EXPLORING NORTH CAROLINA

North Carolina from the Tropics to the Arctic

STANDARD COURSE OF STUDY CORRELATIONS:

Science, Grade 6, Goal 4: The learner will investigate the cycling of matter.

4:05 Evaluate designated systems for ability to enable growth of certain plants and animals.

Science, Grade 6, Goal 7: The learner will conduct investigations and use technologies and information systems to build an understanding of population dynamics.

7.01 Describe ways in which organisms interact with each other and with non-living parts of the environment.

7.02 Investigate factors that determine the growth and survival of organisms.

7.03 Explain how changes in habitat may affect organisms.

7.06 Investigate processes which, operating over long periods of time, have resulted in the diversity of plant and animal life present today: natural selection, adaptation.

Science, Grade 8, Goal 5: The learner will conduct investigations and utilize appropriate technologies and information systems to build an understanding of evidence of evolution in organisms and landforms.

5.02 Correlate evolutionary theories and processes: biological.

5.03 Examine evidence that geologic evolution has had significant global impact, including the distribution of living things.

Earth and Environmental Science, Goal 2: The learner will build an understanding of lithospheric materials, tectonic processes, and the human and environmental impacts of natural and human-induced changes in the lithosphere.

2.05 Create and interpret topographic, soil and geologic maps using scale and legends.

MATERIALS & PREPARATION

- Copies of spreadsheets from the National Climatic Data Center that list "Normal Daily Maximum Temperatures" and "Normal Daily Minimum Temperatures," available at www.ncdc.noaa.gov/oa/climate/online/ccd/nrmmax.txt and www.ncdc.noaa.gov/oa/climate/online/ccd/nrmmin.txt.
- Copies of weather data tables for several North Carolina cities, for Part 2 (if Internet/computer access is not available in classroom). Data available at: http://countrystudies.us/unitedstates/weather/north-carolina/.
- North Carolina State Transportation Maps (copies available at no charge from any State Welcome Center and many city visitor centers, or bulk quantities via the Department of Transportation Web site: www.ncdot.org/public/publications/.)
- Topographic maps (optional, for Part 3. *See Additional Resources.*)
- Before the lesson, transfer the climate data in "Explore" Part 1 onto the board, a poster or a flip chart.

INTRODUCTION TO LESSON: Teams of students will examine average-temperature data for various cities in North Carolina and the eastern United States to discover why so many "northern" and "southern" species of plants and animals converge in North Carolina. They will use spreadsheets, road maps and/or topographic maps.

BACKGROUND FOR TEACHER: North Carolina's diverse overall climate and microclimates are hospitable to species that are generally associated with much more northern or southern latitudes. Such species thrive in our varied ecosystems. North Carolina is located between 33°52' (33.88) and 36°31' (36.53) N latitudes. (Note: Latitudes taken for Sunset Beach and Knotts Island are both slightly beyond the state line borders). The state's elevation extends from sea level on the coast to 6,684 feet above sea level at the top of Mount Mitchell, the highest peak east of the Mississippi River. This difference in altitude causes variations in average temperatures throughout the state. According to the State Climate Office of North Carolina, the average temperature varies more than 20°F from the lower coast to the highest elevations. The average annual temperature at Southport, in our southernmost coastal region, is nearly as high as that of interior northern Florida, while the average temperature at the summit of Mount Mitchell is lower than that of Buffalo, New York.

engage ➢ Ask students to volunteer definitions of the words *tropical* and *arctic*. *(Possible answers: Tropical—warm; humid; rainy; like the weather near the equator. Arctic—snowy; icy; frigid; like the weather at the North Pole.)* Once everyone has agreed on general definitions of these words, have students try to think of one place

For follow-along viewing guides for students, see Viewing Guide 1 and Viewing Guide 7.

Rhododendron photograph courtesy of N.C. Division of Tourism, Film and Sports Development.

Fraser fir photograph courtesy of N.C. Division of Tourism, Film and Sports Development.

