LIKING LICHENS IN GEORGIA

Can you identify multiple habitats in Georgia? How are humans impacting the environment?

Essential Questions
1. Can you name the five physiographic regions (physiographic provinces) of Georgia?
2. Can you identify one or more ways that humans impact the environment?

Georgia Performance Standards

Characteristics of Science-Habits of Mind
S3L1. Students will investigate the habitats of different organisms and the dependence of organisms on their habitat.
   a. Differentiate between habitats of Georgia (mountains, marsh/swamp, coast, Piedmont, Atlantic Ocean) and the organisms that live there.
   d. Explain what will happen to an organism if the habitat is changed.

S3L2. Students will recognize the effects of pollution and humans on the environment.
   a. Explain the effects of pollution (such as littering) to the habitats of plants and animals.

What the Student Should Know
Students will know:
♦ There are many different physiographic regions in Georgia.
♦ A vary of habitats exist in Georgia: freshwater ecosystems (lakes, rivers, wetlands); marine ecosystems (shorelines and oceans); and forests.
♦ Humans can negatively impact habitats.

What the Student Should Be Able to Do
Students will:
♦ Identify different habitats, and their associated physiographic region.
♦ Understand how humans negatively impact habitats.
♦ Understand what happens to an organism if the habitat changes.

Questions to the author can be sent to the project administrator, Dr. Bob Hill at bobhill@uga.edu.
Enduring Understandings
♦ Georgia has a diversity of habitats. Organisms living in each habitat have developed unique characteristics to survive in their environment.
♦ When a habitat is altered, especially by humans, organisms become stressed and less tolerate organisms will die.
♦ Participating in stewardship activities protects the habitat we live in and surrounded by.

Background
Georgia is divided into five physiographic regions: the Appalachian Plateau, the Ridge and Valley, the Blue Ridge, the Piedmont, and the Atlantic Coastal Plain. “The form of the landscape and the climate of the area influenced the development of vegetation and animal life in each of these provinces.” (The New Georgia Encyclopedia, http://www.georgiaencyclopedia.org/nge/Article.jsp?id=h-948). Within each of these providences is a wide array of habitats. Habitats include forests, lakes, river, coastlines, etc. Habitats are “an area that provides an animal or plant with adequate food, water, shelter, and living space. (North Carolina Department of Environmental and Natural Resources, http://www.dfr.state.nc.us/stewardship/wwwildlife/www13.htm). For example, the habitat of a dragonfly is a wetland. The habitat for an alligator is a wetland, too. However, alligators, as reptiles, have certain temperature requirements; therefore, only certain physiographic regions of Georgia, with higher year around temperatures can support alligators. For more information on habitats, organisms that live in certain habitats, and unique adaptations organisms have developed to survive in various habitats, visit http://www.mbgnet.net/index.html.

Lichens are an example of living organisms that live in a variety of environments, especially harsh environments. Lichens are organisms composed of either algae or a cyanobacteria living in a relationship with a fungus. By living together, the fungus is able to colonize in many different environments that they could not live alone.

“The fungus can live in places lacking the organic matter that they would normally need as a source of nutrients. Algae and cyanobacteria, which usually live in aquatic or moist habitats, can live in drier places. They can also be affected adversely by high light intensity and, given the protection of the fungus, they can expand into environments where light intensity is high” (Purvis, 2000, p. 7).

Lichens are important to an ecosystem. They can live in adverse conditions and in locations were plants cannot thrive. They are early colonizers after disturbances and have a role in soil formation. Lichens provide a food source to some mammals such as reindeer living in the Arctic. However, more common they are used by birds as nesting material. Humans harvest lichens to make dyes, healing aids and tonics.

For more information on lichen morphology and ecology, visit
♦ Introduction to Lichens: An Alliance between Kingdoms at http://www.ucmp.berkeley.edu/fungi/lichens/lichens.html
♦ Lichens of North America at http://www.lichen.com
♦ 10 Things You Should Know About Lichens at http://ohioline.osu.edu/sc195/029.html
♦ What is a Lichen? at http://www.earthlife.net/lichens/lichen.html
However, like most organisms, when the environment is altered, lichens become stressed and may die. Air pollution occurs when air moves across the Earth and picks up harmful gases and particles produced from human activities. When some lichens are exposed to certain pollutants, especially to sulfur dioxide (SO2) emitted from coal-burning power plants, lichens are injured and die. Lichens have also shown sensitivity to some other pollutants, such as heavy metals, nitrous oxides, and ozone, but for the most part lichen damage can be attributed to SO2. The effect of these pollutants may be observed on lichen distribution (arrangement of lichens over a set area) and diversity (the presence of different lichen species and their relative abundance).

