



# Savannah River Ecology Laboratory UNIVERSITY OF GEORGIA

Eco-Meet 2018

Study Packet

## The Sandhills Habitat

### Georgia Performance Science Standards

<https://www.georgiastandards.org/standards/Georgia%20Performance%20Standards/SeventhGradeRevised2006.pdf>

**S7L4.** Students will examine the dependence of organisms on one another and their environments.

**S7L5.** Students will examine the evolution of living organisms through inherited characteristics that promote survival of organisms and the survival of successive generations of their offspring.

### South Carolina Science Academic Standards

[https://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-](https://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf)

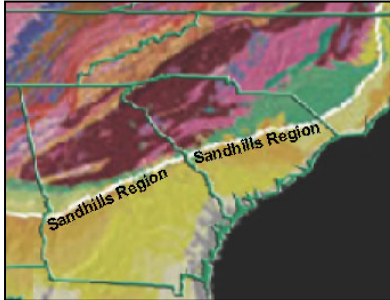
[Learning/documents/South\\_Carolina\\_Academic\\_Standards\\_and\\_Performance\\_Indicators\\_for\\_Science\\_2014.pdf](https://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf)

**Standard 6.L.4:** The student will demonstrate an understanding of how scientists classify organisms and how the structures, processes, behaviors, and adaptations of animals allow them to survive.

**Standard 6.L.5:** The student will demonstrate an understanding of the structures, processes, and responses that allow protists, fungi, and plants to survive and reproduce.

**Standard 7.EC.5:** The student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environments.

# The Sandhills Habitat



## Description

Sandhills are an inland habitat type characterized by rolling hills capped by deep coarse sands. They are wedged between the Coastal Plain and Piedmont regions. Scientists believe sandhills were formed by ancient oceans that rose and then receded in response to melting and freezing of polar ice caps. Beaches formed wherever the water met the land. Each time a beach formed, a sandhill was left behind when the ocean receded.

## Sandhills Flora (Plant Life)

Because sandhills contain dry, nutrient-poor soil, this habitat contains only hearty, well-adapted plants. Turkey oak and longleaf pine trees are typical sandhills vegetation. Their rooting systems allow them to extract water from various soil depths. These species are also adapted to the frequent, lightning-induced fires that strike sandhills. Longleaf pines have a thick, fire-resistant bark, and turkey oaks killed by fire will resprout because the fire does not damage their root systems. Several grass species, which also can survive fires, inhabit sandhills. They include wiregrass, sorghastrum, broomsedge and three-awn grass.



Turkey oak leaves with longleaf pine trees in the background

What allows so many plant species to survive on sandy soils that are virtually devoid of moisture and nutrients? Most biologists believe the answer is linked to the historical importance of fire, which helps maintain the open canopy crucial for light-thirsty understory vegetation. A low-intensity fire also induces the production, release, or germination of the seeds of "fire-adapted" plants. Some plants, such as wire grass, cannot reproduce without such fires. The fire creates patches of bare soil suitable for germination sites, and nutrients released during the fire can nourish young seedlings.



View of sandhills habitat

The longleaf pine landscape was once abundant, even dominant on the Coastal Plain of the Southeast, but it has become rare due to human land use practices.

Most longleaf forests had been cleared by 1930 or so; current estimates are that about 2 million acres remain, of which only 10,000 acres are old-growth forest. We hear so much about tropical rainforest destruction, but most folks may not even realize that more than 97% of a once vast forest habitat in the Southeast has been eliminated. The loss of longleaf pines has translated to loss of habitat for many plant and animal species.



Longleaf Pine Tree

Longleaf Pine Seedling



Sweet Pitcher Plant

Though mostly dry, the sandhills harbor wetlands used by a variety of animals and plants, including carnivorous plants.

Nutrient-poor habitats typically have soils that are acidic; therefore, nutrients and minerals are not available in forms that are accessible to plants. The ability of carnivorous plants to capture and digest insects, supplemented by their capacity to make energy stores by photosynthesis as other green plants do, makes them highly competitive in nutrient-poor habitats.

The Sweet Pitcher Plant has narrow, hollow red-veined leaves. This pitcher plant has a partial hood, which doesn't quite cover the top the leaves, so the pitcher often fills with rainwater. The plant produces insect-attracting nectar. Insects cannot resist the nectar and eventually fall into the pitcher. The inside of the leaf is coated with a slick wax and thick downward pointing hairs. Once trapped, a fluid of secreted enzymes kills the insect and slowly digests it. The pitcher plant absorbs the nutrients and minerals resulting from the captured insect.

### Sandhills Fauna (Animal Life)

The sandhills fauna can be just as diverse as the flora. Many resident animal species are able to live with the hot, dry conditions by adopting a fossorial lifestyle. Underground refuges reduce the risk of overheating, dessication, and predation, and may even protect the animals during periodic fires. The gopher tortoise is arguably the most well known fossorial creature of the sandhills.



Gopher Tortoise (Georgia's State Reptile)

The gopher tortoise is modest in size: up to 14 inches long. Yet it takes many years for one to reach full stature. It can live for 50 years or more, but it may not reach reproductive maturity until 15-20 years of age.



