
<tr>
<td>1965</td>
<td>250</td>
<td>66</td>
</tr>
<tr>
<td>1970</td>
<td>380</td>
<td>80</td>
</tr>
<tr>
<td>1975</td>
<td>430</td>
<td>57</td>
</tr>
<tr>
<td>1980</td>
<td>500</td>
<td>70</td>
</tr>
<tr>
<td>1985</td>
<td>507</td>
<td>88</td>
</tr>
</tbody>
</table>


Table Five
Percentage of Water Applied for Irrigation by Crop in 1985 – North Carolina

<table>
<thead>
<tr>
<th>Crop</th>
<th>Percent of Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>51.5 %</td>
</tr>
<tr>
<td>Corn</td>
<td>25.0 %</td>
</tr>
<tr>
<td>Vegetables</td>
<td>6.8 %</td>
</tr>
<tr>
<td>Peanuts</td>
<td>5.3 %</td>
</tr>
<tr>
<td>Soybeans</td>
<td>2.3 %</td>
</tr>
<tr>
<td>Other</td>
<td>9.1 %</td>
</tr>
</tbody>
</table>


Questions for Discussion

1. Based on graph three, describe the trend in water use in North Carolina since 1955.
2. Which source of water, surface water or ground water has shown a decrease in use for irrigation?
3. What does graph four tell you about population trends in North Carolina since 1960?
4. Which crop is most important to the economy of North Carolina?

Extending the Lesson:
Use the Environmental Almanac as a resource for information on water use in North Carolina and the United States.