Humans can improve air quality for lichens by limiting pollutants from vehicles and industries and altering the way they live. Some ways to reduce air pollution is:

- Check car emissions. Make repairs to emission systems.
- Drive less. Take mass transit, carpool, and bike.
- Pump gasoline in the evening and early morning.
- Convert vehicles to alternative fuels.
- Support scrubbers and other pollution-control devices that remove noxious substances from industrial and coal-burning operations.

**Materials**

- Computer with Internet access (per group)
- Map of Georgia illustrating five physiographic regions. (map at [http://www.georgiaencyclopedia.org/media_content/m-9031.jpg](http://www.georgiaencyclopedia.org/media_content/m-9031.jpg))
- Georgia lichen samples

**The Activity**

**Warm Up**

1. Discuss the five physiographic regions of Georgia: the Appalachian Plateau, the Ridge and Valley, the Blue Ridge, the Piedmont, and the Atlantic Coastal Plain. Use maps, photos, and videos to illustrate the various regions.
2. Discuss what a habitat is. Show specific examples of a temperate forest, freshwater stream, lake, and coastline of Georgia. Then, show the students, as well as ask the students, about the organisms that live in each habitat. Discuss unique adaptations certain organisms have with their habitat. For example, a dragonfly requires standing water for its aquatic nymph stage. Based on your students, you may wish to draw the connection between physiographic regions and habitats and how these two factors are critical for understanding which organism lives in certain regions and locations in Georgia. Often to show illustrate physiographic regional adaptations, you might need to look at the species-level of an animal or plant. For example, Longleaf pine trees cannot
tolerate the soils and temperature in North Georgia mountains, but live well in the coastal plain.

3. Continue to have students identify the various conditions/elements that make the habitats, and the organisms that live in them, different-soils, geology, plants/vegetation, elevation, etc.

4. Discuss what a lichen is. Talk about how these organisms have developed the ability to live in a variety of locations.

5. Discuss how each of the habitats has been influenced by humans through farming, urbanization and manufacturing. Discuss natural changes and phenomena such as seasonal weather, hurricanes, tornadoes and etc. Ask students to consider what might happen to plants and lichens during and after a natural disaster. For human-induced impacts, discuss with the students what they or their parents can do to reduce air pollution. A writing lesson can be used to engage students and teach these concepts. Consider preparing a rubric with requirements and grading expectations for the writing assignment.

Exercise

1. Have the students conduct a brief library search or use textbooks and reference materials to learn about habitats. Encourage the students to consider habitats that are unique to their area. This might include wetlands, marshes, coastlines, mountain forests, etc.

2. Using Georgia lichen samples, illustrate to the students lichen morphology. You may ask the students to find certain morphological characteristics on lichen samples. Ask students to consider the advantages and disadvantages of being a lichen in each of Georgia’s habitats.

   a. The students are encouraged to read the background information on the page.
   b. After reading the page, have the student click on the icon and identify the lichen displayed on the page.

4. Have the students obtain lichen samples. Students can bring lichens from home or you can collect them as a class. (Please be aware lichens cannot be collected from an area without first getting permission from the landowner and those responsible for the site. It is prohibited to collect from federal, state, and local parks without special permission.) It would be advisable to have samples lichens across Georgia like the "Dixie Reindeer Lichen" (from the Piedmont) and "Deer Moss" from the Coastal Plain.

5. Using A Guide to Twelve Common & Conspicuous Lichens of Georgia’s Piedmont, have the students identify the lichen samples you provided and those they collected. Have the students group the lichens based on their location and habitat.
Performance Assessment

Students will:

♦ Research green plants, fungi (mushrooms), animals and lichens that live in other regions of Georgia. Using information resources including maps, match animal and plants with their homes (areas in GA where they live: mountains, marsh/swamp, coast, Piedmont, Atlantic Ocean).

♦ Write an illustrated story telling what you found out about the organisms in your area, such as where they live, what they consume, and what external features the animals, plants, and lichens have that enable them to live where they do.

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LIKING LICHENS PROJECT-  www.georgialichens.org

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