Scutes on a juvenile tortoise that is approximately three years old

The upper shell, or carapace, can have a range of colors: gray, tan, and chocolate. By contrast, the lower shell, or plastron, is usually a lighter brown or pale, golden yellow. Both the plastron and carapace consist of a matrix of bony plates called scutes. It is often possible to estimate the age of a young tortoise by counting the rings (annuli) on a scute, much as you would count rings on the cross-section of a tree. In juveniles and adult females, the plastron is perfectly flat, but in mature males it develops a noticeable concavity toward its posterior. The male also has an elongated scute at the plastron's front end that is used to joust other males when battling for courtship rights with a female.

The gopher tortoise's elephant-like hind legs are well suited for overland travel. The strong, flattened forelimbs (encrusted with hard epidermal scales in older animals) terminate in stubby, wide claws and are great for digging burrows. Even hatchlings with their spindly legs can dig on their own.

Many people think a turtle's home is its shell, but that's a misconception because it ignores the need for proper habitat. Tortoises require sandy soils, open-canopy areas that receive plenty of sunlight, and tender, low-growing plants. A good sandhill habitat has a sparse upper canopy, dominated by longleaf or slash pine, and a subcanopy of mixed oaks and evergreen shrubs. Close inspection of the patchy, herbaceous layer reveals an astounding diversity of annuals and perennials on which the tortoise feeds. In areas where the soil surface has not been severely disturbed, clumps of knee-high wire grass provide the tortoise with forage material in early spring, before other plants emerge.



Longleaf pine trees with open grassy areas

The gopher tortoise spends a majority of its time in its burrow. The burrow passage, which can be from under three to over seven yards long, is usually just wide enough for the resident tortoise to turn around in, but it often ends in a large chamber several yards below ground surface. The large amount of soil excavated to construct the tunnel is deposited outside the burrow entrance in a mound called an apron.

Gopher tortoises are ectotherms, which means they do not have an internal mechanism to regulate body temperature. Instead, they must modify their behavior. They avoid extremes of weather by retreating into the stable environment of their burrows, emerging briefly to graze on nearby vegetation. Conversely, on cool days they may perch atop the burrow apron to bask in the sun. Female gopher tortoises may also use the apron as a nesting site. On average, an individual tortoise will use between two and seven burrows per year, often the same ones year after year.

A gopher tortoise sometimes shares its burrow with another tortoise, but it usually occupies the burrow singly and may even defend it against others. Despite occasional territorial disputes with other tortoises, the gopher tortoise is an accommodating host, sharing its home with other species—called commensals. Sixty vertebrate and at least 300 invertebrate species have been found in various tortoise burrows. Some guests use the burrow as a temporary refuge, but others—mostly insects and arthropods—have never been observed outside their benefactor's shelter. By creating a home for many types of animals, the gopher tortoise increases the local faunal diversity, earning it the designation of a "keystone" species. Biologists warn that a decline in gopher tortoises could trigger the disappearance of other sandhill species.



As with many other species in danger of extinction, the gopher tortoise is most threatened by loss or degradation of habitat. Causes of habitat degradation include fire suppression and conversion of structurally complex, mixed-age longleaf pine forests (with a diverse understory) to slash or loblolly pine forests. The dry, sandy ridges favored by tortoises are also choice sites for roads, housing, and commercial developments. When several tortoises are likely to be affected, they may be relocated elsewhere. But relocation is a short-sighted, temporary solution, because it ignores the fate of burrow commensals (which are not relocated), increases the risk of spreading diseases, and fails to consider the complex interactions within tortoise populations.

An interesting amphibian that inhabits the sandhills is the slimy salamander. Slimy salamanders are large salamanders, reaching 6.75 in (17 cm), with blackish-blue color and scattered silvery-white or gold spots all over their body. The salamander gets its name from the slimy secretions it produces when threatened, which stick like glue and are hard to get off. Slimy salamanders prefer to stay under logs, stones, debris, or in burrows during the day and come out on moist nights to forage for invertebrate prey. Unlike most other amphibians that lay their eggs in wetlands, slimy salamanders deposit their eggs under logs or dirt in the summer or early fall. These eggs will usually hatch around October and young do not have an aquatic larval stage.



Other reptiles and amphibians that inhabit sandhills include broad-headed skinks, oak toads, six-lined racerunner lizards, glass lizards, and hog-nosed snakes. Mammals that inhabit sandhills include white-tailed deer, opossums, gray foxes, bobcats, fox squirrels, and cottontail rabbits. Birds include the mourning dove, sparrow hawk, red-tailed hawk, and wild turkey.

### Research

Scientists at the Savannah River Ecology Laboratory have conducted a variety of animal and plant studies in sandhills of the 310-square-mile Savannah River Site near Aiken, S.C., since the early 1950s. Studies have included plant and animal inventories, forest dynamics, longleaf pine/wiregrass restoration and fire ecology of the sandhills. Scientists have confirmed that periodic fires – whether they be lightning-induced or prescribed burning by forest managers – increase plant biodiversity in the sandhills. Fire returns nutrients to the nutrient-poor sandhill soils and temporarily creates more open space that allows new species to become established. Research has shown an increase in both the number of plant species and the number of individual plants. Such increases mean there is a potential for increase in the number of animal species that inhabit sandhills.



Prescribed Fire