Sea oats photograph courtesy of N.C. Division of Tourism, Film and Sports Development.

that is tropical, arctic and "everything in between." The answer: our own state, North Carolina! Tell students that they will become "Fahrenheit detectives" to solve the mystery of why North Carolina is home to both palm trees and Christmas trees. Show Chapter 1 of "America's Eastern Natural Boundary."

explore

Part 1. Divide the class into teams and hand out copies of spreadsheets to each group. Provide the following climate data from the video on a blackboard, poster or flip chart:

North Carolina Average High and Low Temperatures for January and July

	Mount Mitchell		*Greensboro*		*Wilmington*	
	Jan	*Jul*	*Jan*	*Jul*	*Jan*	*Jul*
High	34°F	68°F	47°F	88°F	56°F	90°F
Low	17°F	53°F	28°F	68°F	36°F	72°F

Ask the teams to find three different cities with the same or very similar high and low average temperatures as these three North Carolina cities for the months of January and July. To avoid all teams having duplicate answers (i.e., all of them selecting the first "matching" city on the list), you might suggest that they circle all the corresponding data before choosing cities.

When teams have finished, ask a student from each team to write the team's data on the board, poster or chart.

Part 2. Hand out North Carolina State Transportation Maps, one per team. Assign each team a minimum of three different cities, one from each of North Carolina's three geographic regions (Mountains, Piedmont, Coastal Plain). If computers are available, have them use data from http://countrystudies.us/united-states/weather/north-carolina/ to find the temperatures for their assigned cities (or distribute materials you've gathered beforehand). Ask students why they think there is such variation in temperatures among the cities. How do these figures compare to those of Mount Mitchell, Greensboro and Wilmington? *(These questions are designed to stimulate student thought and response. Students do not have to come to definitive conclusions.)*

Part 3. (Optional) Pass out topographic maps to each team.

Have the teams locate the cities they were assigned and determine an average elevation for these locations.

(Elevation in feet above sea level is written on certain contour lines on the maps. The contour interval—the number of feet in elevation between each contour line—is listed at the bottom center of each map. One can determine an approximate elevation by counting the number of contour lines to the highest point, usually shown as an oval).

BEYOND THE CLASSROOM

A visit to Mount Mitchell State Park (http://www.ncparks.gov/Visit/parks/momi/main.php) or Grandfather Mountain (http://www.grandfather.com/photo_tours/index.php) would reinforce some of the concepts of this lesson.

Additional Resources:

Topographic maps may be purchased from the United States Geological Survey (http://topomaps.usgs.gov/ordering_maps.html). A more convenient way to get multiple maps is to buy an atlas, such as the North Carolina Atlas and Gazetteer (DeLorme Publishing). Possible sources include online or local bookstores, outdoor/camping stores, and some state parks and nature centers.

Several variations in altitude may exist within a single city due to a range of topography; as long as students are close, it will suffice. Have students consider their cities' elevations and average January/July temperatures and ask them if they can detect any correlations between the two sets of data.

explain Write this statement on the board:

As a rule of thumb, every 1,000 feet in elevation above sea level is equivalent to a climate change of 300 miles north.

Ask students what they think this statement means. Then ask students on each team to discuss with one another how this fact might influence the kinds of plant and animal life found in North Carolina. After they've had time to discuss the topic, have them choose a team leader to share their thoughts and opinions with the class.

elaborate Show Chapters 1 and 6 of "Climate Change in the Carolinas." Chapter 1 looks at glacial/interglacial cycles in the Ice Ages and the relationship between CO_2 in the atmosphere and temperature change. Chapter 6 discusses what changes in climate and sea level are predicted for North Carolina in the coming century. In teams, have students discuss common themes in the two videos.

OPTIONAL: For an advanced or upper level class, ask each team to choose one of the "boundary" species mentioned in the video (plant or animal) and research its current range/distribution. See if students can discover any historical trends that show that the species has expanded its range or disappeared from places it was once found. Ask if they can make correlations between a species' range and climatological data (e.g., temperature, rainfall). Points for discussion might include: How might humans be responsible for changes in the range of a species? *(Possible answers: encroachment onto or destruction of the species' habitat; contribution to global warming or acid precipitation that changes climate).* How might changes in distribution of a species be good and bad?

evaluate Observe discussions to measure students' understanding and articulation of the concepts in the lesson.

Teacher's Notes: