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# LEARNING WITH LONGLEAF

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ALLIANCE



Teaching children about the environment not only increases their understanding of natural areas and ecological processes, but it is also essential skill building to make informed decisions and solve problems in a changing world. Surprisingly, however, children all over the United States are often more knowledgeable about tropical rainforests and other distant habitats than those in their own backyards – even for an ecosystem like longleaf pine, which is as rich in plants and animals as most tropical rainforests and equally in peril of permanent destruction.

The study of the longleaf pine ecosystem presents an opportunity to understand important biological concepts, the cultural history and modern conservation issues of a large portion of the southeastern United States. Environmental education is a powerful tool we can use to raise awareness, increase engagement, and grow a love for longleaf across the range.

John McGuire and Rhett Johnson authored this longleaf educational series to provide key concepts on longleaf ecosystems, specifically for classroom teachers. Illustrations accompany each concept and provide coloring opportunities for students. Artwork is by Patrick Elliott of Tallahassee, Florida.

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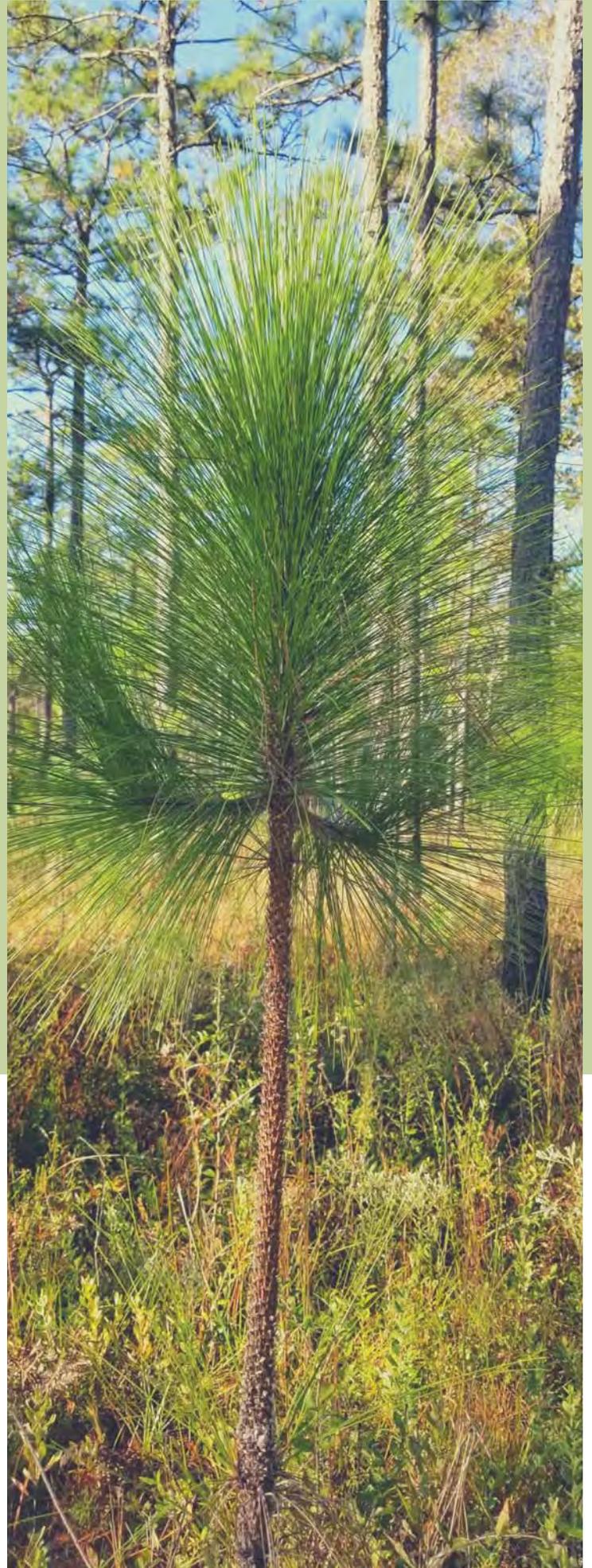
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# LONGLEAF PINE FORESTS

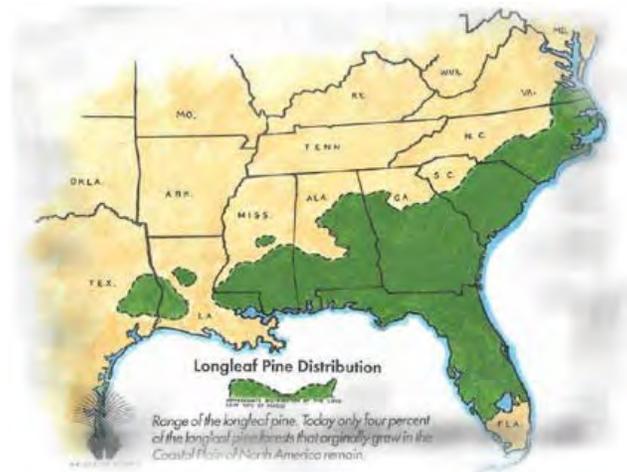
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*Ecosystem*



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## At One Time, the Longleaf Pine Ecosystem Stretched Nearly Continuous from Eastern Texas to Southern Virginia



(Bolded words in text indicate key words and concepts)

### Student Information:

When early Europeans first explored the southeastern United States, they found a forest of longleaf pine trees covering about 90 million acres (about the area that 90 million football fields would cover). These forests were seen in nine states, with Georgia, Alabama, and Florida having had the most longleaf pine. With the exception of occasional rivers, swamps and Native American farms, this forest stretched as far the eye could see. Today about 97% of this forest has been destroyed.

### Teacher Information:

At one time, longleaf pine forests were perhaps the largest forest type in North America dominated by a single species of tree. Prior to the settlement of the south by Europeans, forests comprised predominantly of longleaf pine trees **ranged** over about 90 million **acres** of the southeastern United States. This **ecosystem** could be found in a variety of **habitats** from rolling sandhills in North Carolina and South Carolina to 3000 ft tall mountains in North Georgia and Alabama to the flatwoods in Mississippi, Texas and Florida. Where there was fire, there was longleaf pine. In general longleaf pines were found in the drier sites because they burned more frequently. In wetter sites longleaf pine forests would subtly grade in other habitat types like cypress ponds or hardwood river corridors (because fire would not travel into these areas very often).

These frequent fires created an ecosystem that is as rich in biological diversity (**biodiversity**) as some tropical rainforests. However, unlike the rainforest, most of the diversity was not found by looking up, but instead by looking at down at the ground. In an area no bigger than the size of a hula-hoop, up to 40 different types of plants could be found in the **groundcover**.

Because the longleaf pine ecosystem covered such a large area and frequent fires were requisite to its existence, one can easily imagine how fire behaved across the landscape up until the last 150 years or so (prior to significant Euro-American settlement). Without the presence of roads, urban areas, open fields, etc. fire would have moved freely across the terrain, fingering its way across enormous areas. When the fire ran into rivers, streams, or the occasional Native American village or when weather conditions changed such that combustion could no longer be sustained, the fire would stop and either extinguish or smolder and (later) ignite again.

Today, longleaf pine forests can still be found in every state of its original range except Virginia (where there are only a few dozen trees remaining). However, only around 3 million acres of this (once immense) longleaf pine forests remains today. A **species decline** has closely followed the loss of this forest type. Today many species of plants, animals and even insects that require longleaf pine forests are either **threatened** or **endangered** with global **extinction**. If more is not done to help protect and restore the longleaf pine forests, we can expect its demise in the next few generations.

### **Key Words and Concepts:**

[acre](#), [biodiversity](#), [ecosystem](#), [endangered](#), [extinction](#), [groundcover](#), [habitat](#), [range](#), [species decline](#), [threatened](#).

**Acre:** A unit of measure used to describe large areas, equal to 43,560 square feet. A square acre would be approximately 209 feet by 209 feet and a circular acre would have a radius of 117.75 feet. Visually, one acre is about the size of a football field.

**Biodiversity:** The number of different plant, animal and insect species found within a particular area. Longleaf forests have high biodiversity. This diversity, however, is often found not by looking up to the tree canopy but by looking down at your feet. Most of the diversity of this forest is found mostly on the forest floor. Fire helps to maintain this high biodiversity.

**Ecosystem:** Plant and animal communities, their environment, and the resulting interactions. An ecosystem can be as simple as a mud puddle or dead log or as complex as a forest containing thousands of acres.

**Endangered:** A plant, animal or insect that is in imminent danger of extinction. Can be federally endangered (in peril of global extinction) like the red-cockaded woodpecker or American chaffseed plant or state endangered (in peril of extinction from a region) such as the gopher tortoise in Mississippi.

**Extinction:** Ceasing to exist. Extinct species will never reappear on the earth. It can also be referred as globally extinct. Longleaf forest examples include: passenger pigeons, Carolina parakeet, and possibly the Bachman's warbler and ivory-billed woodpecker.

**Groundcover:** A generic term used to describe the mat of plants found on the forest floor. In longleaf pine forests, this groundcover is usually dominated by a species of grass like wiregrass or split-beard bluestem.

**Habitat:** An animal's environment (where it lives). This area must supply all of the animal's life needs.

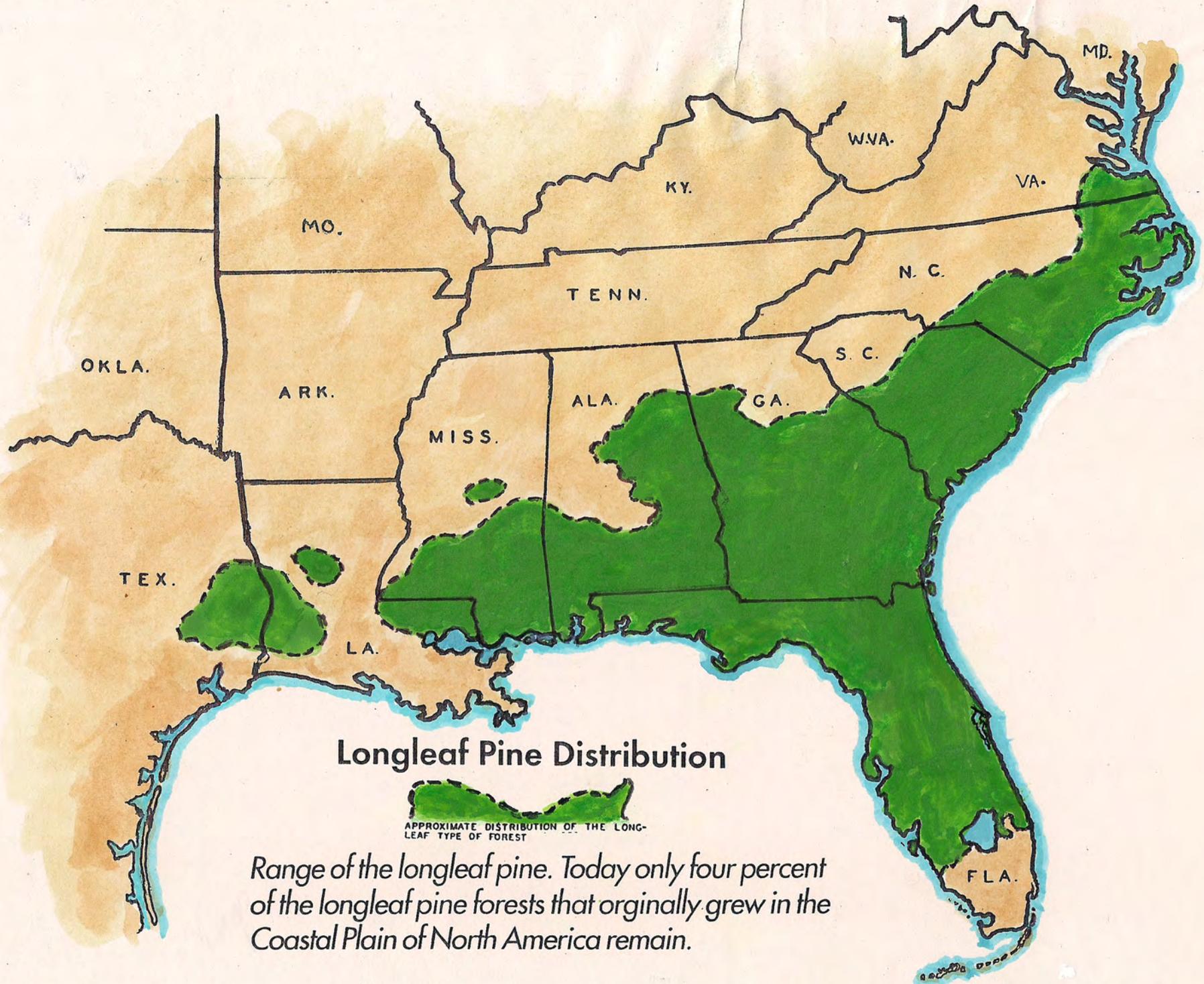
**Range:** An area where a species can naturally occur. Range can be limited by geography, climate, soils, elevation, aspect, etc. Also can be used to describe areas where livestock are grazed. May also be used to describe a collection of mountain peaks such as those found in north Georgia and Alabama where longleaf pine once thrived.

**Species Decline:** A reduction in the actual numbers of a species. Usually this decline is a result of a reduction in the area occupied by species.

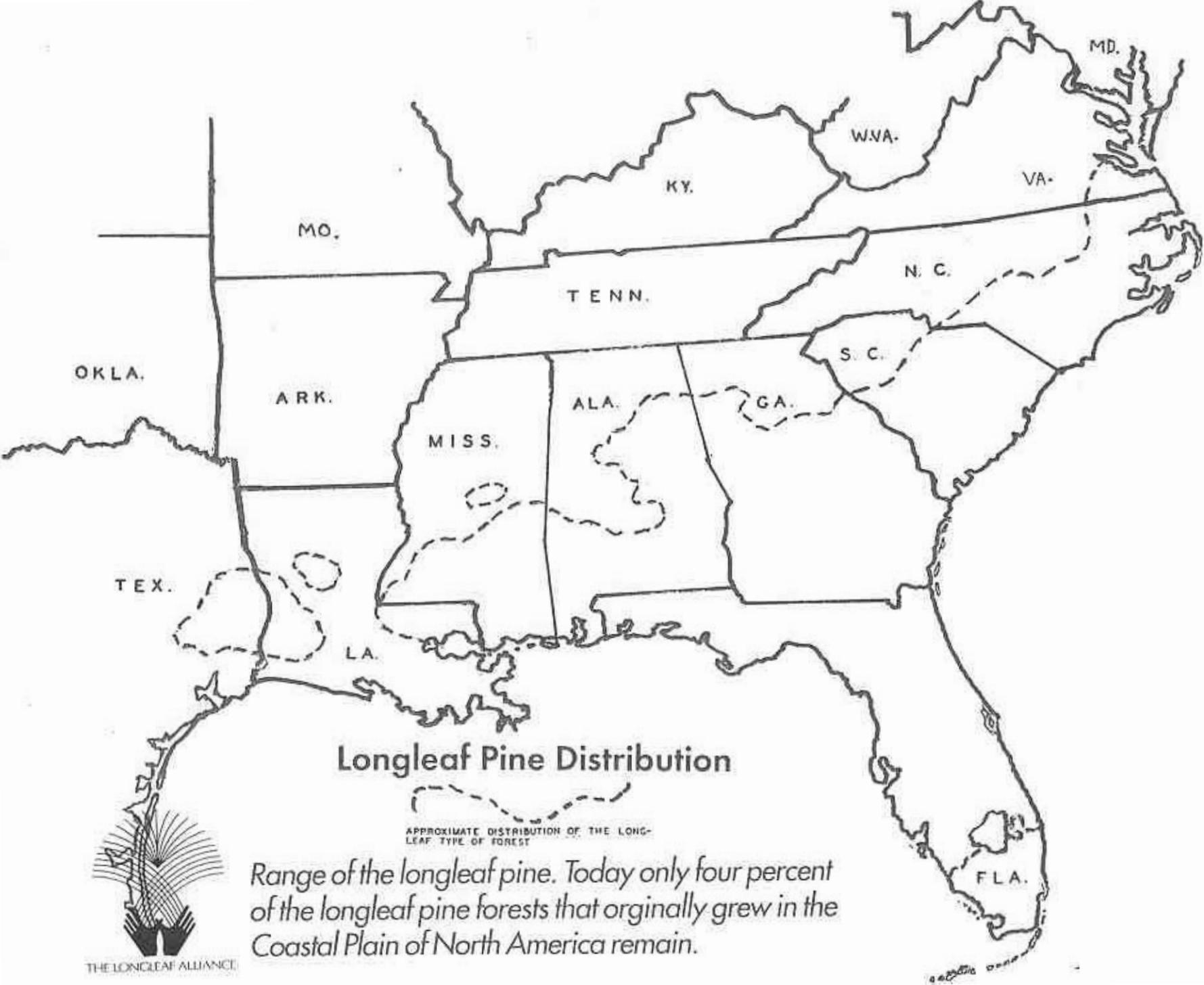
**Threatened:** A species that is one step from becoming an endangered species. Although threatened and endangered species are given protection in the United States through the Endangered Species Act, threatened species are considered to be at less risk of extinction than endangered species.

### **Suggested Activities:**

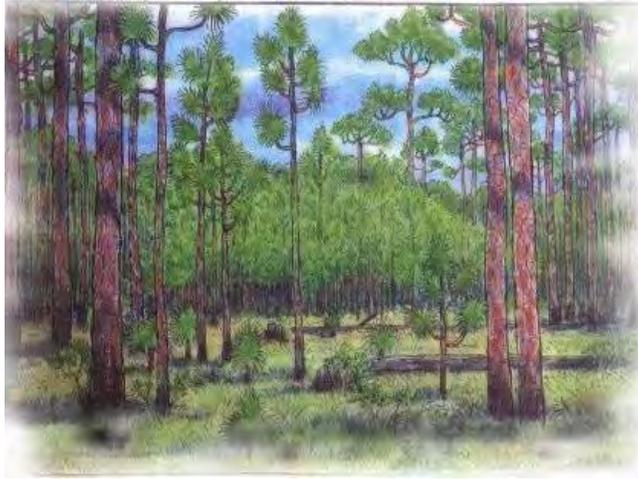
- Range of the longleaf pine – Social Studies correlation
- Mapping questions: Which state has the heaviest concentration of longleaf pine?
- Extend development of map and globe skills
- Interpret and display information and data using various graphic organizers
- Apply reference skills in independent investigations of selected topics
- Comprehend the geographic link between specific state and regions of the U.S.
- Describe the natural environment of specific state including significant Geographical features
- Relate geographical features of specific state to the movement of settlers during 19<sup>th</sup> century



*Range of the longleaf pine. Today only four percent of the longleaf pine forests that originally grew in the Coastal Plain of North America remain.*



## A Group of Young Longleaf Pine Trees Growing in a Forest Opening



(Bolded words in text indicate key words and concepts)

### Student Information:

If you were to look at the longleaf forest from a bird's perspective, it would be similar to a big piece of Swiss cheese. Over time, lightning, tornados, and hurricanes create “holes” in the forest by killing trees. It is only through the death of these older trees, that the younger forest can grow.

### Teacher Information:

A quick glance across the longleaf pine forest may lead one to believe that all the trees are the same size. However, upon closer inspection tightly clustered patches of longleaf pine seedlings will be observed. Young longleaf pine seedlings actually take advantage of the forest openings created by the death of adult (**canopy**) trees to **regenerate**. These **disturbances** occur somewhat regularly. Lightning kills one or two adult trees frequently in the longleaf ecosystem while tornados and hurricanes may kill hundreds of trees infrequently. “Forest gaps” is the term that scientists give to these **forest openings**. This picture shows young longleaf pine trees accumulating in these **gaps**.

The reason for this phenomenon is twofold. Adult longleaf pine trees drop seeds every few years. However, these living trees are also dropping pine needles every day. Pine needles burn very well. Small longleaf pine seedlings growing amongst all these pine needles have a difficult time becoming established because frequent ground fires sweeping through the forest burn them up. Because there would be less accumulation of pine needles in forest gaps, fires are unable to travel far into the opening—thus giving small seedlings a chance to grow. You will also note how the growth of these seedlings in these gaps appears to follow a “bell-shaped curve”. The death of mature trees means that there is decreased **competition** and increased resources available for longleaf pine seedlings. Compared to “closed canopy” redwood, Douglas fir, or tropical rain forests, when walking through a longleaf pine forest you will immediately notice

how open and sunny it appears. One would think that light would not be a limiting **resource** for seedlings. However, within these gaps light DOES increase as well as soil moisture and soil nitrogen (all elements needed for longleaf pine seedlings to grow). The farther one travels into the gap, the more of these resources are available. Seedlings in a gap center are getting more sun light, soil moisture and nitrogen than ones growing at the edge—and thus are larger.

Some of the longleaf pine seedlings clumped together in this picture are observed in various stages of growth. Some longleaf pine seedlings are in the **grass stage**. The grass stage is a period when seedlings are not growing much aboveground and instead are putting on a tremendous root system below ground. In this stage, longleaf pine seedlings resemble a clump of grass—hence the name. Longleaf seedlings are very resistant to fire at this stage. Trees may stay in the grass stage for several years until enough resources become available so they can grow in height. Other longleaf pine seedlings pictured are in the **rocket stage**. This is a stage when rapid height growth occurs in longleaf pine. For the rocket stage to start, excess resources must become available around the seedling. By growing fast, the tree is able to capture more resources than its neighbor, thus giving it an advantage. Also, rapid growth allows the tree to get its top above the frequent fires that move through the woods. Longleaf pine remains somewhat susceptible to fire when they leave the grass stage until they reach about 4 feet in height. Those trees that are stuck somewhere in between the two growth stages are usually thinned out by fire or stressed over limited resources.

### **Key Words and Concepts:**

[canopy](#), [competition](#), [disturbance](#), [forest opening](#), [gap](#), [grass stage](#), [regeneration](#), [resource](#), [rocket stage](#).

**Canopy:** A general term used to describe the area at the tops of trees. The term can mean all the treetops in a forest area, or parts of an individual, mature tree that are green. As longleaf pine reaches maturity, this canopy stops growing in height and flattens out – it is not beneficial to be the tallest tree in an environment dominated by lightning. Such a canopy in an old longleaf pine forest is called "flat-topped".

**Competition:** Two or more individuals attempting to secure finite resources for themselves. Competition can occur with abiotic factors like light, nutrients, living space, water, or biotic factors like mates. For example, a longleaf pine seedling may stay in the grass stage for several years until competition is reduced and resources become available.

**Disturbance:** Something out of the norm which can cause disruption and can be natural or man-made. These can be large or small in size (scale). In longleaf pine forests, hurricanes, lightning, fire, tornado, and insects are examples of natural disturbances. A man-made example would be logging.

**Forest Opening:** An opening without trees. A meadow or gap in the tree canopy where extra resources are available (like light, soil moisture, nitrogen, etc.) and fires may not be as intense. Usually these openings are required by certain plant species to regenerate such as the case with longleaf pine seedlings.

**Gap:** A small opening in the forest canopy caused by the death of one or several trees. The results are an increase in resources such as light, nitrogen, soil moisture reaching the forest floor. A gap is required for young longleaf pine to regenerate.

**Grass Stage:** The early period in a longleaf pine seedling's life, where it has no aboveground stem. In fact, the tree more resembles a clump of grass rather than a tree. Despite little sign of above-ground growth, the tree is growing an immense root system below-ground that we can't see.

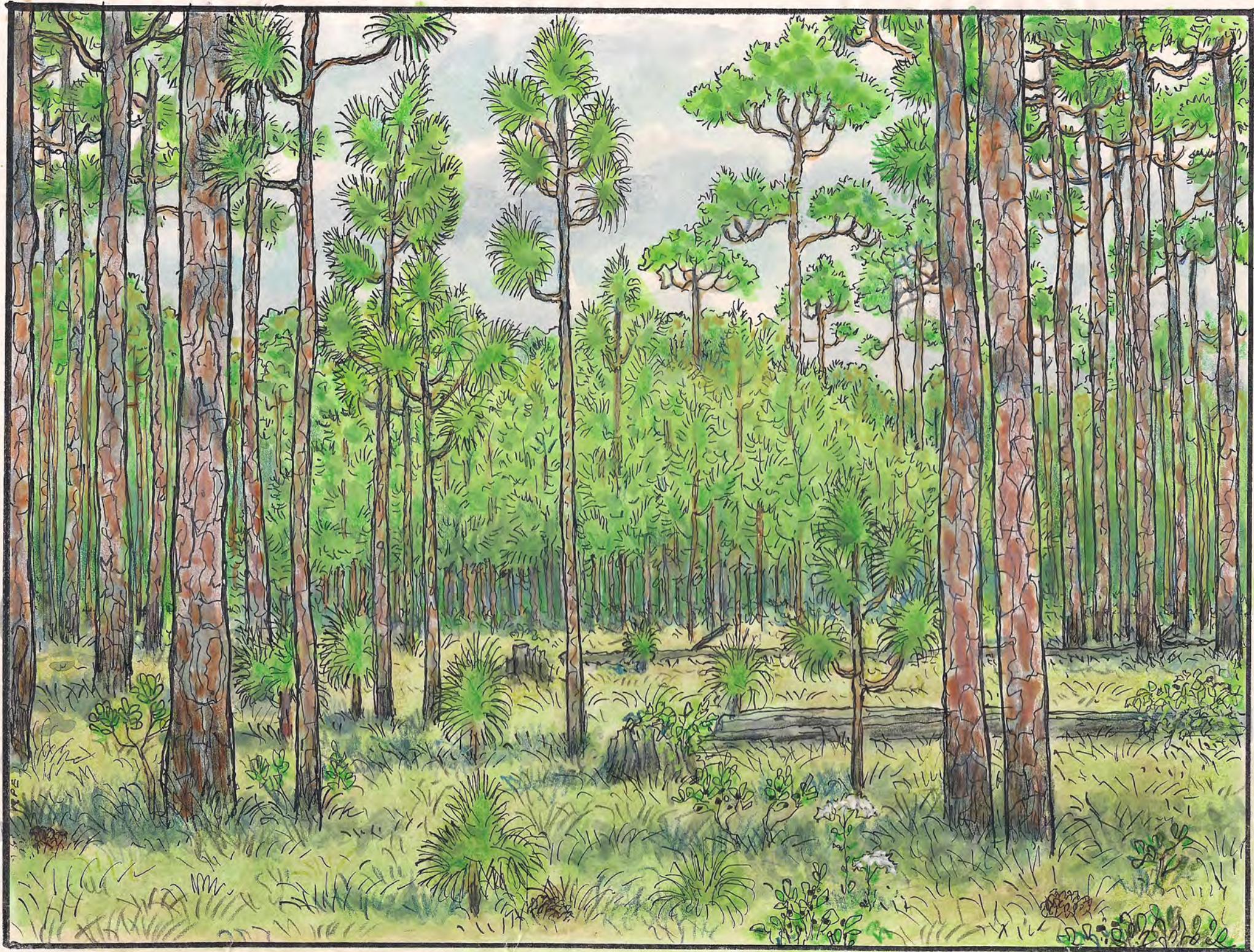
**Regeneration:** Getting trees back on open land by planting or natural seeding.

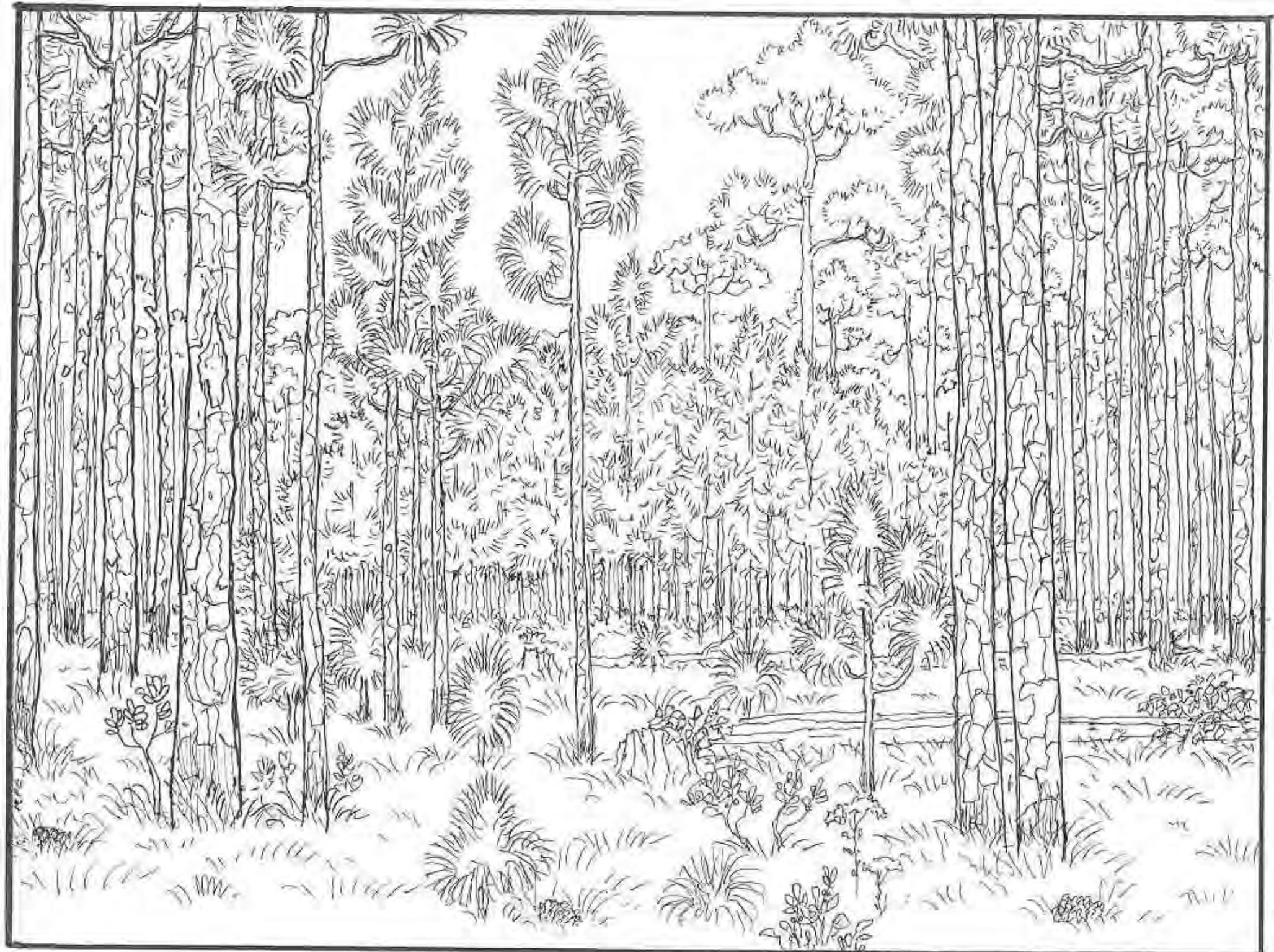
**Resource:** A supply that can be drawn upon when needed. Supplies can be abiotic factors like light, nitrogen, and water or biotic factors such as meat.

**Rocket Stage:** A period in the life of a longleaf pine seedling when it begins growing very rapidly to get ahead of the next fire that may come through an area.

### **Suggested Activities:**

- Life stages of tree – longleaf pine
- Graphing activity: Compare average yearly growth of a person to average yearly growth of longleaf pine. When you are 30, how tall will you and the pine be?
- Demonstrate dormancy by planting seeds and placing them in the dark. Bring the seeds out into the light to watch for growth.
- Identify living (biotic) and non-living (abiotic) factors that affect animal life
- Recognize evidence of the sun as the Earth's major source of energy
- Describe changes to the earth's surface caused by natural and man-made forces





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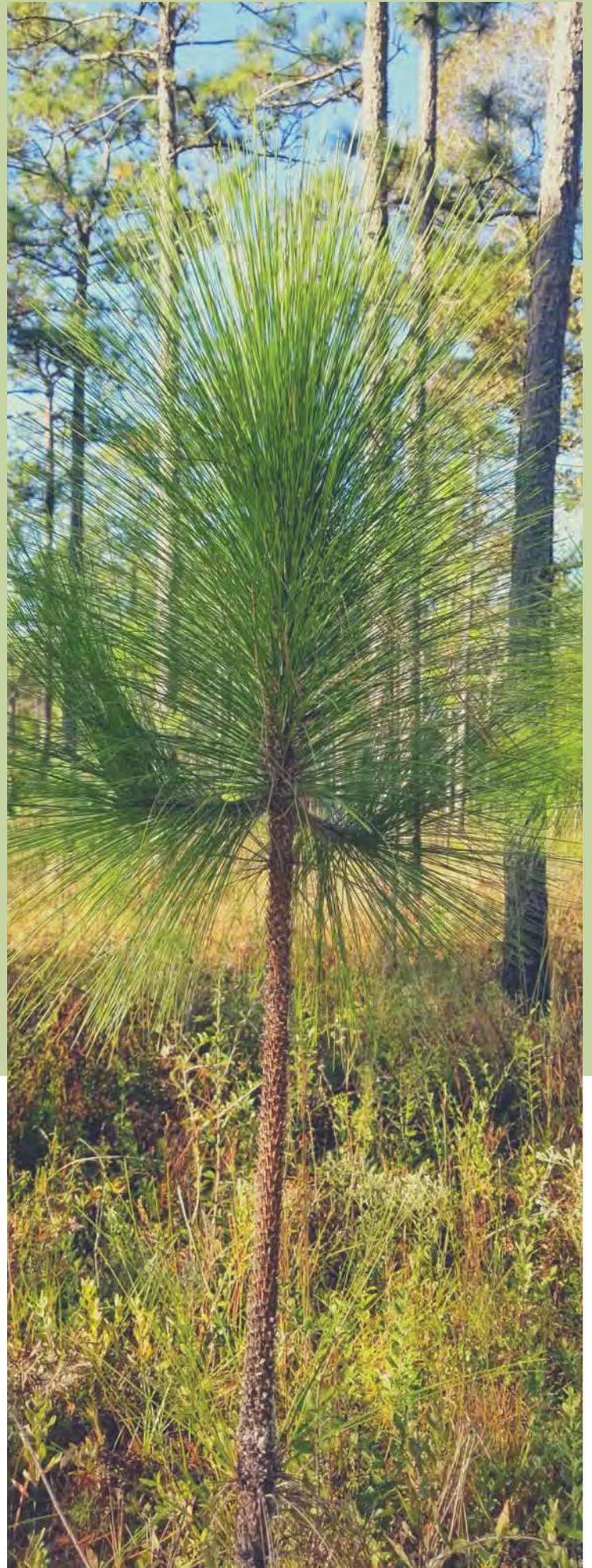
# WHO LIVES IN THE FOREST?

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*Diversity &  
Interrelationships*



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## Fox Squirrel Finds a Vantage Point on the Stump of an Old Longleaf Pine Tree



(Bolded words in text indicate key words and concepts)

### Student Information:

Fox squirrels are found across much of the Southeastern and Midwestern United States. Those that live in longleaf forests come in different colors. Some are black with silver or white markings around the feet, nose, and tips of the ears and tail. Others are silver-grey, with black markings. They eat the seeds of the longleaf pine, acorns, soft fruits like blueberries and blackberries, and many of the mushrooms that grow in longleaf forests.

### Teacher Information:

**Fox squirrels** are the largest tree squirrels found in North America. This large body size is an **adaptation** to help survive in the open landscape of the longleaf pine forest. In most dense forest habitats, squirrels are able to jump from tree to tree, but among the widely spaced trees in an open longleaf pine forest the fox squirrel has to travel overland, requiring more energy and making a larger body size more advantageous.

Fox squirrels of the Southeastern longleaf pine forests exhibit different **color phases** and are usually either black with grey or silver “points” around their feet, noses, and tail tips or a grizzled silver-grey with black markings. In the mountains of North Georgia and Alabama where longleaf pine is found, fox squirrels are reddish in color, often with black or white heads. They are typically about one and one half times as large as grey squirrels.

Fox squirrels spend much more of their time on the ground than other tree squirrels, perhaps making them more vulnerable to **depredation** by foxes, bobcats, and snakes. Other **predators** include hawks and owls. They are largely **diurnal**, that is, they are active from about an hour before sunrise to about an hour after sunset. They construct leaf nests high in the crowns of trees in which they shelter, rest, hide, and raise young. They use cavities in trees much less than grey squirrels.

Fox squirrels eat a variety of foods, including acorns, berries, tender buds, insects, fungi and the seeds of the **longleaf pine** itself. It has been suggested that they may disseminate the spores of some of the fungi (called truffles) of the longleaf forest which help longleaf grow. The large seeds of the longleaf are a favorite food. These seeds are nutritious, high in fat content and energy. The feeding squirrels often leave piles of cone scales and the skinny core of the cone as evidence of their feeding activity. The fox squirrel's size helps them manipulate the large and heavy cones of the longleaf pine.

**Fatwood** stumps (similar to the one the fox squirrel in this picture is standing on) are the remnants of fallen longleaf pine trees and can be fairly common throughout the longleaf pine forest. However, due to the frequency of fire, these stumps generally do not stay around long. When fire sweeps through an area, stumps usually catch on fire. If it is dry enough, stumps will burn for days and eventually be entirely consumed. Left behind after the fire is a hole where the stump once stood with a myriad of interconnected tunnels which had housed the massive root system of the longleaf pine tree. These tunnels provide a home or a **refuge** for a wealth of different critters (from bugs to rodents to snakes).

### **Key Words and Concepts:**

[adaptation](#), [color phase](#), [depredation](#), [diurnal](#), [fatwood](#), [fox squirrel](#), [longleaf pine](#), [predation](#), [refuge](#).

**Adaptation:** An alteration or adjustment in physical structure or habits. Adaptations are often hereditary by which a species or individual improves its ability to survive and reproduce in its environment. Adaptations can be changes in fur color, amount of fur, better night vision, etc.

**Color Phase:** Animals of the same species but exhibit different color fur, feathers, etc.

**Depredation:** The act of predation; eating or destroying.

**Diurnal:** Active during the day. Diurnal animals are active during the day and sleep at night. Diurnal flowers are open during the day and closed at night.

**Fatwood:** The resin laden wood of longleaf pine. Known also as lightwood or lighterwood due to the ease it takes to catch on fire. It is used a lot as kindling.

**Fox Squirrel:** Largest tree squirrel in North America. Southeastern subspecies adapted to mature longleaf and scrub oak forests.

**Lighterwood:** See also fatwood. Also called fat lighter or fat lighterwood.

**Longleaf Pine:** A southern pine species which once dominated the uplands of the southeastern United States. It is the state tree of Alabama. Also called: The Fire Forest, Pine Barrens, Pineywoods, High Pines, Flatwoods, Mountain Pine, Yellow Pine Forests, etc.

**Predation:** The capturing of prey as a means of maintaining life. One (of many) examples of predation in the longleaf pine forest is the grey fox. Using its strong sense of smell and keen

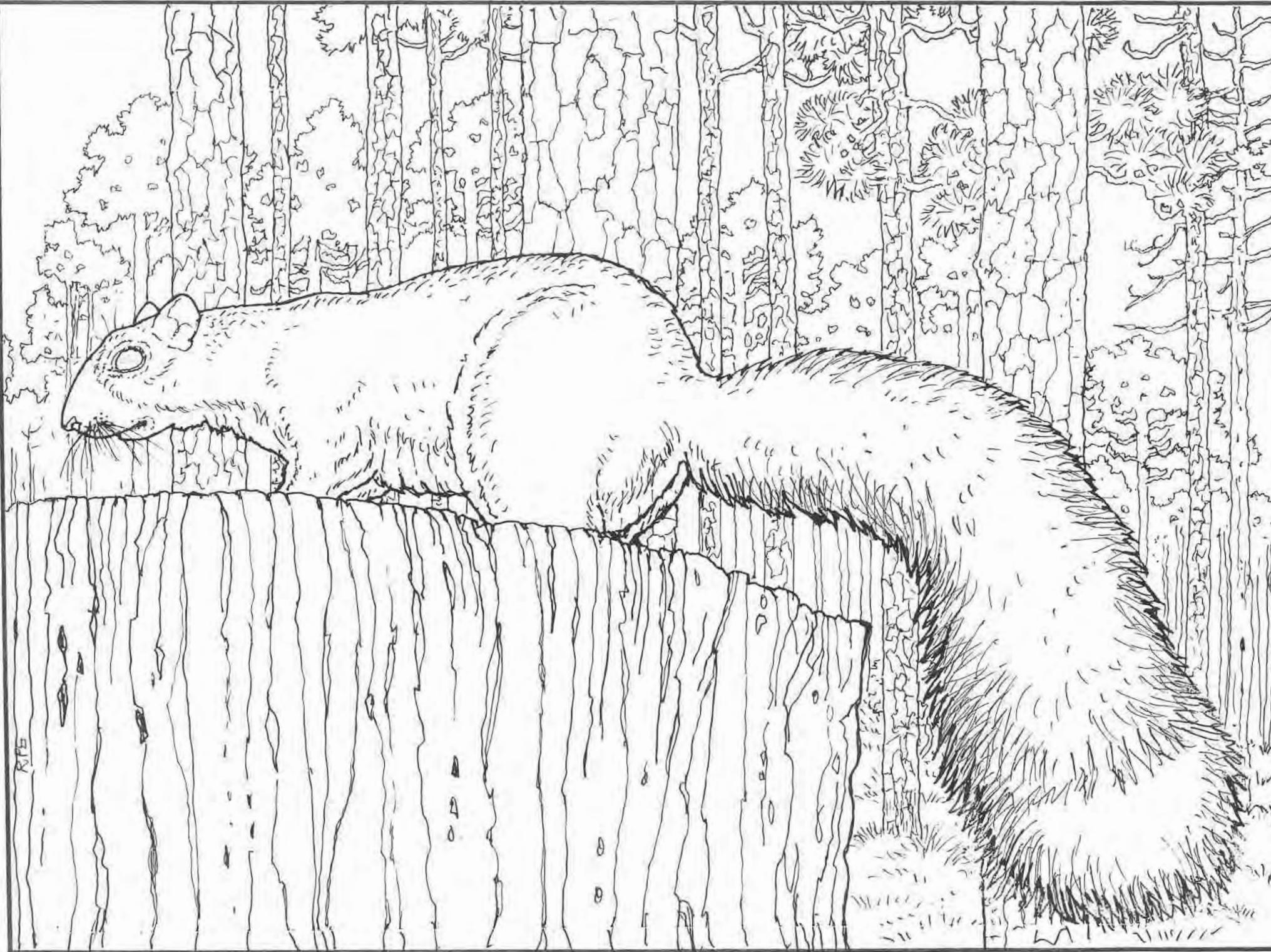
eyesight, the fox hunts around the forest looking for food. One food type the fox is particularly fond of is ground-nesting birds like bobwhite quail.

**Refuge:** Safe places. Often places used to escape predators.

### **Suggested Activities:**

- Descriptive Writing Prompts: Describe animal/plant life in the pictures
- Expository Writing Prompts: Explain why you like a particular plant/animal.
- Narrative Writing Prompts: Write a story about an adventure into the forest. Write about a day in the life of a particular plant/animal.
- Poetry Writing Prompts: Write a poem about a plant/animal in the longleaf pine ecosystem.
- Make a chart of each animal's needs: water/food/shelter/body temperature.
- Relate structural characteristics and behavior of various animals to their roles within an ecosystem
- Classify animals into groups according to specific characteristics
- Identify behaviors and body structures that help animals survive in a particular habitat





R15

## A Covey of Bobwhite Quail Scratching Around for Food



(Bolded words in text indicate key words and concepts)

### Student Information:

The name of the bobwhite quail comes from the lovesick call of the male bobwhite. Listen closely next time you're in the longleaf pine forest for the whistle which says "bob-white".

### Teacher Information:

The **bobwhite quail** and the longleaf pine ecosystem share a relationship of **commensalism** – a relationship between two entities where one organism benefits and yet the other is neither benefited nor harmed by the other. Bobwhite quail depend on fire in the longleaf pine forest to maintain abundant ground cover and clear the ground so they can scratch around for food.

This picture depicts male (white head) and female (brown head) bobwhite using their feet to scratch around the soil looking for seed (called "**scratch feeding**"). Bobwhite quail generally feed heavily just before dark. The majority of the adult bird's diet consists of vegetable matter. Of this vegetable matter, the seeds of fire-dependent native beans (legumes) are highly desired (especially during the winter season when grass seeds have spoiled). The reverse is true of birds two weeks old and younger. To help young birds grow quickly, their diet is comprised mainly of protein-rich insects. Fire helps maintain **bugging** areas where young chicks feed on insects.

Fire creates early **successional** habitat that is vital for quail. Without frequent fires in the longleaf pine forest, dead organic debris (called **duff**) would quickly accumulate making the search for food difficult. Frequent fires also stimulate the production of lush bunchgrasses that assist in evasion of predators.

By autumn of each year, bobwhites form loose groupings called **coveys**. Coveys are generally made up to 9 to 14 birds. This grouping allows quail to transfer information about food and

cover resources to covey members, i.e., safety in numbers. This lessens the likelihood of **predation** on individual birds by snakes, hawks, bobcats, etc.

Quail remain in coveys, feeding and roosting as a unit, throughout winter. Early daylight hours are typically spent feeding. Mid-day is reserved for resting, preening, and dust bathing. In late afternoon, coveys feed again before forming the covey circle on the ground to roost at dusk.

By about mid-April coveys begin to break up. The early stages of covey break-up coincide with the time males (or cocks) start whistling their characteristic bobwhite notes.

At the turn of the twentieth century and during the Great Depression era, large blocks of land in South Georgia, central Alabama and areas of the Carolinas, were purchased by wealthy industrialists who wanted to establish areas where they could hunt quail. Today these quail hunting **plantations** represent some of the best remaining representations of longleaf pine forests.

### **Key Words and Concepts:**

[bobwhite quail](#), [bugging](#), [commensalism](#), [covey](#), [duff](#), [plantation](#), [predation](#), [scratch feeding](#), [succession](#).

**Bobwhite Quail:** Ground nesting and roosting species of game bird. These birds thrive in longleaf pine forests maintained by fire.

**Bugging:** The act of searching for insects to eat. Young birds are especially notorious for eating insects. Insects contain a large amount of protein. Protein is important for young birds to help grow feathers. A bugging area is relatively unobstructed by leaf litter and other rubbish and allows young (small) birds areas to find, capture, and consume insects. Fire plays an important role in keeping these bugging areas free of debris.

**Climax community:** The end point in plant succession. Longleaf pine forests are not considered climax because fire prevents the later stages of plant succession from occurring.

**Commensalism:** A mutual relationship where one individual benefits while the other is neither harmed nor benefited. For example, the dung beetle relies on the scat of the gopher tortoise which it crafts into a ball and rolls to a location where it can be eaten later. The gopher tortoise is neither harmed nor benefited by the beetle.

**Covey:** A small social group of birds of the same species (like quail) that stay together during the fall and winter.

**Duff:** An accumulation of non-living organic debris (mostly plant stuff) on the forest floor. Duff is often material that has already begun to decompose.

**Plantation:** A large landholding usually owned by a single family for a specific purpose. One group of plantations is the cotton and rice plantations stereotypical of the antebellum south (e.g., *Gone with the Wind*). The other group of plantations is the quail-hunting plantations where recreation plays a key role in management of the property. In forestry, the term plantation refers to planted stands of trees in tidy rows. These tree plantations are usually one species.

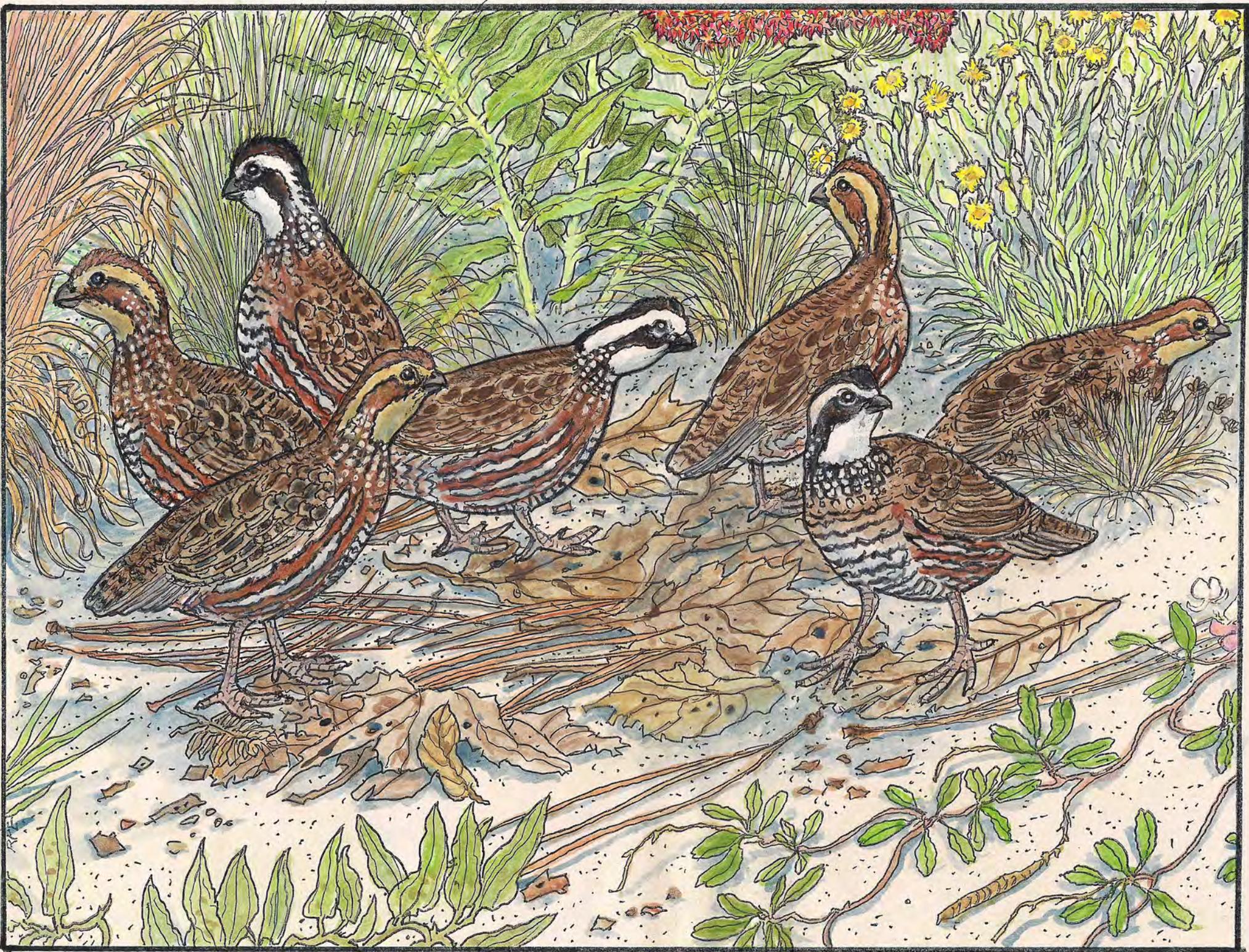
**Predation:** The capturing of prey as a means of maintaining life. One (of many) examples of predation in the longleaf pine forest is the grey fox. Using its strong sense of smell and keen eyesight, the fox hunts around the forest looking for food. One food type the fox is particularly fond of is ground-nesting birds like bobwhite quail.

**Scratch feeders:** Birds that feed primarily on the ground. These birds use their feet to scratch at loose litter to uncover food like seeds and insects. Common examples in the longleaf pine forest include; bobwhite quail, sand doves and eastern turkey.

**Succession:** The term used to describe transitions in community structure in ecological time. Usually these transitions occur after some disturbance (wind, ice, fire, etc). In the absence of these disturbances, the environment of the southeastern U.S. would likely be a hardwood forest with little plant growth on the forest floor. This final stage of succession is called a **climax community**. Frequent fires prevent this stage of succession from happening.

### Suggested Activities:

- Descriptive Writing Prompts: Describe animal/plant life in the pictures
- Expository Writing Prompts: Explain why you like a particular plant/animal.
- Narrative Writing Prompts: Write a story about an adventure into the forest. Write about a day in the life of a particular plant/animal.
- Poetry Writing Prompts: Write a poem about a plant/animal in the longleaf pine ecosystem.
- Identify and replicate Bobwhite Quail sounds.
- Adaptations: Bird feathers – Each child observes a tail or wing feather and a down feather. They separate the quills and make decisions about which would aid in flying and which is for protection.
- Make a chart of each animal's needs: water/food/shelter/body temperature.
- Relate structural characteristics and behavior of various animals to their roles within an ecosystem
- Classify animals into groups according to specific characteristics
- Identify behaviors and body structures that help animals survive in a particular habitat





## A Family of Red-Cockaded Woodpeckers Makes a Home in a Mature Longleaf Pine Tree



(Bolded words in text indicate key words and concepts)

### Student Information:

While most woodpeckers make their homes in dead trees where the wood is rotten and soft, the red-cockaded woodpecker is the only bird in North America that makes its cavities in living pine trees. In the southeastern United States, the longleaf pine was a favorite tree for the red-cockaded woodpecker to make its home.

### Teacher Information:

The relationship of the **red-cockaded woodpecker** to the southern pine forest is one of **specialization**. This woodpecker is very fickle, occupying a very specialized **habitat niche**. All of the other woodpeckers in the southeast **construct** their cavities in snags, while only the red-cockaded woodpecker makes its home in a living pine tree.

Historically, the red-cockaded woodpecker's range extended west to Texas, north to New Jersey and inland to Missouri, Kentucky, and Tennessee. In the southeastern United States, the longleaf pine is a preferred tree to make cavities. However, unlike the outer few inches of soft, **sapwood**, the majority of the inner portion of older longleaf pine trees is made up of very dense wood called **heartwood**. Red-cockaded woodpeckers purposely seek out longleaf pines that suffer from a **fungus** called **red-heart disease** – a fungus which causes the inner heartwood of the pine to rot and become soft enough to construct a cavity. In longleaf pine, trees do not begin to suffer from red-heart fungus until their age averages 80 - 120 years old. Once a suitable, mature tree is found, it generally takes a red-cockaded woodpecker 1-3 years to construct a cavity. Generally these birds will excavate groups of cavity trees in an area (called a cluster).

During the American Revolution, patriots from the south often wore jaunty red feathers or cockades in their caps to show their defiance. The familiar lines from "Yankee Doodle Dandy" -

"stuck a feather in his cap" recall this practice. The male red-cockaded woodpeckers have a small patch of red feathers on the sides of their heads that are visible only when they are angry or courting.

In addition to one breeding pair of birds per cluster, male **helper birds** from the previous nesting season help incubate the eggs and raise the young of the next generation. Frequent fires maintain an open and park-like forest preferred by the woodpeckers. These open conditions are very favorable for the production of beetles, ants, roaches, caterpillars, wood-boring insects and spiders (all desired **foraging** material of the woodpecker).

Rat snakes are very agile tree climbers and the primary predators of red-cockaded woodpeckers. As a **defensive behavior**, the woodpecker chips small holes (called **resin wells**) into the bark of the cavity tree. These resin wells cause gum to ooze down the face of the tree. When the scales of the snake come into contact with this **gum**, the snake generally retreats back down the tree.

From the late 1800's to the mid 1900's the red-cockaded woodpecker rapidly declined as its habitat was destroyed because of logging, agriculture and other land use changes. Because much of the longleaf pine ecosystem has been destroyed, the red-cockaded woodpecker has few areas to make its home. In fact, only about 1% of suitable habitat for the woodpecker is found throughout its former range. In 1970, the species was listed as "**endangered**" which means it is in great danger of becoming extinct throughout all or a portion of its range.

The red-cockaded woodpecker once shared its pine forest habitat with the (now possibly **extinct**) ivory-billed woodpecker. Other birds like the passenger pigeon and Carolina parakeet are also extinct. However, there is still hope for the red-cockaded woodpecker. Under the guidance of the **U.S. Fish and Wildlife Service**, some populations are stable or increasing.

### **Key Words and Concepts:**

[construct](#), [defensive mechanism](#), [endangered](#), [extinction](#), [foraging](#), [gum](#), [habitat niche](#), [heartwood](#), [helper birds](#), [red-cockaded woodpecker](#), [red-heart disease](#), [red-heart fungus](#), [resin wells](#), [sapwood](#), [specialization](#), [U.S. Fish and Wildlife Service](#).

**Construct:** To build. It may take the red-cockaded woodpecker several years to build a cavity in a living longleaf pine tree. It may take a gopher tortoise only several days to construct a burrow. Many buildings and structures were constructed from the wood of longleaf pine trees.

**Defense Mechanisms:** Defenses developed by various plants and animals to protect themselves against predators and enemies.

**Endangered:** A plant, animal or insect that is in imminent danger of extinction. Can be federally endangered (in peril of global extinction) like the red-cockaded woodpecker or American chaffseed plant or state endangered (in peril of extinction from a region) such as the gopher tortoise in Mississippi.

**Extinction:** Ceasing to exist. Extinct species will never reappear on the earth. Also called globally extinct. Longleaf forest examples: passenger pigeons, Carolina parakeet, Bachman's warbler, and possibly the ivory-billed woodpecker.

**Foraging:** Searching for food. Term can be used for insects, animals, and people.

**Gum:** see [resin](#).

**Resin:** A complex and sticky blend of organic resinous compounds essentially dissolved in liquid commonly called turpentine. Resin is transported in channels called resin ducts. These ducts are held under significant pressure such that when the bark is broken and underlying wood is cut into, the resin flows for several days, or longer, until the resin crystallizes and the wound heals. Also called gum or oleoresin. Not to be confused with sap.

**Habitat Niche:** The portion of the environment that an animal occupies; e.g., parula warblers feed on insects and nest in the tops of mature hardwood trees. Towhees may live and nest in the same habitat, but nest in the brushy layer near the ground and scratch for food on the forest floor.

**Heartwood:** The center, woody portions of a tree where dead material accumulates. It is often dark in appearance, full of resin and rot-resistant.

**Helper Birds:** In red-cockaded woodpeckers, males from previous broods, essentially uncles, may stay behind to help the breeding pair feed new nestlings.

**Red-cockaded woodpecker:** A species of woodpeckers which nests only in living pines and prefers mature, open and park-like longleaf pine forests. This bird is endangered with global extinction. Also called a peckerwood by Georgians.

**Red-heart disease:** A disease that rots the inner portions of a tree. This disease does not kill trees, since the pathogen only attacks the internal, inactive (non-living) heartwood. Trees with advanced infections, however, are subject to wind breakage due to the structurally debilitating effects of the associated wood decay. Rarely, if ever, is red heart a problem on younger trees.

**Red-heart fungus:** The fungus that causes red-heart disease in pine trees. Transmitted through fungal conks.

**Resin wells:** Small holes chipped into the side of a living pine tree by the red-cockaded woodpecker. Resin flows from these holes and accumulates on the face of the pine tree. This resin is an irritant to reptiles and prevents many tree-climbing snakes from preying on the woodpecker nest. Resin wells give the pine tree a very visible white appearance.

**Sapwood:** The outer, living portion of a tree where most nutrient and water uptake happens.

**Specialization:** Either through genetic disposition or behavior an organization is forced into a narrow range of conditions.

**U.S. Fish and Wildlife Service:** A federal agency whose mission is conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.

### **Suggested Activities:**

- Descriptive Writing Prompts: Describe animal/plant life in the pictures.
- Expository Writing Prompts: Explain why you like a particular plant/animal.
- Narrative Writing Prompts: Write a story about an adventure into the forest. Write about a day in the life of a particular plant/animal.
- Poetry Writing Prompts: Write a poem about a plant/animal in the longleaf pine ecosystem.
- Architectural design of the red-cockaded woodpecker nest
- Adaptations: Bird feathers – Each child observes a tail or wing feather and a down feather. They separate the quills and make decisions about which would aid in flying and which is for protection.
- List and describe endangered and extinct animals.
- Survival comparison of the Red-Cockaded Woodpecker’s ability to mark a tree for sap leakage and other animals’ methods of protection.
- Relate structural characteristics and behavior of various animals to their roles within an ecosystem.
- Classify animals into groups according to specific characteristics.
- Identify behaviors and body structures that help animals survive in a particular habitat.





## The Longleaf Forest is Alive with the Beautiful Colors of the Butterfly



(Bolded words in text indicate key words and concepts)

### Student Information:

During the summer and fall seasons, a longleaf forest floor is covered with wildflowers. Beautiful butterflies flutter from flower to flower, feeding and pollinating in the process.

### Teacher Information:

The fire-maintained, open-canopied longleaf forest is typically filled with the wildflowers of many plant species, especially during the summer and fall seasons. This meadow-like scene is enhanced by the presence of scores of "flying flowers". Colorful **butterflies** flit from flower to flower, feeding and **pollinating** in the process. Many of these species are attracted to the flowers of specific species of plants, probably attracted by both odor and color. Some of the flowers depicted in this drawing include the bright orange **milkweed**, also called butterfly weed; the intricate purple and white passion-flower, white flag paw-paw, and yellow partridge pea, a delicate **legume**.

The fruit of the butterfly weed is a typical milkweed pod, filled with light-as-a-feather seeds and downy "wings" to carry them on the wind. Passion-flower fruits are melon-like and locally known as may-pops, perhaps for the "pop" they make when stepped on. Like all legumes, the partridge pea yields a seed-filled pod.

The butterflies included in this drawing are (starting at the top left and proceeding in counter-clockwise fashion) 2 Monarchs, the 2 Eastern Tiger Swallowtails, 2 Cloudless Sulphur butterflies, a Zebra Longwing, a Gulf Fritillary, and at top center, a Zebra Swallowtail.

The larvae, called **caterpillars**, feed voraciously on the leaves and stems of a variety of **host plants**. Some caterpillars are **host specific**, feeding only on one particular type of plant. Both

the Zebra Longwing and Gulf Fritillary use the passionflower as a host plant. The Zebra Swallowtail feeds on the white flag paw paw. Both the Eastern Tiger Swallowtail and Monarch flit on the butterfly milkweed. The Cloudless Sulfur is particular to partridge pea.

At a certain point in the life cycle of butterfly larvae, hormones begin trigger the caterpillars to encase itself in a cocoon. This new life stage is called the pupal stage. Cocoons may be found on specific host plants. While in their cocoons, further changes in hormones cause a **metamorphosis** of the caterpillar, and it emerges as a beautiful butterfly.

Certain butterflies, like monarchs, contain poisonous, distasteful substances that are accumulated from the plants that they eat (milkweed toxins in this case). A young bird like a blue jay may try to feed readily on the monarch. Shortly afterwards, this blue jay will regurgitate the butterfly it just tried to consume. After just one or two such experiences, the bird will absolutely avoid this species. The blue jay now associates the eating of the monarch butterfly with bad tastes and has modified its behavior accordingly. This behavioral modification is called **operant conditioning**. The bright orange color probably helps make quick recognition easier by the blue jay. Some butterfly species that are edible, such as the viceroy butterfly **mimic** the monarch and, thus, may also be avoided by birds.

### **Key Words and Concepts:**

[butterfly](#), [caterpillar](#), [host plant](#), [host specific](#), [legume](#), [metamorphosis](#), [milkweed](#), [mimicry](#), [operant conditioning](#), [pollination](#)

**Butterfly:** Flying insects typically having a slender body with knobbed antennae and broad colorful wings. The adult phase of caterpillars.

**Caterpillar:** Larval stage of moths and butterflies.

**Host Plant:** Species of plants that some organism depends upon, i.e., either lives on or within the plant. Usually used to describe some sort of symbiotic relationship between two organisms; a host (like butterfly weed) and a symbiont (like monarch butterfly).

**Host Specific:** An organism (the symbiont) depends upon one particular species of plants, animal, or insect for its host.

**Legume:** Plants in the pea or bean family which can convert atmospheric nitrogen to elemental nitrogen. The fruit is usually in the form of a pod. Many legumes can be found in the longleaf pine forest. Fire is beneficial to many of these legumes.

**Metamorphosis:** A complete change of physical form. Also, the marked and rapid transformation of a larva into an adult that occurs in some animals and insects (such as the butterfly).

**Milkweed:** A group of plants with milky sap and light wind-blown seeds. Many milkweed species serve as host plants for butterflies and are abundant in longleaf pine forests.

**Mimicry:** Plants and animals which closely resemble another as a form of protection. Some animals mimic dangerous animals to frighten off potential predators. Others are carefully camouflaged to resemble their backgrounds and hide from enemies.

**Operant conditioning:** A type of associative learning that directly affects behavior. Also called trial and error learning.

**Pollination:** Transfer of pollen from one flower to another yielding fruits and seeds. Pollination is carried out by insects, birds, animals, rain, and the wind.

### **Suggested Activities:**

- Descriptive Writing Prompts: Describe animal/plant life in the pictures.
- Expository Writing Prompts: Explain why you like a particular plant/animal.
- Narrative Writing Prompts: Write a story about an adventure into the forest. Write about a day in the life of a particular plant/animal.
- Poetry Writing Prompts: Write a poem about a plant/animal in the longleaf pine ecosystem.
- Expository Writing Prompts: Give detailed explanations for the importance of a particular plant/animal in the longleaf pine ecosystem.
- Describe the lifecycle of the butterfly.
- Make a chart of each animal's needs: water/food/shelter/body temperature.
- Survival comparison and animals methods of protection.
- Describe the life cycles of various animals.
- Identify living (biotic) and non-living (abiotic) factors that affect animal life.





## Pitcher Plant Bogs are among the Most Unique Communities of the Longleaf Pine Ecosystem



(Bolded words in text indicate key words and concepts)

### Student Information:

Pitcher plants are carnivorous plants. **Carnivorous** means that the plants feed on insects they trap in their tube-shaped leaves. Once insects get in these tubes, they are trapped and can't get out. These plants are found in places where water is close to the surface and the soil has few nutrients. These plants also need lots of sunshine. Fire is helpful because it kills and removes other plants that might shade the pitcher plants out. Many other interesting plants and animals live in and around these areas.

### Teacher Information:

Embedded within the longleaf pine ecosystem are countless varieties of **microhabitats**. Among the more unique of these **habitats** are pitcher plant bogs. Pitcher plants and their companion plants are **specialized** to exist in a narrow set of conditions. Soil moisture is critical and many "bog" communities are actually the result of a hard, impermeable clay layer beneath porous sand. Rainwater percolates through the sand but runs into an impermeable clay "lens" where it is either trapped (like a pool) or seeps out the side of a hill. These nutrient-poor, moist sites are ideal for the carnivorous pitcher plants. Bogs common to many "flatwood" longleaf areas are called "**wet prairies**" while other bogs found on hillsides are called "**seepage slopes**". The transition from forest to an open bog is not immediate. Forests usually grade into a wetland bog habitat. This transition area is called an **ecotone** and hosts a rich variety of plant and animal species.

There are several types of **pitcher plants** in longleaf forests, as well as other carnivorous plants, e.g., hooded pitcher plant, trumpet pitcher plant, white-topped pitcher plant, and parrot pitcher plant. Pitcher plants have modified leaves shaped into hollow tubes (that look like a water pitcher), which attract insects. Downward pointing hairs and slippery walls make escape difficult and the hapless insects are dissolved and digested by enzymes in the bottom of the

pitcher. The tiny sundew and dewthread can trap small insects on flat sticky leaves before slowly digesting them. Other bog plants include colic-root; goldcrest; meadow-beauty (also called deerflower); white-topped sedge; orange milkwort (also called bog "Cheetos" because of their resemblance to that treat); bog-buttons (also called "hatpins"); several species of orchids; and many other wildflowers.

Both soil moisture conditions and full sun are critical to these plant and animal communities. Most of these bog plants have little **shade tolerance**. Pitcher plant bogs are **fire dependent** habitats. The frequent fires common to the longleaf ecosystem keep woody shrubs from encroaching on bogs. Without fire, moisture-loving shrubs invade drying up bogs and shading out the herbaceous plants. Today, many of these unique bog systems are exceptionally rare having been lost to either development, water drained out of them, or fire not being allowed to move through them.

The Spanish moss seen hanging from the trees is an example of **commensalism** - a one-way relationship. Spanish moss is considered an **epiphyte** meaning it requires the host (pine tree in this case) for mechanical support rather than a source of nutrients or water. The pine tree is neither benefited nor harmed by the presence of the Spanish moss. The moss plays host to numerous varieties of invertebrates both hanging from the tree and when it falls from a limb onto the ground.

### **Key Words and Concepts:**

[carnivorous plants](#), [commensalism](#), [ecotone](#), [epiphyte](#), [fire dependent](#), [habitat](#), [microhabitat](#), [pitcher plant](#), [seepage slope](#), [shade tolerance](#), [specialization](#), [wet prairie](#).

**Carnivorous Plants:** Plants that trap and digest insects for food. These plants live in soils that are low in nutrients. Nutrients are obtained from digesting insects. Fire is a vital part of their reproductive cycle of these plants. Carnivorous plants have various mechanisms to attract and trap insects. Flies, ants and other insects are attracted to the pitcher plant by the sweet smelling liquid in its trumpet shaped body. Sticky filaments on the dewthread and sundew will trap and later assist in the digestion of insects that happen to get stuck on them. The Venus flytrap simply closes around an insect like a leg-hold trap.

**Commensalism:** A mutualistic relationship where one individual benefits while the other is neither harmed nor benefited. For example, the dung beetle relies on the scat of the gopher tortoise which it crafts into a ball and rolls to a location where it can be eaten later. The gopher tortoise is neither harmed nor benefited by the beetle.

**Ecotone:** A transitional area between two ecotypes such as the area between a longleaf pine forest and a pitcher plant bog.

**Epiphyte:** A form of commensalism where the individual uses a host plant (or animal) for mechanical support rather than a source of nutrients and water. The host is neither harmed nor benefited. In longleaf pine forests, Spanish moss is considered an epiphyte.

**Fire Dependent:** Species or ecosystem that requires fire for survival or persistence.

**Habitat:** An animal's environment (where it lives). This area must supply all of the animal's life needs.

**Microhabitat:** Small areas that is different than the larger area in which they are contained. Examples include pitcher plant bogs, caves, cypress ponds, etc.

**Pitcher plant:** Carnivorous plants whose modified leaves trap insects to be digested.

**Seepage slope:** A wet, nutrient poor area on the side of a hill where pitcher plants may be found.

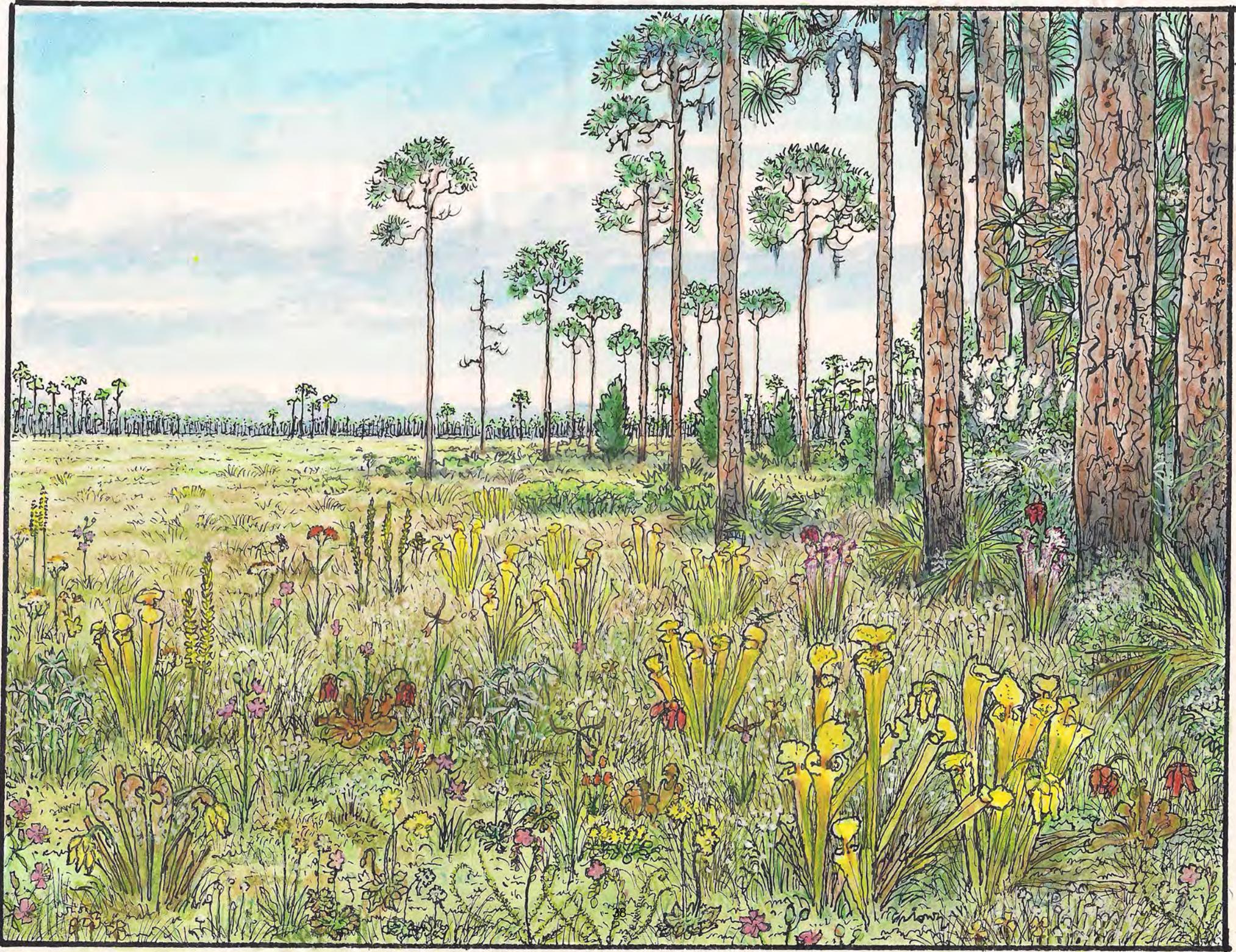
**Shade tolerance:** The ability to thrive in low light conditions. Most hardwoods are relatively shade tolerant. Most pines are not.

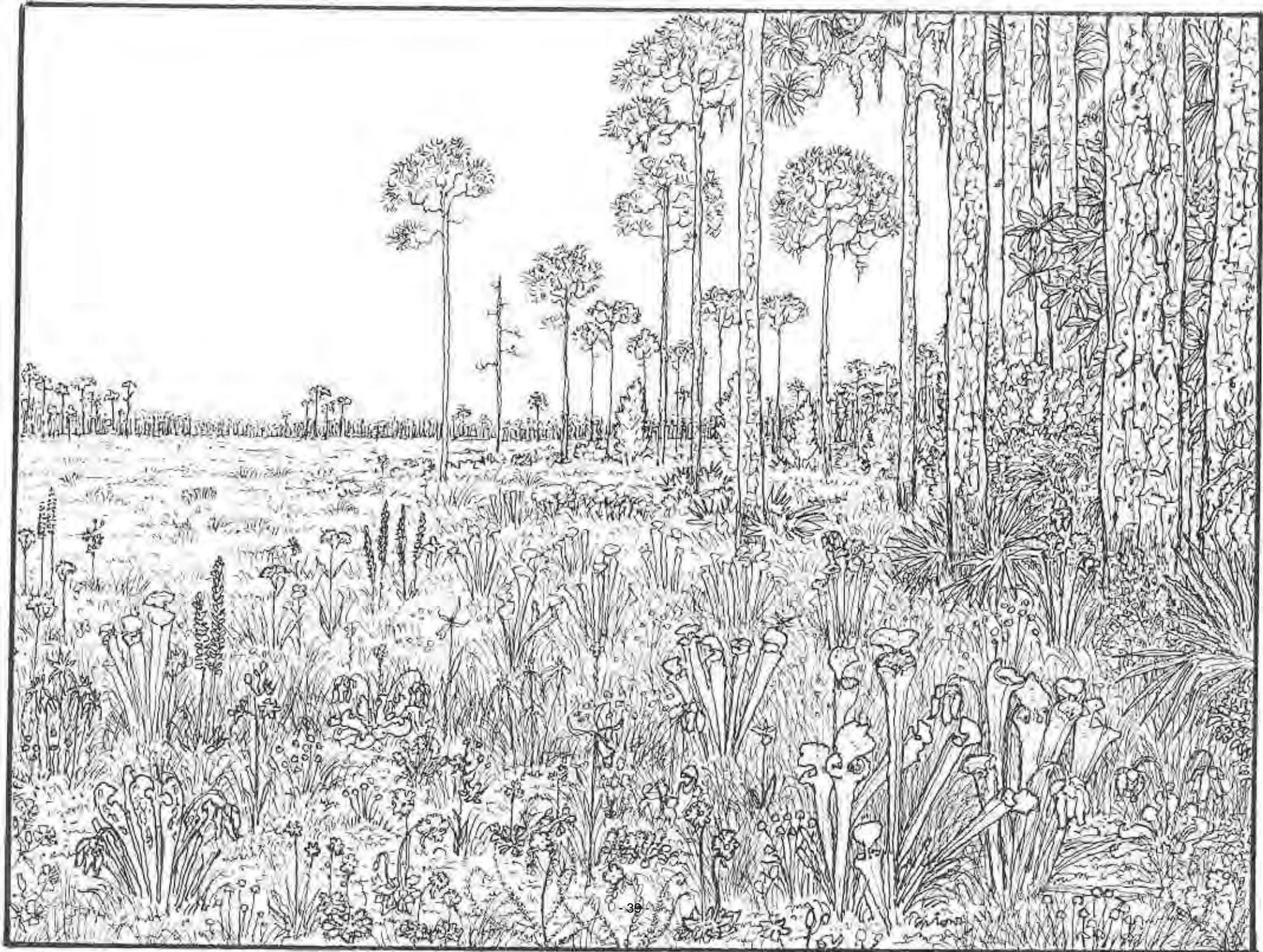
**Specialization:** Either through genetic disposition or behavior, an organization is forced into a narrow range of conditions.

**Wet-Prairie:** An open, grassy, flatland habitat whose soils may become saturated with water somewhat easily. Longleaf pine trees may be dotted throughout the habitat. Pitcher plants are common.

### **Suggested Activities:**

- Describe different communities in the longleaf pines.
- Place a boiled egg in vinegar overnight to show how a pitcher plant digests its prey.
- List endangered/extinct animals from the longleaf pine forest or embedded natural communities.
- Describe the life cycles of various animals.
- Identify living (biotic) and non-living (abiotic) factors that affect animal life.



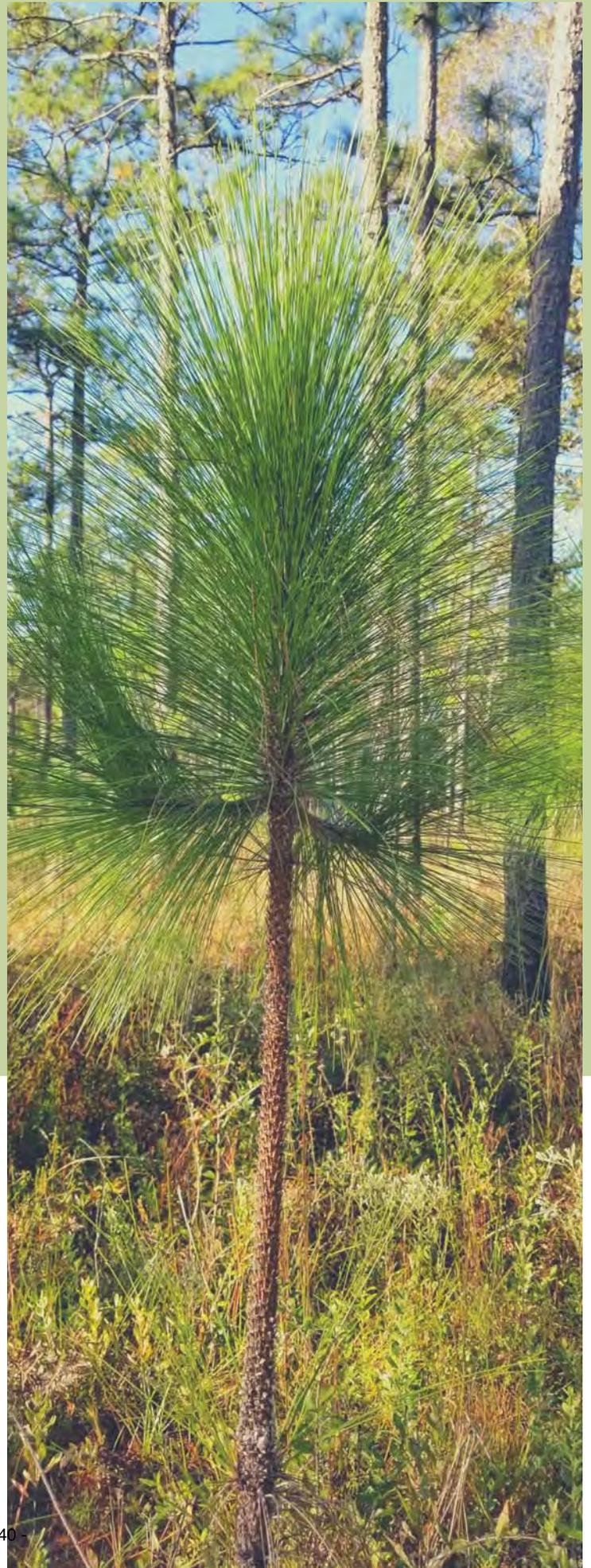


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# FIRE IN THE FOREST

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*Ecological  
Disturbance*



— THE —  
LONGLEAF  
ALLIANCE

## These Animals Play it Cool When Fire Sweeps through the Woods



(Bolded words in text indicate key words and concepts)

### Student Information:

Fire plays an important role in longleaf pine forests. Most critters in this forest have developed ways to escape the flames.

### Teacher Information:

Like most people, you were probably raised on the words of Smokey Bear. Because of his message, most people have grown up believing that all fires are devastating and must be kept out of the woods. And who can forget the horrifying scene from Walt Disney's Bambi, where fire almost consumes Bambi and friends? In longleaf pine forests, little of the message by Smokey or Disney holds true. In fact, fire is an essential element in regulating many processes, maintaining biodiversity and perpetuating the longleaf pine forest. These fires are unlike the dramatic fires we have been seeing in the western United States. Instead, fires in longleaf pine forest are small fires that creep along the forest floor; burning only the dried grasses, fallen **pine needles**, pine cones, etc. (called **detritus**).

Most critters in the longleaf pine forest have developed mechanisms to cope with the frequent fires of this forest. The gopher tortoise plays a key role in helping animals escape fire. Although greatly exaggerated for this picture, numerous insects, reptiles and mammals use the **burrow** of the gopher tortoise as **refuge** during a fire. In particular, we see the southern toad, eastern hog-nosed snake (also called spreading or puff adder), the eastern coachwhip, oak toad, cotton rat, eastern slender glass lizard (also called glass snake), five-lined race runner lizard, box turtle, velvet ant (also called cow killer), gopher frog, cottontailed rabbit and even the wily Virginia Opossum (also called the grinner) heading to the gopher tortoise burrow to escape the fire.

Many of these critters may use this cool burrow as a year-round residence while others use it only temporary. In fact, over 120 different species of animals and insects depend on the gopher tortoise directly or indirectly. For this reason, the gopher tortoise is considered a **keystone**

**species** of longleaf pine forests. Specific **food web** dynamics (**trophic levels**) can be observed exclusively in these burrows. For example, the gopher tortoise cave cricket (like the gopher tortoise scarab beetles) eats the fiber-rich **dung** (also called **scat**) of the gopher tortoise. In turn, the giant wolf spider (not pictured) eats the cave cricket. Field mice both live in the burrows and use it to cache food stores (like seeds and acorns). The eastern diamondback rattlesnake **preys** on the field mouse and, in turn, is preyed upon by the eastern indigo snake. The gopher tortoise tick (not pictured) is a **parasite** (harmful to its host) and **endemic** (meaning found exclusively) to gopher tortoises. Note that gopher tortoises are not found throughout the entire **range** of longleaf pine forests.

**White-tail deer**, mourning doves and **bobwhite quail** simply run or fly ahead of the flame front. Insects like the tiger swallowtail and cloudless sulfur butterflies, as well as red-winged grasshoppers either fly ahead of the flame front or fly up to the safety of the tree crown. Birds such as the great crested flycatcher take advantage of this smorgasbord of insects. The fox squirrel simply climbs up a tree and moves to the safety of the canopy while the fire passes. Some plants of the longleaf pine forests like wiregrass or native legumes (not pictured) depend on fire to help stimulate the flower production they need to reproduce.

### **Key Words and Concepts:**

[bobwhite quail](#), [burrow](#), [detritus](#), [dung](#), [endemic](#), [food web](#), [keystone species](#), [parasite](#), [pine needles](#), [prey](#), [range](#), [refuge](#), [scat](#), [trophic levels](#), [white-tail deer](#).

**Bobwhite Quail:** Ground nesting and roosting species of game bird. These birds thrive in longleaf pine forests maintained by fire.

**Burrow:** An underground home sometimes constructed with a series of tunnels. Both gopher tortoises and pocket gophers can construct burrows. Often times, these burrows are used by other critters.

**Detritus:** The remains of something that has been destroyed or broken up. Also, loose material (stone fragments and silt) that is worn away from rocks. Essentially, detritus is forest "junk".

**Dung:** The excrement of an animal. Also called scat.

**Endemic:** Found only within that system. Many legumes are endemic to longleaf pine forests.

**Legume:** Plants in the pea or bean family which can convert atmospheric nitrogen to elemental nitrogen. The fruit is usually in the form of a pod. Many legumes can be found in the longleaf pine forest. Fire is beneficial to many of these legumes.

**Food Web:** A community of organisms where there are several inter-related food chains. Take away one organism and the "web" may collapse. This collapse is also called the "rivet popping theory" meaning you can take rivets (organisms) off an airplane (ecosystem) and it still may fly (function). Take away too many rivets or the wrong rivet and the plane will fall apart and most likely will crash.

**Keystone Species:** A species on which a group of other animals and plants depend for survival or success. The gopher tortoise is considered a keystone species because so many animals and plants depend on it.

**Parasite:** A relationship between two organisms where one benefits and the other is harmed.

**Pine Needles:** The green, leafy portion of pine trees. Shape is similar to long, thin needles (hence the name). Longleaf pine has the longest needles of all the southern pines. The needles of longleaf pine grow in groups of three. Groups of needles are found as a circular bunch out on the ends of branches (with a similar appearance to a burst of fireworks you see on the Fourth of July). The green needles of longleaf pine are responsible for photosynthesis and protecting the tree's buds (the growing tips of the tree) from fires.

**Prey:** An animal hunted or caught for food. Also called quarry.

**Range:** An area where a species can naturally occur. Range can be limited by geography, climate, soils, elevation, aspect, etc. Also can be used to describe area where livestock are grazed. May also be used to describe a collection of mountain peaks such as those found in north Georgia and Alabama where longleaf pine once thrived.

**Refuge:** Safe places. Often places used to escape predators.

**Scat:** See dung.

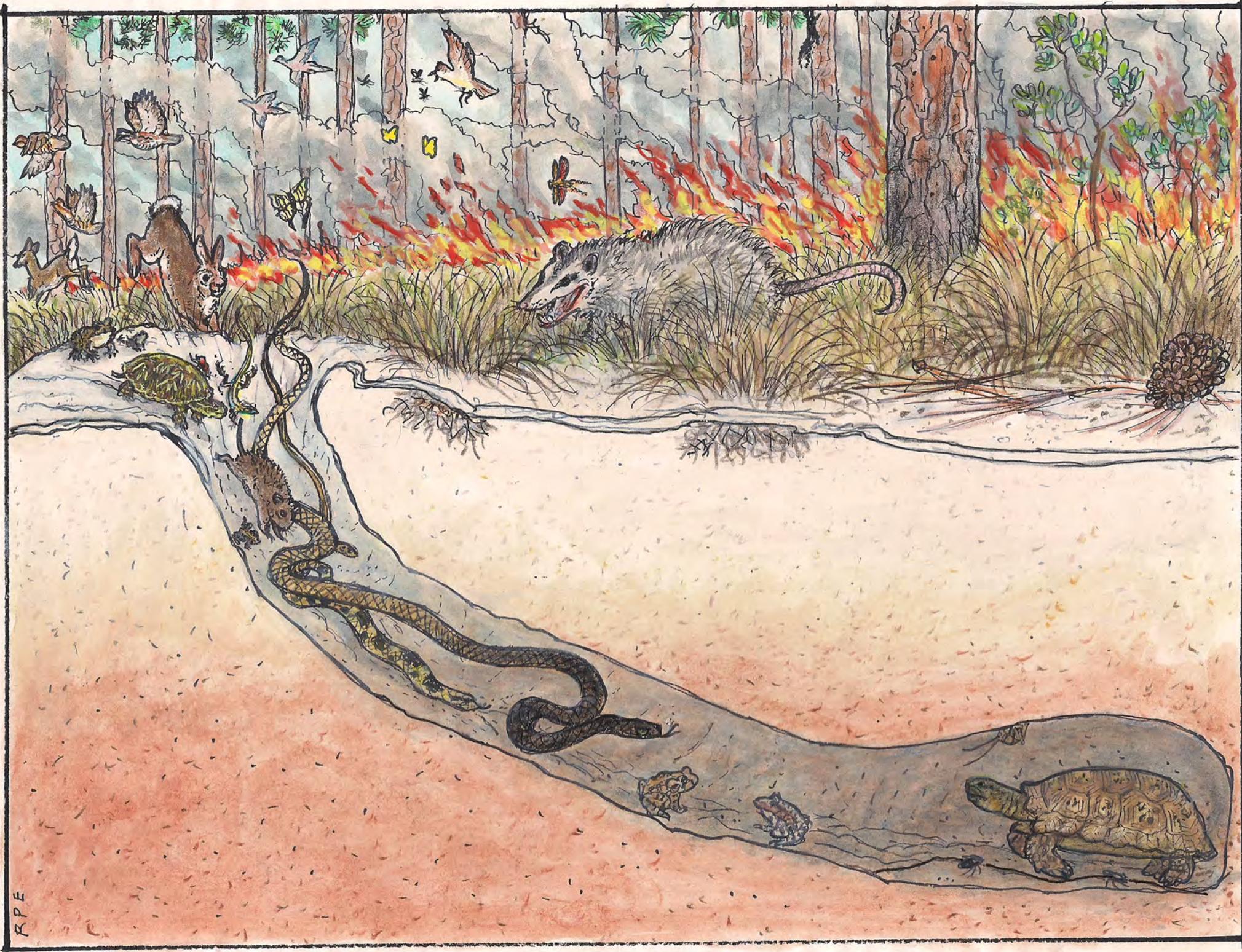
**Trophic levels:** The feeding position in a food chain such as primary producers, herbivore, primary & secondary carnivore, etc. Green plants form the first trophic level, the primary producers. Herbivores form the second trophic level, while carnivores form the third and even the fourth trophic levels.

**White-Tailed Deer:** The forest deer common to the Southeast and much of the nation.

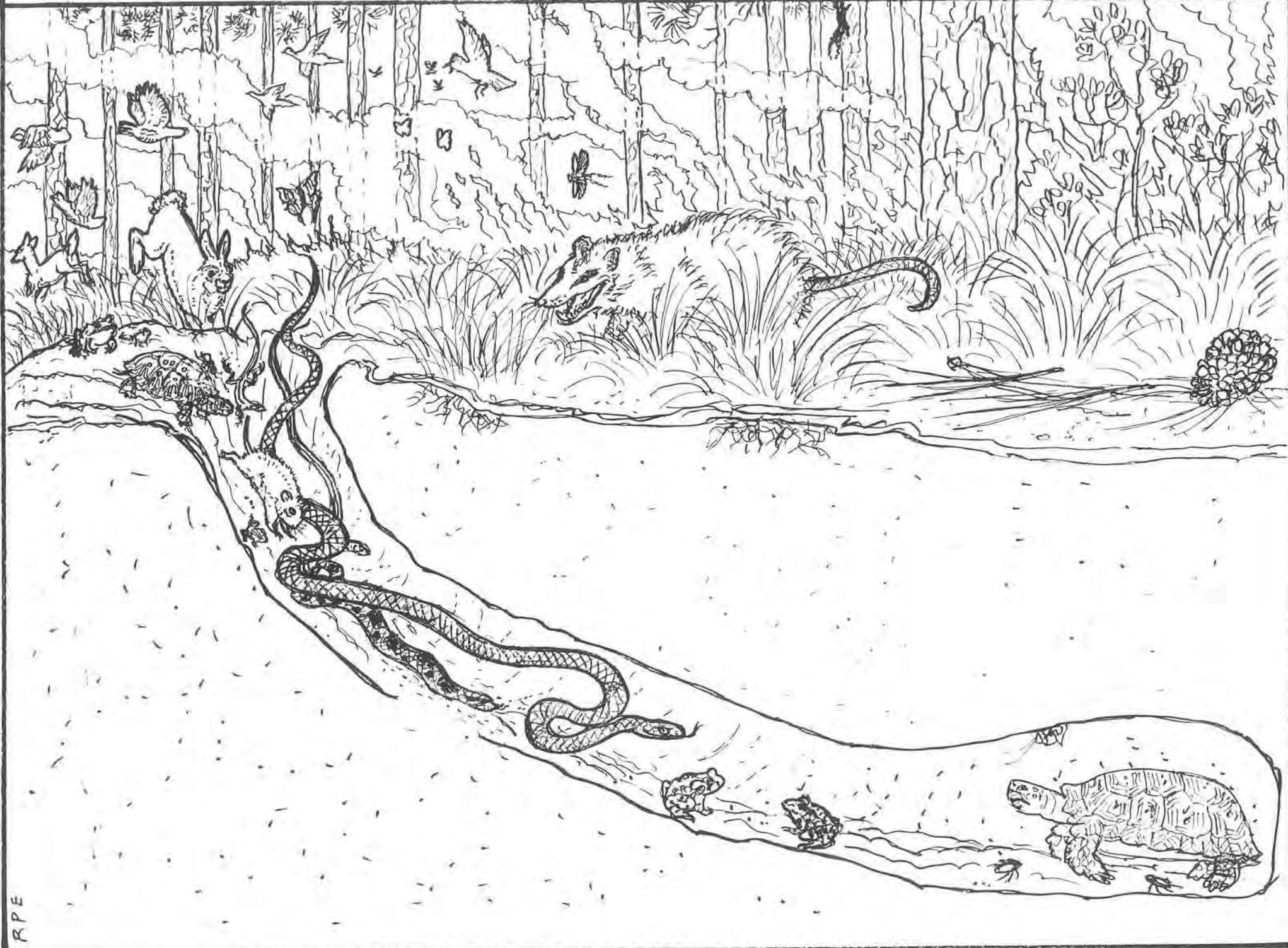
### **Suggested Activities:**

- Descriptive Writing Prompts: Describe animal/plant life in the pictures.
- Expository Writing Prompts: Explain why you like a particular plant/animal.
- Narrative Writing Prompts: Write a story about an adventure into the forest. Write about a day in the life of a particular plant/animal.
- Poetry Writing Prompts: Write a poem about a plant/animal in the longleaf pine ecosystem.
- Expository Writing Prompts: Give detailed explanations for the importance of a particular plant/animal in the longleaf pine ecosystem. (e.g., Gopher tortoise)
- Activity: Students locate gopher dens.
- Work with a partner to write a narrative description describing a food chain in the gopher den.
- If gopher dies, what happens to the other animals?
- Compare and contrast fire versus no fire in the longleaf pine ecosystem. How will the gopher tortoise be affected?
- Make a chart of each animal's needs: water/food/shelter/body temperature.
- List the endangered/extinct animals within the longleaf pine ecosystem.

- Survival comparison and animals methods of protection.
- Identify behaviors and body structures that help animals survive in a particular habitat.



RPE



RPE

## Southeastern Native Americans Purposely Burned the Longleaf Pine Forest



(Bolded words in text indicate key words and concepts)

### Student Information:

Similar to forest managers of today, Native Americans of the longleaf pine forests purposely burned areas for centuries to create habitat for important plants and animals they needed for survival.

### Teacher Information:

This picture depicts **Native Americans** around the Tallahassee, FL area (the Apalachee) burning the longleaf pine forest. However, the practice of using fire was common to all tribes throughout the longleaf pine ecosystem.

The longleaf pine forest remained a significant source of food, medicine, tools, housing materials and clothing for most **indigenous** cultures of the Southeast. **Lightning-ignited fires** played a role in creating these desired provisions; however, because these fires were stochastic in character (and thus unreliable), **Native Americans** purposely burned areas to perpetuate many of the desired plants and animals in the forest around them. Over time, the frequent fires began to mold a forest comprised of fire-tolerant longleaf pine and other plant species.

The Alibamo Creek Tribal **legend** states that Fire belonged to Bear in ancient times. However, one day Bear neglected Fire and it nearly extinguished. People heard the cries of the ailing Fire and fed it with sticks and brush. From that point on fire belonged to human beings. The respect for fire by other tribes in the southeast is evident by their calling it “grandfather”.

The Apalachee depicted in this picture are using fatwood knots from a longleaf pine tree to ignite the combination of wiregrass and pine needles. The fire that followed moved quickly across the ground, cleansing it of dead debris. This fire did not make its way up into the treetops of the longleaf pine.

## **Key Words and Concepts:**

[indigenous](#), [knot](#), [legends](#), [lightning-ignited fires](#), [Native American](#).

**Indigenous:** Endemic to a specific area. Usually used to describe cultures, such as the Native Americans.

**Knot:** A round piece of wood that was once the branch of a tree. Knots made of longleaf heart-pine are common in many areas because they do not decay readily. On cut boards, a knot is a cross-grained piece of wood that signifies where a branch emerged from the tree trunk.

**Legends:** Tales passed down from generation to generation, often exaggerated. In an era when few people could read (let alone write), such legends were vital for passing on information such as family history. Also called oral legends.

**Lightning-ignited fire:** Fires created by lightning. Either the energy from the lightning bolt is transmitted down the tree trunk to ignite grasses or a blazing chunk of the struck tree is blown off and the grasses ignited. In the southeast, such fires usually occur within the summer months.

**Native American:** The first Americans also called American Indians, native people or aboriginal people. In the southeast, most Native Americans were killed outright by the American military (such as Andrew Jackson's efforts in the southeast), white settlers, killed by disease or shipped off to other states (like Oklahoma) along the "Trail of Tears".

## **Suggested Activities:**

- Describe aspects of the lives of local Native American tribes historically in your area.
- Illustrate the impact of the expansion of American settlements on Native American societies.





## Professional Land Managers Setting the Longleaf Pine Forest on Fire



(Bolded words in text indicate key words and concepts)

### Student Information:

Similar to how your doctor writes you a prescription to take care of a cold, land managers write a prescription to help heal the land. For the longleaf pine forest, fire is the common cure for illness. Fire is to the longleaf pine forest like rain is to rainforest or tides are to salt marshes. Take away fire and the longleaf pine forest will die.

### Teacher Information:

Historically, the longleaf pine ecosystem was maintained by frequent, yet low intensity fires, which burned every 3 to 10 years. Fires started by lightning, Native Americans, and (more recently) Euro-American settlers molded a longleaf pine forest comprised of fire tolerant plant and animal species. In this condition, the longleaf forest is considered a **fire climax community**.

In the late 1800's and early 1900's, new land uses caused the forest to change. Logging, roads, and farm fields broke up the continuity of the natural forest which carried fire. By the mid-20th century people following the advice of **Smokey Bear** and began to actively put out fires.

Over time, the forest industry would come to understand the importance of fire in maintaining the longleaf pine ecosystem. For it is not a question if the south's forests will burn but a question of when they will burn. Through fire suppression, frequency of fire was being substituted for intensity, i.e., frequent, low-intensity fires versus infrequent, **catastrophic wildfires**.

Today, fires set by managers (called **prescribed fires**) are used in the longleaf pine forest as a low cost way to benefit certain wildlife and plants, increase scenery, assist in **nutrient cycling**, and reduce the threat of large destructive wildfires in the future. However, these fire managers are not merely going out into the woods and dropping a match.

A prescribed burn is so named because land managers first write a "prescription" of criteria that must be met before ANY burning can be done. The parameters of this prescription include weather, fuel types (e.g., live and dead vegetation) and amount, nearby manmade structures and topography. Land managers are systematically reintroducing fire into the landscape using carefully planned prescribed fires. Those individuals who do not follow this rigid protocol in using fire are called **arsonists**.

The silver hand-held "drip-torches" contain a mixture of gasoline and diesel fuel. This mixture allows the burner to lay down a line of fire on the ground. The yellow shirts and green pants are standard issue Nomex (fire-retardant) clothing. Goggles safeguard eyes from flying ashes, plastic hard-hats protect the head from falling branches, and leather gloves and boots protect the hands and feet from heat. The small packs attached to the belt are heat resistant fire shelters. In the rare event that a person becomes trapped by flames, he/she would deploy their shelter climb inside and allow the fire to blow over the top of them.

The bottom left of the drawing shows part of a "**fire break**". A fire break is a plowed line around the area being burned. Plowing removes grasses, trees (i.e., fuel) that would otherwise allow the fire to continue to burn. The direction of the smoke indicates that the wind is pushing the flames. When a fire moves with the wind it is called a headfire. A fire pushing against the wind moves slowly and is called a backfire.

### **Key Words and Concepts:**

[arsonist](#), [catastrophic wildfire](#), [fire break](#), [fire climax community](#), [nutrient cycling](#), [prescribed fire](#), [Smokey Bear](#).

**Arsonist:** Malicious individuals who purposely set fire to the woods without regard to its effects on human life or property. Usually done during the hottest, driest, windiest times of year to increase the level of damage caused by the fire.

**Catastrophic Wildfire:** A fire not set by prescription but instead set by Mother Nature. Usually these fires burn during the hottest, driest days of the year and can result in loss of habitat, human structure or life. Historically, most fires started by Mother Nature were not catastrophic in scope because fire as a regular natural process on the landscape and the fuels were kept in-check. Fires started becoming more catastrophic when man interrupted the fire regime through fire suppression and thus caused an un-natural build up of fuel.

**Fire-Break:** An area where all organic (burnable) material is scraped away by hand or with a machine. It can be used to keep a fire from moving either in or out of an area.

**Fire-Climax community:** A plant and animal community that is limited by and adapted to an early successional stage by frequent fire disturbances. Longleaf pine forests are considered fire climax.

**Nutrient Cycling:** The process of nutrient exchange. For instance, the decay of organic material and the return of nutrients to the soil in elemental form (like nitrogen, phosphorus, etc.).

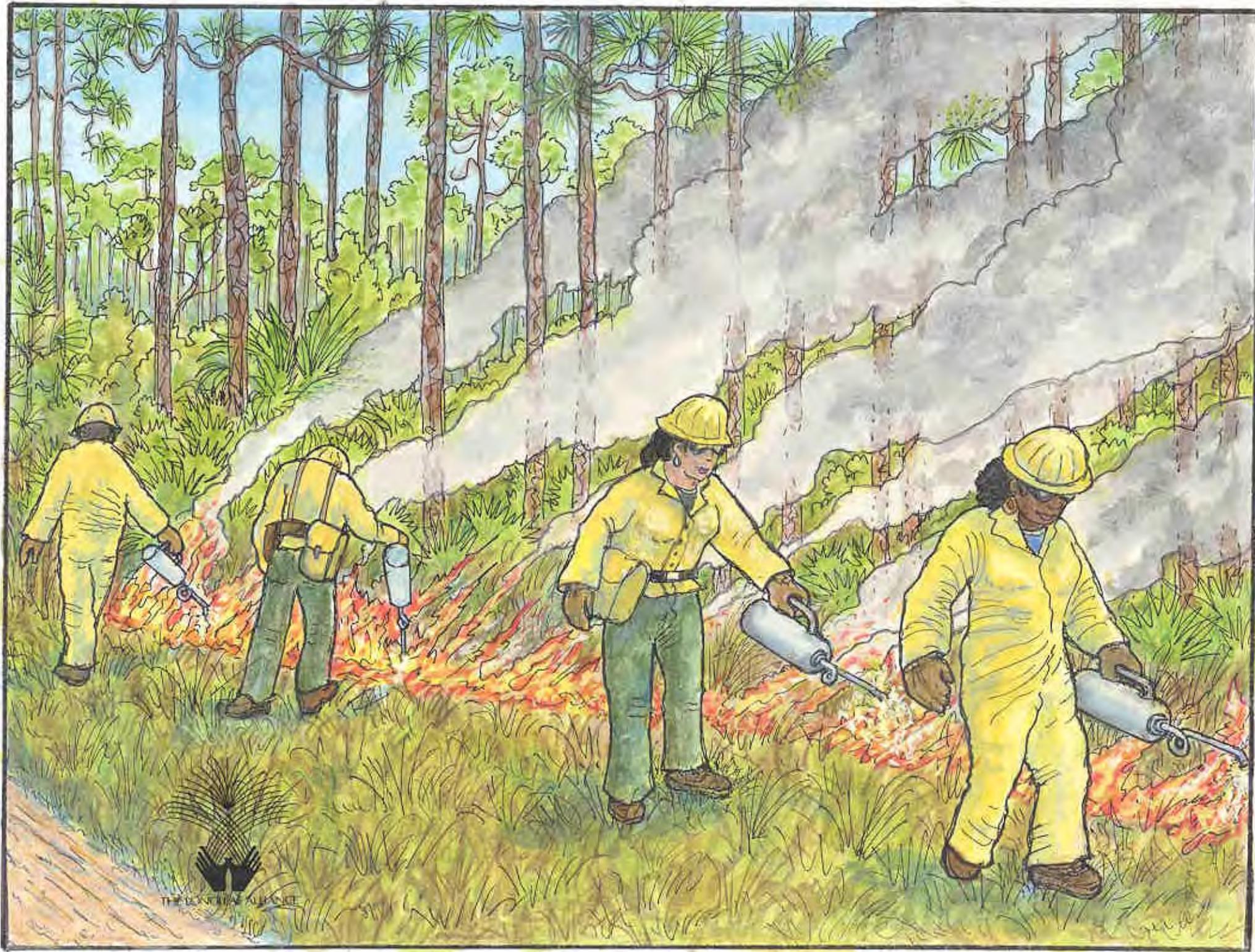
This elemental form is then taken up and incorporated by plants, perhaps eaten by animals, and returned to the soil as it is recycled again.

**Prescribed fire:** Fire set by trained personnel under specific weather conditions for a specific objective. Also called a controlled burn because the experts can somewhat predict what the fire will do.

**Smokey Bear:** A campaign initiated in 1944 to preach the importance of fire prevention in forests. An affectionate black bear called Smokey Bear was adopted as its mascot. The Smokey Bear campaign is the longest running public service campaign in US History. Smokey's forest fire prevention message remained unchanged for 50 years until April 2001, when the Ad Council updated its message to address the increasing number of wildfires in the nation's wildlands.

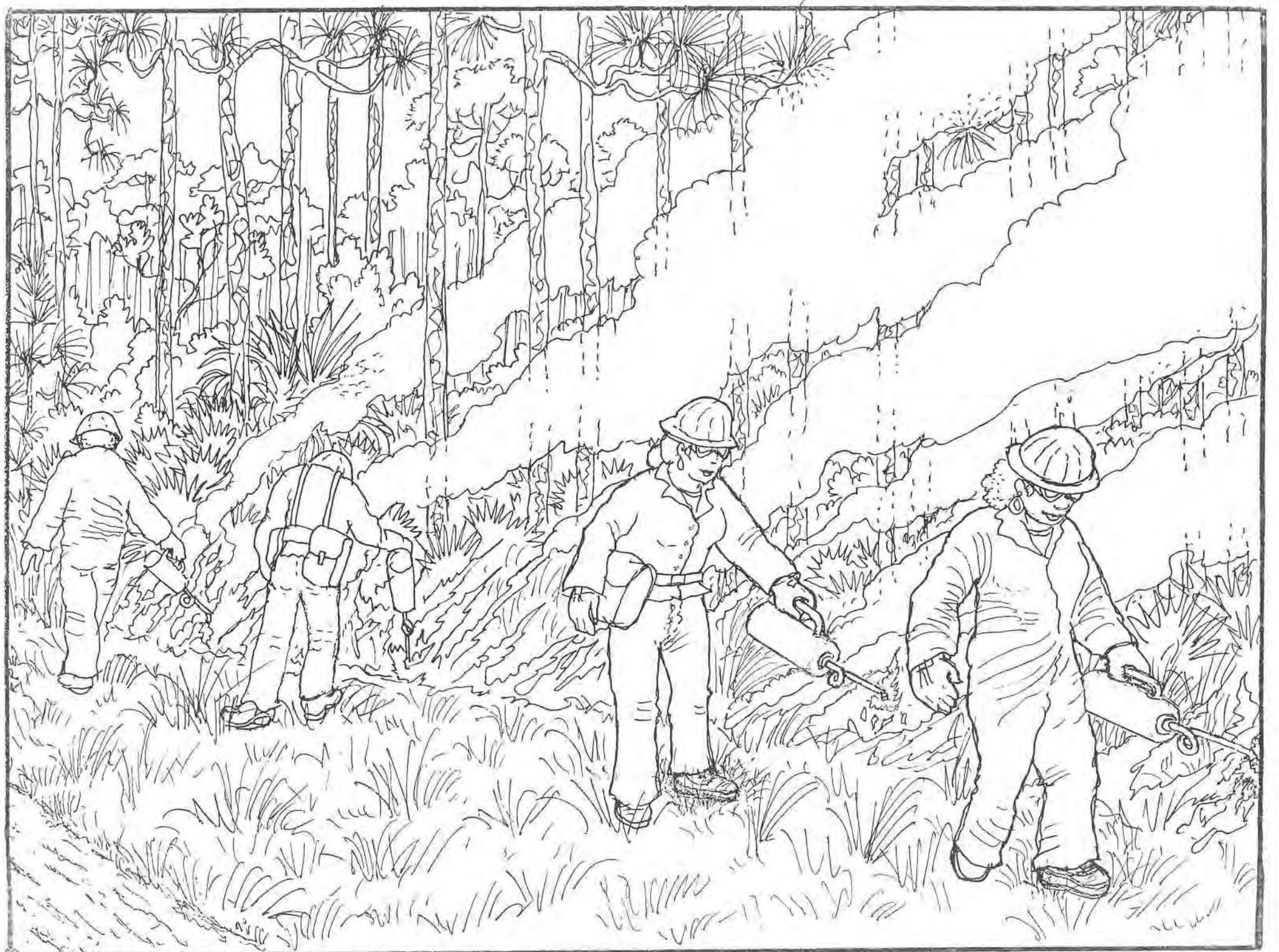
**Suggested Activities:**

- Prescribed burning vs. wildfires – writing



  
THE NATIONAL ALLIANCE

*Hand-drawn signature*

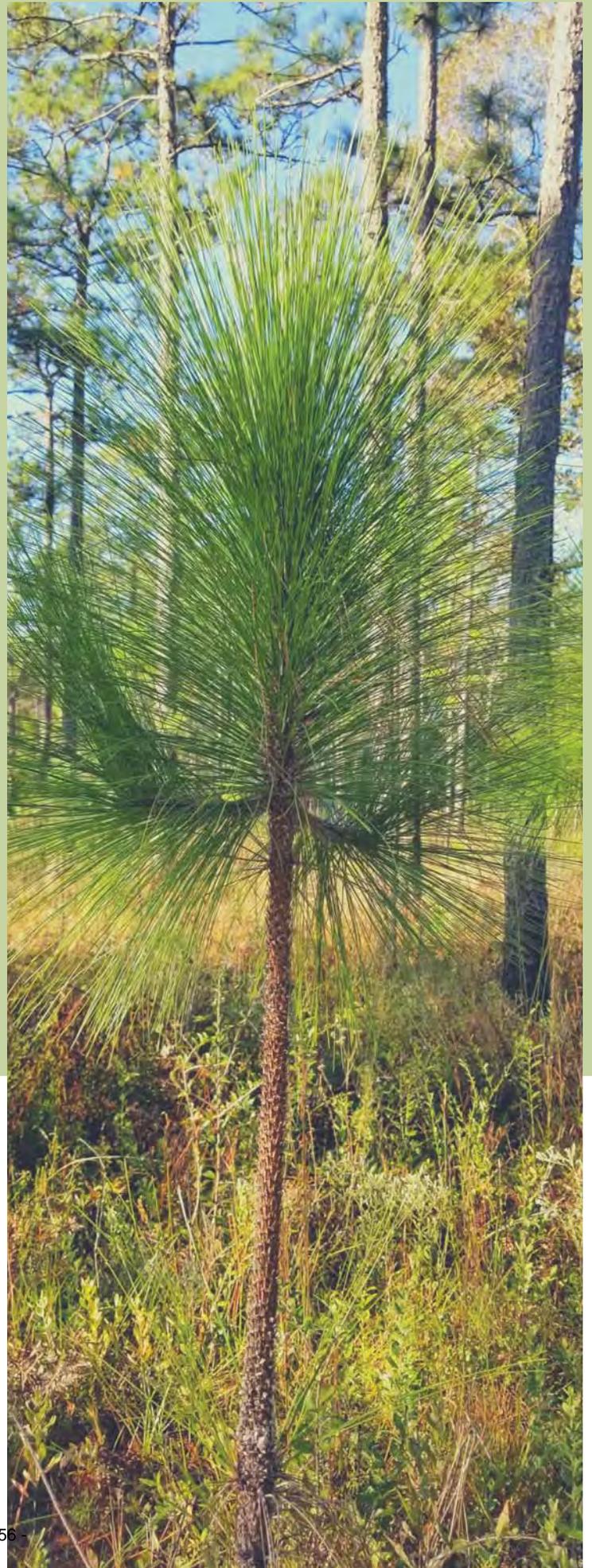


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# HUMAN INFLUENCES

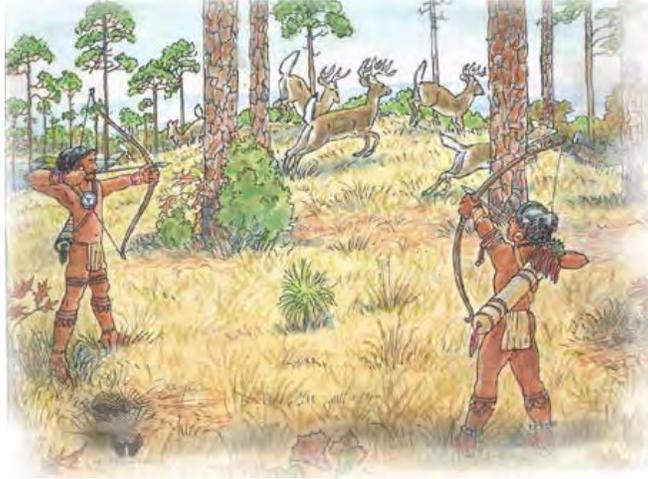
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*Patterns  
of Change*



— THE —  
LONGLEAF  
ALLIANCE

## Deer Found in the Longleaf Pine Forests Were Highly Valued by Many Indigenous Tribes



(Bolded words in text indicate key words and concepts)

### Student Information:

To the indigenous tribes of the longleaf pine forests, deer provided the convenience of “one stop shopping” of today’s grocery store. From a single deer, clothing, tools, and food could be found. A park-like longleaf pine forest with lots of green grasses growing was very important for deer.

### Teacher Information:

About 15,000 years ago, in the colder climate of the ice age, **megafauna** like mastodons, woolly bison, and mammoths roamed throughout the southeastern United States. To hunt these large creatures, indigenous people would hide around watering holes with spears in hand, wait for an ambush, and thrust their weapons into the creature’s vital organs. More simply, it was neither a productive nor a wise **hunting** technique to stalk a 4-ton creature. As climate began to change over thousands of years and the megafauna died off, smaller animals like **white-tailed deer** began to radiate out throughout the landscape. Unlike the extinct megafauna, deer traded size for speed, a good sense of smell, and great hearing. More simply, deer are more alert and not easily ambushed by clumsy humans. To hunt these fast, skittish creatures, hunting techniques evolved.

As many land managers understand today, **Native Americans** realized that fire was a powerful tool that could be used to manage habitats suitable for preferred game animals. Purposely burning the forest not only attracted deer to areas of lush, new growth but also made it possible for deer numbers to expand by increasing their food supply. **Human-induced fire** was also used to corral fleetly animals (like deer) into open areas where hunters waited to shoot them. The use of fire kept the longleaf pine forest open, giving hunters better shooting access. However, because the forest was so open it would have been difficult to get close enough to an animal to kill it by hand. For this reason, hand held spears were abandoned and bows and arrows were adopted.

Veins of native flint rock made surgical sharp arrowheads and staves carved from hardwood trees made precise bows.

Deer was an important resource to many tribes throughout the Southeast. Among other things, deer hides provided clothing, antlers were used as tools, hooves worn as ornaments, and venison consumed as food. Some estimates have suggested that venison comprised about 85% of these people's protein intake. When Europeans arrived, deerskins (buckskins) were used as a trade item. Deerskins traded to English tanners purchased "modern" tools, weapons and clothing for Native Americans—things the longleaf forest could not supply. A conservative estimate of buckskin production in the late eighteenth century suggests about 1.5 million pounds of leather per year was supplied to the market (about 1 million deer). As the trade intensified, deer populations became depleted and eventually the markets shifted to other products like cotton textiles.

### Key Words and Concepts

[Arsonists](#), [human-induced fire](#), [hunting](#), indigenous, [megafauna](#), Native American, [white-tailed deer](#)

**Arsonist:** Malicious individuals who purposely set fire to the woods without regard to its effects on human life or property. Usually done during the hottest, driest, and windiest times of year to increase the level of damage caused by the fire.

**Human Induced Fire:** Fires set deliberately or accidentally by humans. Early Americans, settlers, and present day managers all use fire as a tool. [Arsonists](#) and careless people occasionally start fires as well.

**Hunting:** Taking game animals for means of food, clothing, or medicine.

**Indigenous: Endemic to a specific area. Usually used to describe cultures, such as the Native Americans.**

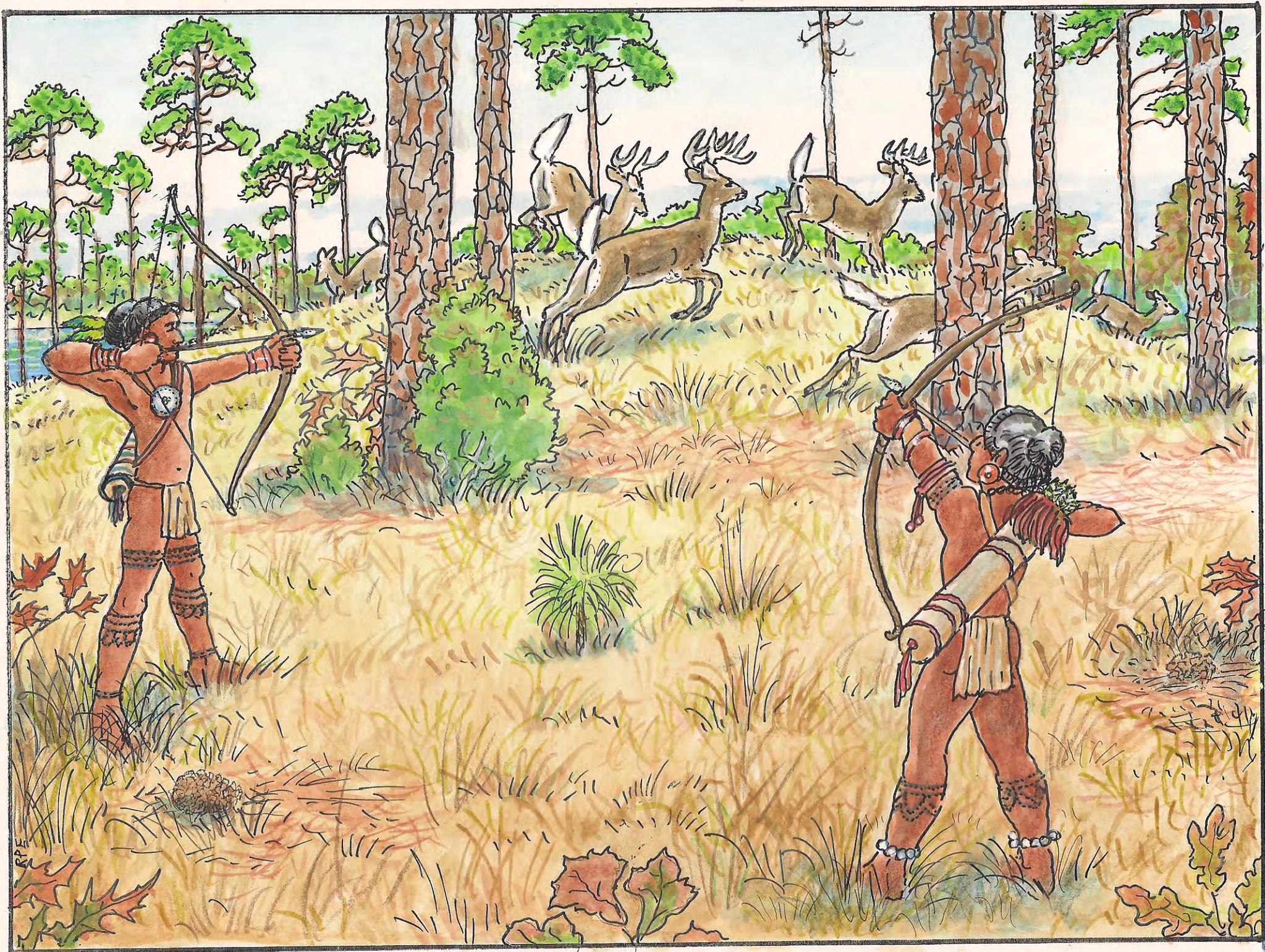
**Megafauna:** Large, ice-age animals such as mammoth, mastodon, giant sloth, etc.

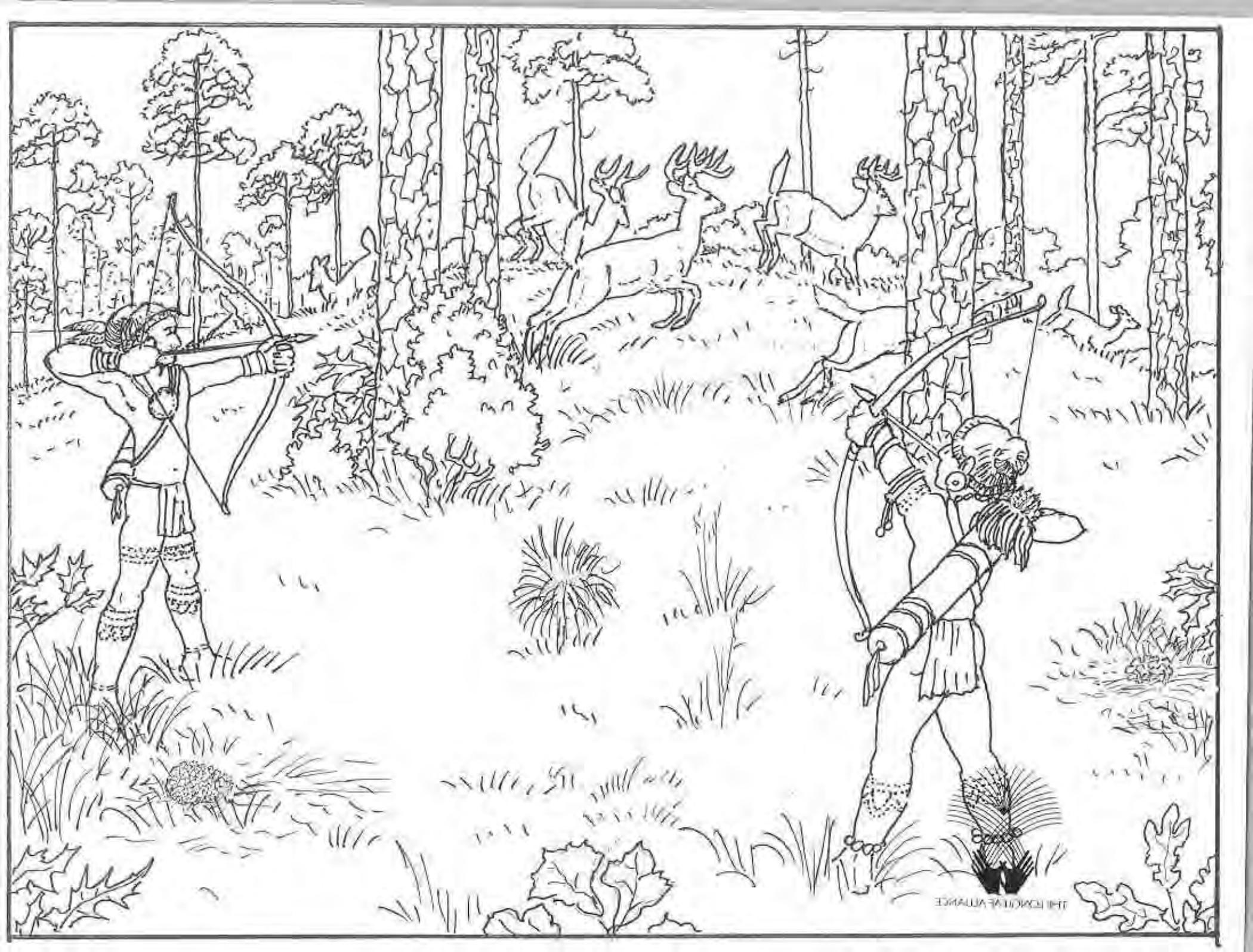
**Native American:** The first Americans also called American Indians, native people or aboriginal people. In the southeast, most Native Americans were killed outright by the American military (such as Andrew Jackson's efforts in the southeast), white settlers, killed by disease or shipped off to other states (like Oklahoma) along the "Trail of Tears".

**White-Tailed Deer:** The forest deer common to the Southeast and much of the nation.

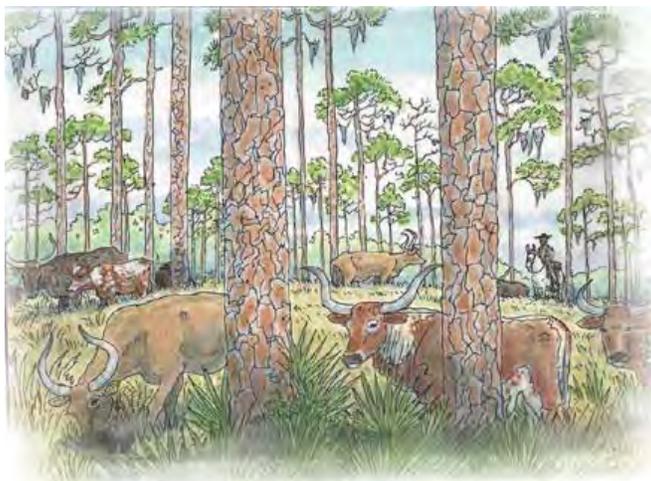
### Suggested Activities:

- Write a brief summary of how the deer were treated as "one stop shopping" as today's grocery stores.
- Describe aspects of the lives of local Native American tribes historically in your area.
- Illustrate the impact of the expansion of American settlements on Native American societies.





## A Spanish Vaquero Driving His Cattle through the Longleaf Forest to Market



(Bolded words in text indicate key words and concepts)

### Student Information:

When European settlers arrived in the South, they found longleaf pine trees towering over a carpet of grasses as far as their eyes could see. All of this grass provided a cheap source of food for the cattle. It was these Europeans who brought cows to America. Unlike cattle-farms of today, fences were not used and cattle were simply left free to roam about as they pleased. This picture shows a Spanish vaquero (cowboy) in what is now Florida looking after his *vaca* (cows).

### Teacher Information:

This picture depicts a Spanish **vaquero** (cowboy) looking in on his **vaca** (cattle) herd in southeastern longleaf pine/wiregrass terrain with an occasional saw palmetto thicket (Florida, South Alabama or Georgia) circa late 1600's to 1763, 1783 to 1821. The long-horned cattle used by the Spaniards in the New World trace back to the estuarine marshes of Andalusia in Southern Spain as well as the more wooded region of Extramadura in Western Spain. It is important to remember that cows were not found in North America before Europeans arrived. Scientists would call cows **non-natives** to North America. These cattle the early Spanish settlers brought with them were allowed to roam freely and became semi-feral, giving birth to offspring which often displayed spotted and speckled color patterns typical of **feral animals**.

The system of **brands** and brand registration was three-fold. First, the fierro or iron brand was burned into the animal's flank hide (note picture), second was the senal or ear-mark. Lastly, the venta or sale brand was stamped on the animal's shoulder as a bill of sale. The new brand was burned below the venta brand and the new transaction was recorded. This type of branding may seem a bit overdone considering the discomfort the animal must have endured during the ordeal. However, these brands used by the Spaniards were considerably less elaborate than using half

the side of the animal required in placing the full coat of arms used on Spanish ranches prior to the time of bringing livestock to the Americas.

At the close of the Revolutionary War, it was generally those of Scotch-Irish decent who braved the hardships of the Pine Barrens frontier and settled the longleaf region of what is today the Carolinas, Georgia and Alabama. The herding practices of these cracker frontiersmen were distinctively Celtic in origin. Typically, fences only enclosed a few acres of "**cowpen**" land on which subsistence crops were grown. **Livestock** were simply turned out in the customary Celtic tradition of **free-range** herding. This cattle culture also encouraged the habitual use of fire to "**freshen**" up of the forest. These people knew from the way cattle gravitated to the fresh burns that the tender grass of the longleaf pine forests would make them grow and fatten. Often, these forests would be burned twice a year to provide adequate areas for the cattle to **graze**.

### **Key Words and Concepts:**

[brand](#), [cowpen](#), exotic, [feral animal](#), [free-range](#), [freshen](#), [graze](#), [livestock](#), [non-native](#), [vaca](#), [vaquero](#)

**Brand:** Marks burned onto the hides of live cattle with a red-hot branding iron. Such marks were used to help identify ownership of cattle. During a time when cattle were not fenced in, the lack of brands could make the identification of one's cattle very difficult.

**Cowpen:** An area (usually a garden) enclosed by fence to keep out free-range cattle.

**Exotic:** Something not found in an area naturally. In most cases it was introduced to an area by man. With few natural predators, these exotics can reproduce unchecked, e.g., fire ants, kudzu, feral hogs.

**Feral Animal:** Domestic animals gone wild. Physical changes are usually noted in offspring such as teeth elongating, coat growing longer and changing colors as in the case with feral hogs.

**Free Range:** A practice no longer allowed whereby livestock are released into the forest to graze. Fences were used to keep livestock out of areas rather than fence them in. The animals were left to graze where they pleased. Brands and ear notches were methods used to identify ownership.

**Freshen:** In range management, the "green up" of tender grasses for grazing following a fire.

**Graze:** Foraging for grassy or herbaceous vegetation by animals like cattle or bison.

**Livestock:** Domesticated animals like cattle, hogs, horses, sheep, or goats.

**Non-native:** See [exotic](#).

**Vaca:** Spanish for "cow".

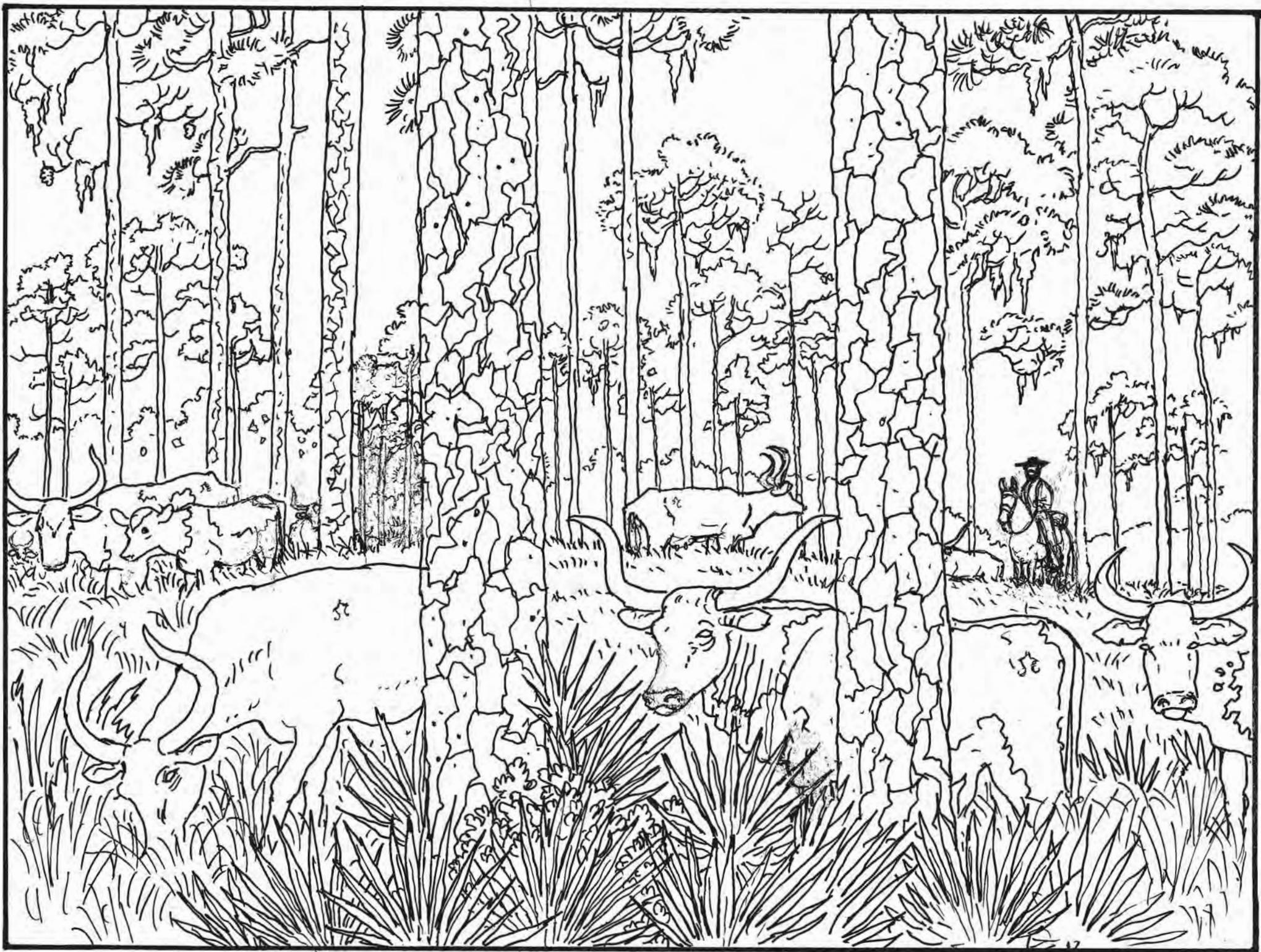
**Vaquero:** A cowboy of Spanish decent.

### **Suggested Activities:**

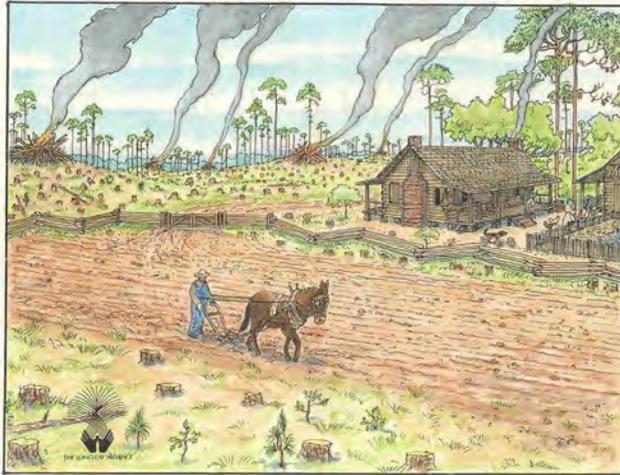
- Assess the impact of European contact on Native American populations in the longleaf range.
- Describe European explorations and settlements in the various states within the longleaf range and identify reasons for and consequences of each.



RPE



## The Settlement of the Longleaf Pine Frontier in the Early 1800's



(Bolded words in text indicate key words and concepts)

### Student Information:

Although it may be hard to envision, at one time the longleaf pine forest was the wild frontier. Mysterious and (sometimes) dangerous animals and plants could be found everywhere in the forest. Paved roads and air-conditioned cars and houses did not exist. Mule-drawn wagons slowly carried people through endless longleaf pine forests. Homes were built from the lumber of longleaf pine trees cut with axes and saws. Most families could only afford a single mule to farm the land. Life was tough for these people.

### Teacher Information:

The procurement of food, shelter, and medicine on the longleaf pine frontier was filled with uncertainty and peril. Self-sufficiency was essential, and the survival of these people was inextricably linked to the fruits of the longleaf pine ecosystem. The axles of every pioneer wagon that moved through these woods were lubricated with the **tar** extracted from the **lightwood** of longleaf pine. The essential tasks of life in the piney woods could easily result in serious or even fatal injury. Access to trained medical practitioners was often a day or more ride from one's **settlement**. Pioneers learned to gather the herbs, animal parts and minerals needed to concoct various **herbal medicines** from the woods around their house.

Longleaf pine forests were found across a variety of different soil types from very fertile **clayey soils** to not so productive sandy soils. Before the introduction of modern fertilizers and irrigation systems, only the more fertile soils such as those found in east Texas, Southeast Alabama, and the Low-country of South Carolina proved to be valuable **agricultural** areas for cotton, corn, etc. In these areas, cleared land was deemed more valuable than forested land. Trees were cut with hand axes and sawed into lumber for cabins, smoke houses, barns, and the likes. Trees not used in construction of the homestead were either piled and burned or sold to nearby lumber companies. Stumps were removed by hitching up a mule and coaxing the mule to pull them out of the ground (later, dynamite seemed to do the trick).

Unlike today's enormous agricultural fields maintained with diesel powered tractors, pioneer farmers were physically limited by how much land could be farmed. As a rule of thumb, one man and one mule could work only 50 acres.

Since the landscape was **open-range**, cattle were generally free to roam where they pleased. Fences were used to keep livestock out of areas (like crops). Smaller longleaf pine trees were quartered and made into **rail** fences. Typically a few acres of **subsistence** crops were planted around the house (like collard greens and purple-hulled peas). Plum or persimmon trees may have been planted around the house for fresh fruit. Chickens were raised mainly for eggs but also for meat in the rare event of a visit from a neighbor. In the common event that something could not be grown; the nearby Pineywoods provided a wealth of food items. Numerous edible berries, plants and animals flourished in the pine uplands.

### **Key Words and Concepts:**

[acre](#), [agriculture](#), cants, [clayey soil](#), free range, [herbal medicine](#), [lightwood](#), [open-range](#), [rail](#), [settlement](#), [subsistence](#), [tar](#)

**Acres:** A unit of measure used to describe large areas. Equal to 43,560 square feet. A square acre would be approximately 209 feet by 209 feet and a circular acre would have a radius of 117.75 feet. Visually, one acre is about the size of a football field.

**Agriculture:** The raising of crops and/or livestock for human use. Prior to the discovery of irrigation and use of fertilizers, many of the soils in which longleaf pine forests grow were poorly suited for agriculture.

**Cant:** A squared off piece of timber that was initially a round log. The pieces cut off the log to make the square cant were called slabs. Slabs were often discarded or burned by lumber companies.

**Clayey Soils:** Soil where the texture has a large percentage of small (clay) particles. Clay is smooth when dry and sticky when wet. Soils high in clay content are called heavy soils. Clay also can hold a lot of nutrients, but doesn't let air and water through it well. [Sandy soil](#) is the opposite of clayey soil in that it is made up of larger particles. In the south, clayey soil is usually distinguished as an orange, orange-red color.

**Free Range:** Practice, no longer allowed, of releasing livestock into the forest to forage. Fences were used to keep livestock out of agricultural areas. Brands and ear notches were methods used to identify ownership.

**Herbal Medicines:** Medicines derived from plants and plant materials.

**Lightwood:** Commonly called [fatwood](#) or lighter wood.

**Open range:** See [free range](#).

**Rail:** Fencing materials or tracks for trains. Young longleaf pine trees around 10 – 20 feet tall (saplings) were halved or quartered and stacked upon one another to make rail fences. Rail tracks for trains (such as those used in logging) were often made of metal and of a narrower

"gauge" than normal passenger trains. Rails could have also been made of wooden [cants](#) or the trees themselves.

**Settlement:** Where people live. The term is usually reserved to describe the earliest settlements of a region.

**Subsistence:** The bare necessities of life.

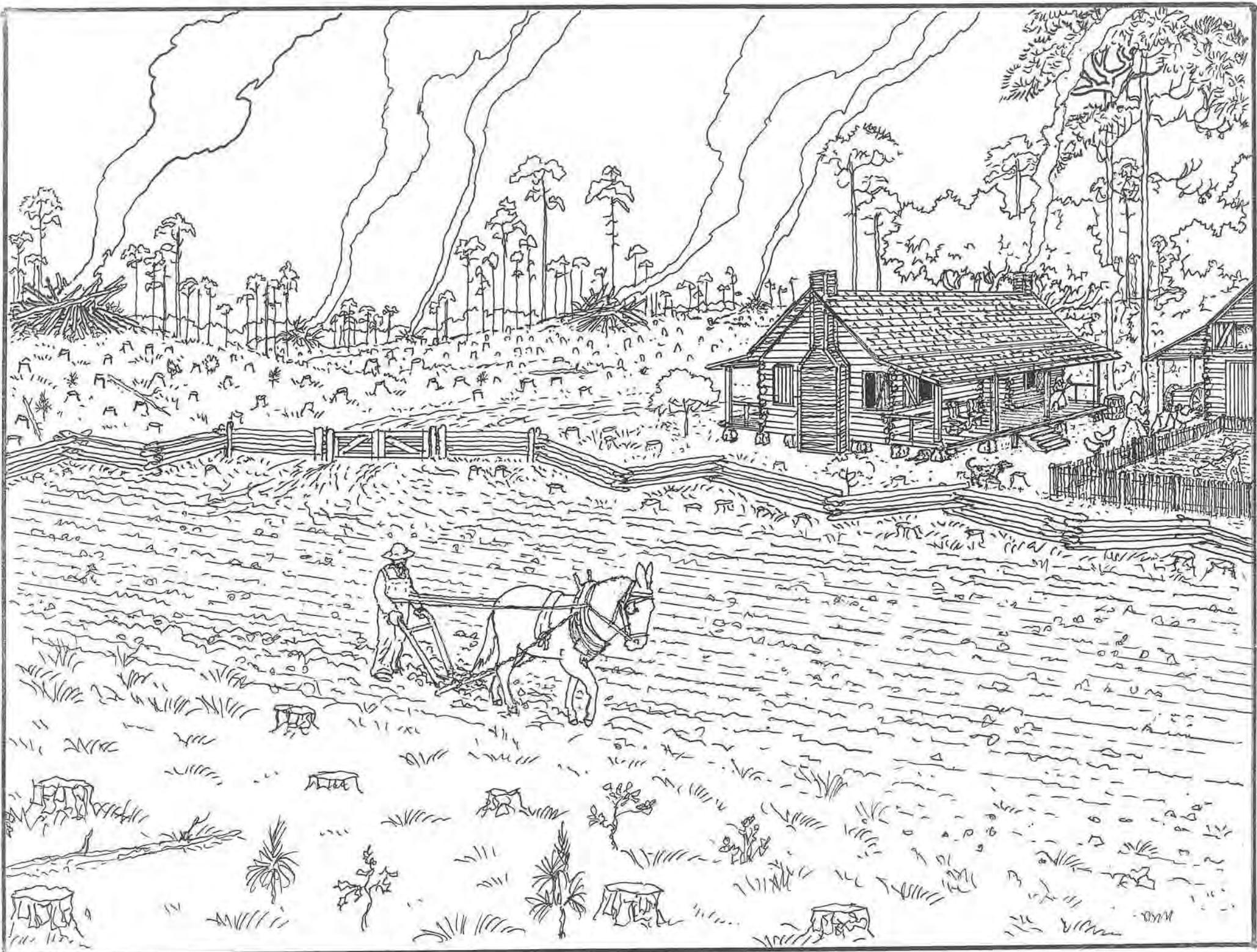
**Tar:** A term used by the turpentine industry. The heavier portion produced in the distillation of resin. When fatwood limbs were cooked down in a fire kiln this was usually produced. Although tar had a variety of uses, it was most often used in the waterproofing of ships. Tar was an early product of the naval stores industry.

### **Suggested Activities:**

- Relate geographical features of a specific state within the longleaf region to the movement of settlers in 19<sup>th</sup> century
- Describe life in early 19<sup>th</sup> century settlements in a specific state within the longleaf region



RPE



## The Longleaf Forest Served as the Wal-Mart for Early Settlers



(Bolded words in text indicate key words and concepts)

### Student Information:

Try to imagine what your life would be like without electricity, telephone, internet, paved roads, or even grocery stores. For the **settler** families living amongst the longleaf pine forest, not having the luxuries that you and I take for granted, was a way of life. The longleaf pine forest provided much of the food and supplies needed for their survival.

### Teacher Information:

It was generally the Carolinians of Scotch-Irish decent who settled the longleaf pine barrens where rice or cotton plantations failed to penetrate. A German traveler to the longleaf pine backcountry in 1783 found cattle, swine, and these piney woods people "here denominated crackers." Pioneering cracker families frequently foraged for supplementary food and other goods in the Pinelands, becoming in effect "**hunter-gatherers**". Although life could be, and often was, hard for people living amongst the pine-barrens, the forest provided food, housing and medicine. These backcountry **yeomen** were tough and resourceful.

This picture depicts a cracker family gathering various food staples. The men are "pulling" (fishing) for **gopher tortoises** (also called Hoover Chickens, Cracker Chicken or Florida Bacon) while women are picking blueberries. Gopher tortoise was considered very good eating by many pioneering country folks. Wild blueberries could be eaten fresh out of the hand, with cream and sugar, syrup or honey, or made into cobblers, pies, jam, preserves or jelly.

In fishing for gopher tortoises, a rope made from braided grapevines with a large hook attached was used for hooking and pulling the tortoise from its burrow (or "gopher hole"). Gopher tortoises have powerful front legs for digging and the strength in their legs made it extremely difficult to pull them from their burrow. The picture also shows various tools that could be utilized to help extract the tortoise from its home. Shovels of two kinds - a long handled pointed end type and one shorter handled, square end shovel (behind the **fatwood** stump) can be seen, as

well as a **mattock** and a "tater rack". These tools were brought along in case digging out the burrow or chopping roots was necessary and in case the gopher tortoise needed to be removed more forcefully. Sadly, gopher tortoises reproduce very slowly. In some areas, **overexploitation** occurred and populations of gopher tortoises were whipped out.

Besides wild blueberries and huckleberries, other native plants utilized from the pine woods (and interrelated habitats) included: yellowhaw and mayberry (in left background), **berries** (*Rubus* species), wild grapes, and prickly pear cactus (front in picture). Both cabbage palm (in left background) and saw palmetto (all through picture) provided "swamp cabbage" (heart bud of either plant) for raw eating out of hand, in salads, or cooked with salt, pork, hamhock, and the likes.

A hatchet buried in the fatwood (**lighter wood** or lightwood stump) is for cutting this wood to take home for kindling. The entire log, in fact, could be loaded onto the family's mule drawn wagon (in the background). On the wagon are other tools and equipment such as a long-handled axe for obtaining larger logs of oak or pine to load up and carry home for longer burning firewood (note: the **axe** is not visible, but it is there). Also, on the wagon are several barrels, crates and **croaker sacks** for whatever the family might find to put in them such as gathering Spanish moss (from the scrub oaks) for stuffing pillows, mattresses and furniture upholstery. Saw palmetto and cabbage palm fronds and fibers, oak to be split into thin strips, wild cane and other grasses & sedges might be gathered and used for weaving and plaiting hats, baskets, or mats. Also on the wagon might be jars to hold wild honey if the family is lucky enough to find a hive.

Also not visible on the wagon but would be there is a scatter gun of some sort loaded with buckshot or birdshot or a small caliber rifle for smaller game like squirrel or rabbits. The firearm would also afford protection from various sources - animal or human.

In the background can be seen the family's hounds. Not exactly purebred, there are traces of redbone, bluetick, and/or black and tan, in them. They're scouting out their territory as dogs will do. The dogs provide the family with companionship, hunting allies, and protection.

The galvanized steel washtubs are used by the family to hold captured gopher tortoises. These types of washtubs were in domestic use at least as early as 1900. The baskets the mother and daughter are using to collect the blueberries are based on baskets from the period of 1890's to 1930's. The larger split-oak basket is a market-style basket, while the small cane basket is actually called a "berry basket".

The clothing styles are based on photos and drawings from about 1890 up into the 1920's. Isolated countrywomen wore sunbonnets and long dresses as late as the 1930's and 1940's in some areas. Men's (and boy's) clothing changed little for decades.

### **Key Words and Concepts:**

[axe](#), [berries](#), [croaker sack](#), [fatwood](#), [gopher tortoise](#), [hunter-gatherer](#), [lighter wood](#), [mattock](#), [overexploitation](#), [settler](#), [yeomen](#).

**Ax (Axe):** Logging and turpentine hand tool. Were used to either fell longleaf trees or to cut off limbs once the tree was on the ground. Could be either single bit (one blade) or double bit (blades on two sides). Also used in the turpentine industry to start a catface or box cut (a broad ax or long ax respectively).

**Berries:** Soft fruits produced by blueberries, dogwoods, blackberries, plums, and other berry producing shrubs/trees that are eaten by many animals and insects in the longleaf pine forest. Also called soft mast.

**Croaker Sack:** Although "croaker" is how it is commonly pronounced in the South, the term likely is derived from "crocus sack". A crocus sack is defined as a gunnysack or a sack made of coarse (usually burlap) material. The derivation of the name is likely because crocus, or saffron, was first shipped in sacks made of this material; also called a "tow sack" or "grass sack" in the South.

**Fatwood:** The resin laden wood of longleaf pine. Known also as lightwood or [lighterwood](#) due to the ease it takes to catch on fire. Used a lot as kindling.

**Gopher Tortoise:** A medium sized land turtle that inhabits the sandy ground of open longleaf forests. Its den is important to the well-being of dozens of other species. Not found throughout the entire range of the longleaf pine forest. Since the gopher tortoise is cold-blooded, it spends a great deal of time outside in the entrance of the burrow (called the apron) soaking up the sun.

**Hunter-Gatherer:** Societies which do not farm or raise their own food but forage or hunt for it. Many of these societies are nomadic or semi-nomadic. Early settlers often resembled hunter-gatherer societies in their activities, particularly in hard times or crop failures.

**Lighter Wood:** See also [fatwood](#). Also called fat lighter or fat lighterwood.

**Mattock:** A kind of pick that is used for digging - has a flat-baled set at right angles to the handle. Also commonly called a "grubbing tool".

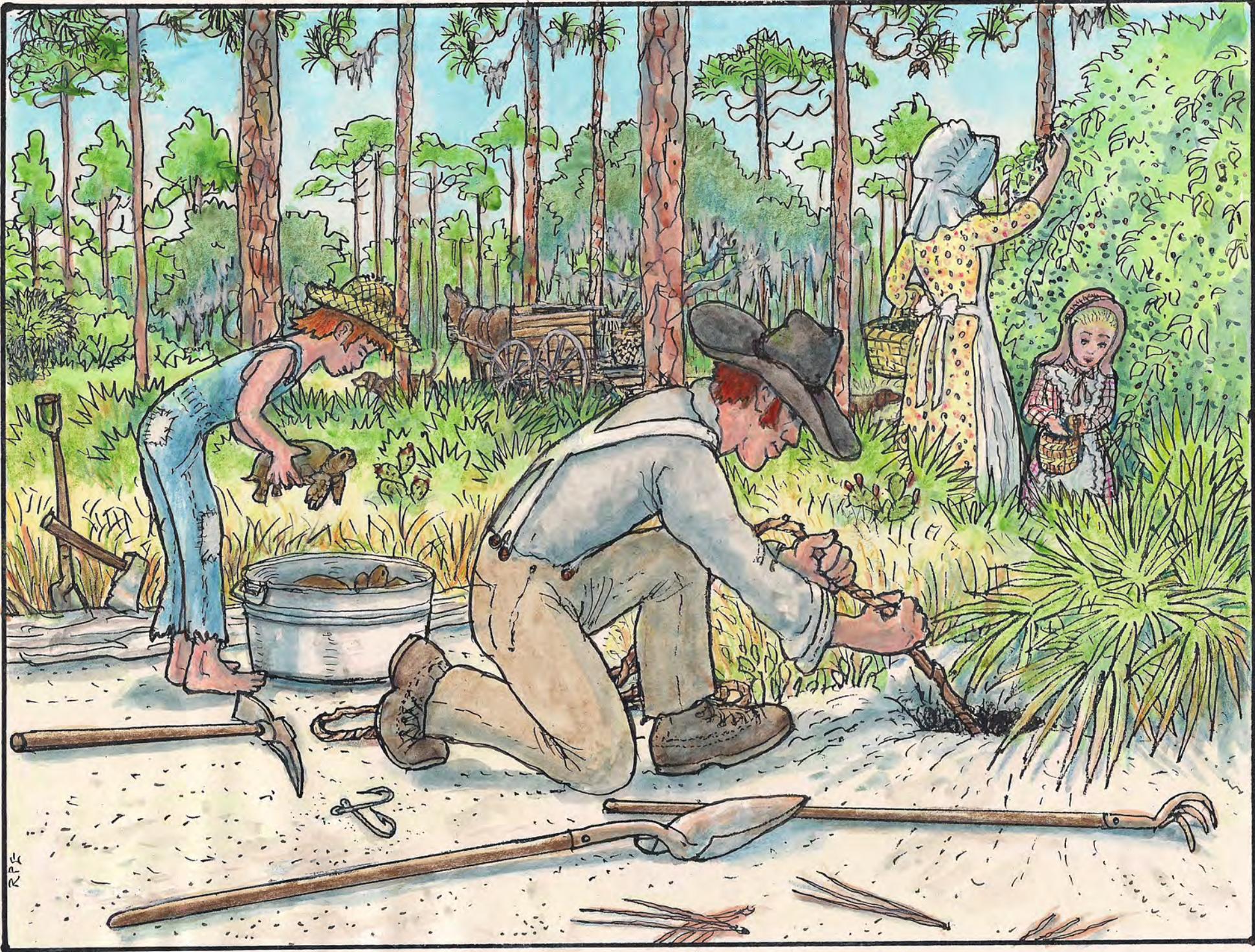
**Overexploitation:** The overharvest or overuse of a resource. The result is a depletion of or exhaustion of that resource. Overexploitation is the opposite of conservation. Longleaf pine forests were overexploited in the late 19th early 20th century. Species can also be overexploited (such as wood's bison or the passenger pigeon) and can result in their extinction.

**Settlers:** The first people in an area. Usually refers to the first Europeans in the New World.

**Yeoman:** The term given to frontier people or early settlers of a region.

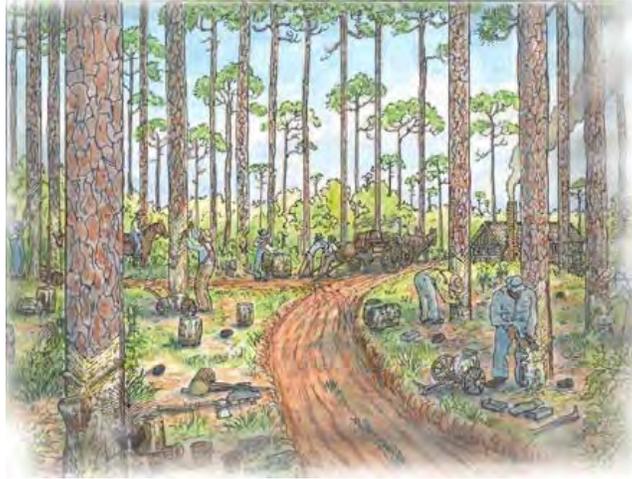
### **Suggested Activities:**

- Natural resources discussion: Benefits of our resources
- Describe life in early 19<sup>th</sup> century settlements in a specific state within the longleaf range





## As part of the Naval Stores Industry the Longleaf Pine Tree was Tapped for its Sticky Resin



(Bolded words in text indicate key words and concepts)

### Student Information:

Similar to how maple is tapped from maple trees in the Northeastern United States, thick sticky resin was also drawn off the longleaf pine tree. However, unlike sweet maple syrup, the resins scraped off the longleaf pine tree were used in thousands of non-edible products from waterproofing ships, to medicines, or as paint thinner.

### Teacher Information:

In the early decades of the twentieth century, the longleaf pine region was responsible for producing 70 percent of the world's supply of naval stores – the collective name for products such as **tar**, **pitch**, **spirits of turpentine** and **rosin** obtained from the pine tree. A century earlier, the dominance of North Carolina in the production of turpentine earned it the title of the Tarheel State (for the black gummy tar that would accumulate on the bare feet of workers). It was the highly resinous wood (often called **fatwood** or **lightwood**) of the longleaf pine tree that made it so desirable and sparked the naval stores industry throughout much of the south. The term **naval stores** was originally applied to the pitch and tar needed for **caulking** wooden ship planks and waterproofing canvas sails of the seagoing vessels of the Royal British Navy in the seventeenth century. As the industry evolved, the distillation of fatwood shifted to the processing of pine gum (oleoresin) extracted from the living pine tree. Around 1850, the production of gum turpentine peaked in North Carolina and began to spread southward through the longleaf pine belt as northerly forest were exhausted. In fact, the movement of many families in the South can be traced the naval stores industry.

Gum from the pine tree was distilled into rosin and spirits of **turpentine** in what has been described by many as an "oversized liquor still". The collection and processing of pine gum was a year round ordeal and often required a large work force. Laborers would work their way from

tree to tree chipping shallow gutters (called streaks) into the fresh wood of the tree face with a tool called a **hack**. This cut face and aluminum gutters nailed to the tree would direct the gum down into a "**box**" that was notched at the bottom of the tree by a broad axe. However, these boxes were often very destructive – essentially girdling the tree at its base. In the early years of the twentieth century, technology improvements allowed gum to be collected in clay or metal cups hung from the tree by a nail. The cut faces were sometimes called "**catfaces**".

A squad of workers traveled from tree to tree **dipping** gum from the cups or scraping the gum from the tree face (called **scrape**) and depositing it into barrels. When a worker finished his task on a tree, he would sing out a particular name he had chosen for himself. A **talleyman** would record this song with a dot. The number of dots determined a worker's pay. Barrels of gum were hauled to a nearby **distillery** and refined. All operations were overseen by the mounted "**wood's rider**".

### **Key Words and Concepts:**

[box cut](#), [catface](#), [caulking](#), [dipping](#), [distill](#), [fatwood](#), [hack](#), [lightwood](#), [naval stores](#), [rosin](#), [scrape](#), [spirits of turpentine](#), [talleyman](#), [tar](#), [turpentine](#), [wood's rider](#).

**Box Cut:** A term from the turpentine industry. A cut that was notched into the bottom of a pine tree where gum draining down the tree face collected.

**Catface:** A term used by the turpentine industry. The chevron marks slashed into a tree during the collection of resin (gum, oleoresin) using a tool called a hack. The slashes resemble cat whiskers and help direct the flow of resin downward. Bark is removed during the slashing processes creating an open "face" (or wound) on the tree's side.

**Caulking:** The process of stuffing material like [tar](#) into the cracks of wooden ship planks to stop water leaks. Caulking essentially "waterproofs" a wooden ship.

**Dipping:** A term used by the turpentine industry. The process whereby, resin (gum) is scraped out of pots affixed to the tree's side or scooped out the [box cut](#) at the base of the tree.

**Distilling:** A term used by the turpentine industry. Cooking down gum to yield various products. Mainly cooking down of gum to yield solid rosin and liquid spirits of turpentine (also called gum spirits). Distilling is done at a distillery.

**Fatwood:** The resin laden wood of longleaf pine. Known also as lightwood or [lighterwood](#) due to the ease it takes to catch on fire. Used a lot as kindling.

**Hack:** A term used by the turpentine industry. A tool which was used to cut into the inner bark of pine trees, wound the tree and stimulate resin flow (the tree's defense to the wounding).

**Lightwood:** Commonly called [fatwood](#) or lighter wood.

**Naval stores:** Substances (such as pitch and tar) derived from pine resin that was historically used to waterproof ships and ropes in the British Royal Navy, hence the name. Later came to be associated with all pine resin products, including turpentine and gum spirits.

**Rosin:** Dried resin. Used for many purposes ranging from cosmetics, pharmaceuticals, paper coatings and even baseball player "stickum". In country singer, Charlie Daniel's song "The Devil Went Down to Georgia" the character Johnny rosined up his bow in preparation to play his fiddle hard.

**Scrape:** The crystallized gum that has collected on the face of a pine tree. The dried gum was scraped off into a bucket, dumped into a large wooden barrel, transported to a distillery and cooked down. Sometimes referred to as gum (because of its gummy feel).

**Spirits of Turpentine:** see [Turpentine](#)

**Tally Man:** A term used in the turpentine industry to describe the man in charge of keeping a tally on the number of trees boxed or streaked by each worker. The number of tallies accrued by a worker was directly related to the money they'd get paid.

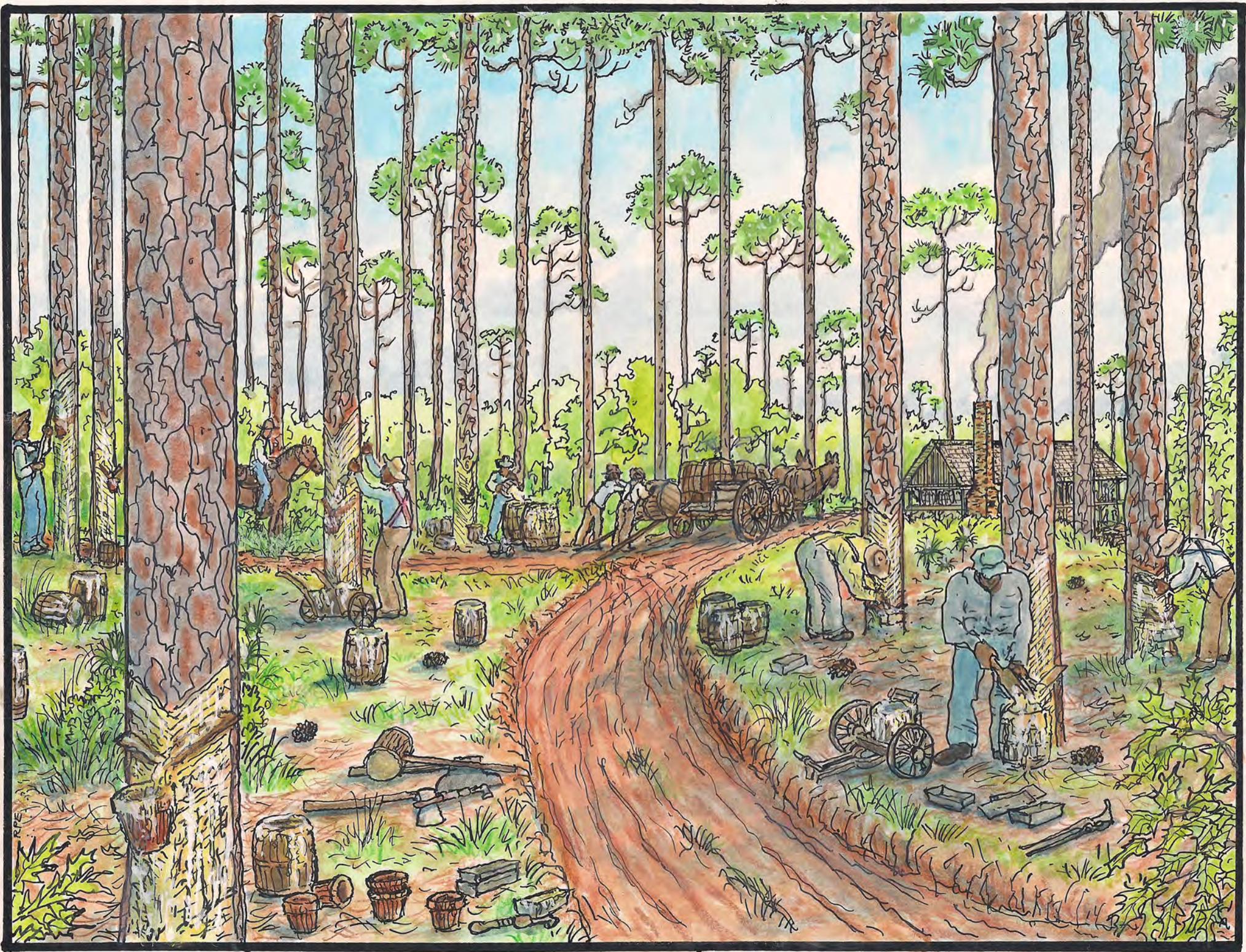
**Tar:** A term used by the turpentine industry. The heavier portion produced in the distillation of resin. When fatwood limbs were cooked down in a fire kiln this was usually produced. Although tar had a variety of uses, it was most often used in the waterproofing of ships. Tar was an early product of the naval stores industry.

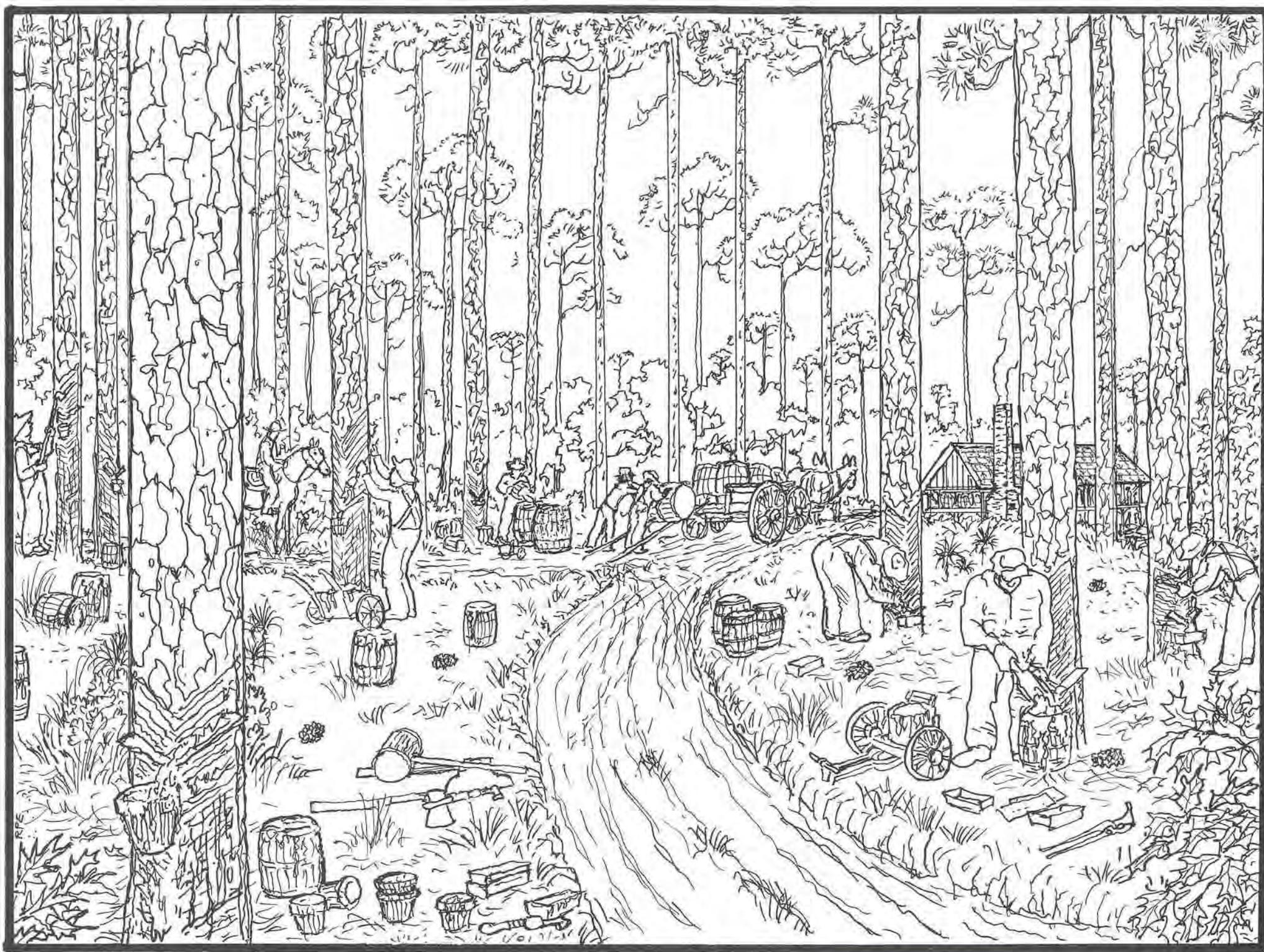
**Turpentine:** A product of the naval stores industry. A lighter fraction than rosin and is usually vaporized during the distillation process. Cooling the turpentine steam yields a liquid which is used primarily as a cleaner and paint thinner. Also called [spirits of turpentine](#).

**Wood's Rider:** A term used by the turpentine industry to describe the field superintendent. This individual usually rode a horse and reported directly to the manager of a turpentine operation.

### **Suggested Activities:**

- Natural resources discussion: Benefits of our resources
- Explain the importance of natural resources and land regions to the beginnings of industry and the development of a specific state's economy
- Explain the development of industry and trade in a specific state within the longleaf range, nationally and internationally, in the late 19<sup>th</sup> century using maps, globes, and time lines
- Describe the economic conditions of a specific state in the early 20<sup>th</sup> century
- Explain the role of a specific state's river systems in its technological and economic development





## Massive Longleaf Pine Trees Were Cut by Hand Axes or Two-Man Saws and Pulled From the Site by Mules or Oxen



(Bolded words in text indicate key words and concepts)

### Student Information:

Old longleaf pine trees produce beautiful lumber, highly valued for its strength, straightness, and resistance to rotting. Some have even called longleaf pine “one of the finest timber trees the world has ever known”. By the turn of the 20th century, most longleaf pine forests were being heavily logged to supply timber for a growing nation.

### Teacher Information:

At the turn of the twentieth century, much of the longleaf pine forest (also called yellow pine) was being logged. Massive longleaf pine trees were felled with hand **axes** or two-man **cross-cut saws** and skidded by draft animals to a more efficient transportation source (like a stream or a rail line). Oxen were the most preferred draft animals because their initial cost was low, they required little attention, and they could live on rough, coarse food and because of their cloven hoofs did not mire in boggy conditions. Except in wet, marshy country, mules would also have been used to haul logs. Mules were faster than oxen, could withstand warm weather conditions, were less excitable and required much less care than horses. Despite horses being more quick, active and intelligent than both mules and oxen, they required considerably higher upfront costs and higher level of care. Also, horses are tall animals making it difficult for the **teamster** to see trouble spots in the forest. This generally meant horses were not preferred in **logging** operations, though they were occasionally used.

Although two-man cross cut saws were more efficient than hand axes, many logging crews were slow to adopt them in the late 1800’s. One reason for the slow transition was the opposition by skilled axemen. These men were considered the aristocrats of laborers and took great pride in their trade. The crosscut saw required much less skill than the axe. But, so long as kerosene was liberally applied to the saw blade to prevent it from bogging down in the sticky **resin** of the

longleaf pine tree, productivity was much higher using the saw rather than the axe. The more difficult, unpleasant work (like a **swamper** or a **road monkey**) was often left to the unskilled workers.

In the longleaf region, displaced farmers and **sharecroppers** replaced the picturesque lumberjack of the Northwoods. African-Americans were segregated in their eating and sleeping arrangements and seldom were allowed to hold the jobs requiring the most skill. Except for the few Caucasians with a specialized skill, however, both races worked very long, hard hours for the low pay. Some loggers were employees of the logging company and others were self-employed and hired for a specific project (called **jobbers**).

If a company was logging extensive areas that took a significant time to cut, then they usually established camps for their workers. Work days were long and when the loggers had to stay in these camps, they were usually too busy to see their families except on Sundays.

Being a forest worker was fairly hazardous work. Although there was always the chance that a man could get cut with an ax or saw, the greatest danger came from falling trees. The hazard came particularly from limbs that would break off and hurtle through space unpredictably when a felled tree hit the ground.

### **Key Words and Concepts:**

[axe](#), [crosscutsaw](#), [jobber](#), [logging](#), [resin](#), [road monkey](#), [sharecropper](#), [swamper](#), [teamster](#)

**Ax (Axe):** Logging and turpentine hand tool. Were used to either fell longleaf trees or to cut off limbs once the tree was on the ground. Could be either single bit (one blade) or double bit (blades on two sides). Also used in the turpentine industry to start a catface or box cut (a broad ax or long ax respectively).

**Crosscut Saws:** Two-man saw used to cut wood. One man pulls on the saw handle while the other pushes on the saw handle and vice versa until the saw moves (cuts) back and forth across the log. The song sung by these men was "I don't want it, you take it. No I don't want it, you take it."

**Jobber:** A person contracted for a specific job. In this case, loggers who were contracted by a logging company to cut trees or raft logs to the mill. Also called a log-jobber or gyppo.

**Logging:** Cutting trees to produce forest products such as lumber, poles, paper, and the likes.

**Resin:** A complex and sticky blend of organic resinous compounds essentially dissolved in liquid commonly called turpentine. Resin is transported in channels called resin ducts. These ducts are held under significant pressure such that when the bark is broken and underlying wood is cut into, the resin flows for several days, or longer, until the resin crystallizes and the wound heals. Also called gum or oleoresin. Not to be confused with sap.

**Road monkey:** An unskilled position in logging operations. The person who cleans the logging roads of debris and animal manure. Also called a chickadee or sandman.

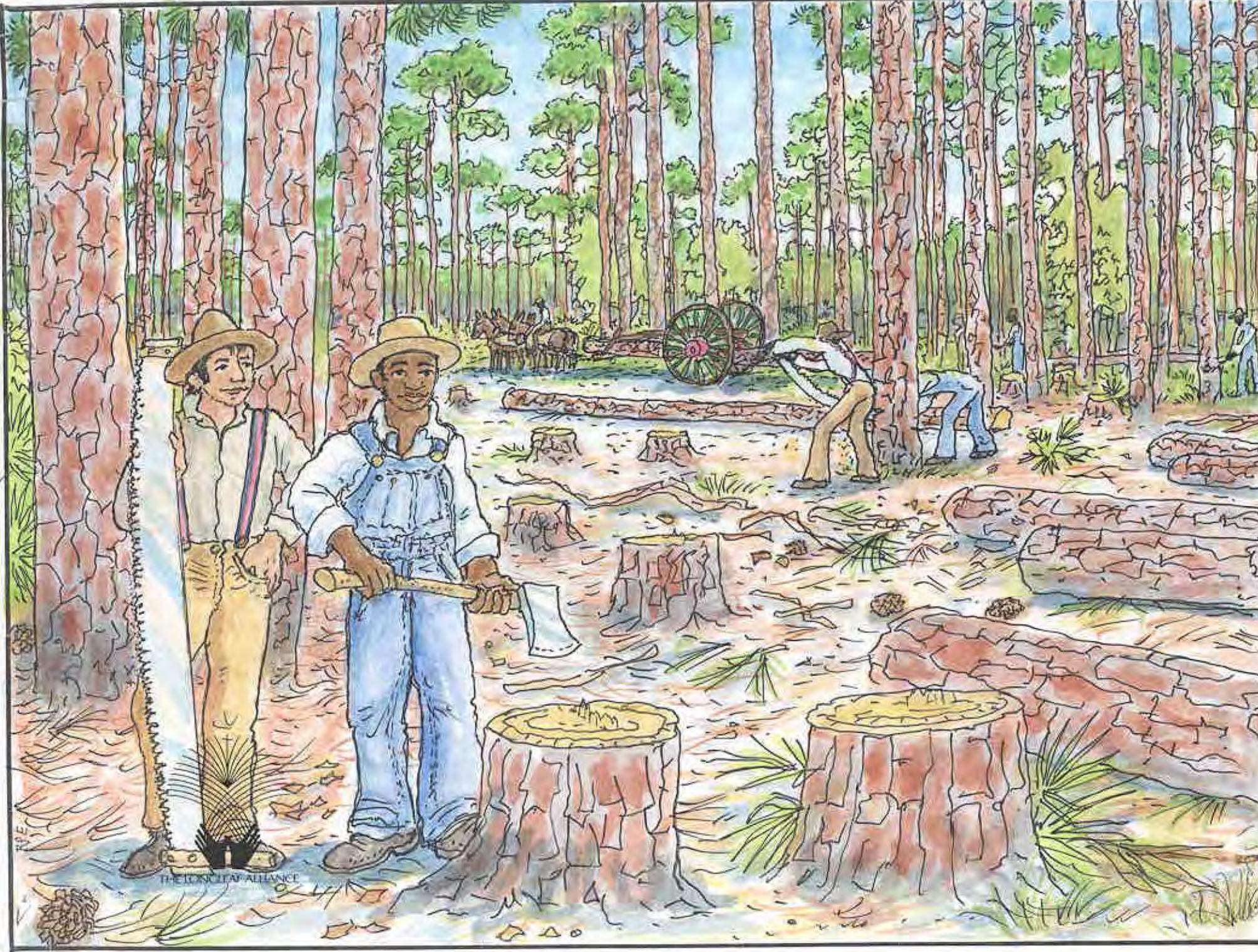
**Share cropper:** An individual who farms (and often lives on) a piece of land owned by someone else. A portion of that individual's crop (or crops) is used for rent to pay the landowner. Also called a tenant farmer.

**Swamper:** An unskilled forest worker, who clears the ground of underbrush, fallen trees, and other obstructions in preparation to constructing a logging road, opening out a gutter road, skidding with animals, or yarding with a donkey engine. Also called a beaver, brusher, or gutterman.

**Teamster:** A person who drives horses

### **Suggested Activities:**

- Natural resources discussion: Benefits of our resources
- Explain the importance of natural resources and land regions to the beginnings of industry and the development of a specific state's economy
- Explain the development of industry and trade in a specific state within the longleaf range, nationally and internationally, in the late 19<sup>th</sup> century using maps, globes, and time lines
- Describe the economic conditions of a specific state in the early 20<sup>th</sup> century
- Explain the role of a specific state's river systems in its technological and economic development



THE LONELY ALLIANCE



## Floating Longleaf Pine to the Sawmill



(Bolded words in text indicate key words and concepts)

### Student Information:

A little over 100 years ago, there were no trucks and few railroads. Those roadways that did exist were often overused dirt roads with many potholes. In those days, horses, carriages, and gopher tortoises were often the only traffic. When logging, heavy items like logs had to be floated or carried on boats if they were to be moved very far. Rivers were the highways of the time.

### Teacher Information:

Because roads and transportation were very primitive in the South until at least the middle of the 19th century, most **bulk goods** were moved by water. Oxen and mules pulled wooden wheeled wagons (2-wheeled "**caralog**" carts or eight wheeled "**Lindsey wagons**") to move logs short distances to rivers and streams.

Oxen were preferred over mules because they were lower maintenance and (with their cloven hoofs) could travel through wet areas easily. The oxen nearest the log cart were called the "tongue steers". The second yoke was called the "grab steers", the third yoke was called the "swing steers", the fourth yoke was called the "lead swing steers" and the fifth yoke was called the "lead steers". Efforts were made to always have the "lead steers" white or to have some visible white places on them. This was so that the driver and the other oxen in the team could see where the "lead steers" were before daylight and after dark. The "tongue steers" were rigged to the tongue of the cart and the other yokes were rigged to the **yoke** of the steers behind with chains. The drivers of the teams were called ox drivers and a good ox driver was fond of his oxen, was kind to them and saw that they were well fed and cared for. The **driver** carried a long whip made of plaited rawhide with a popper on the end and attached to a long handle. The whip was used principally for guiding and directing the oxen and seldom for punishment to the oxen for failure to obey the commands of the driver.

Once to the streamside, specialized tools like **cant hooks**, **peaveys**, or **piques** were used to roll, push or pull the logs into the water. Sometimes, small, water-powered mills, were used to "square up" logs (sawn on at least two and sometimes four sides to form a square timber called a "**cant**") before they were floated. Because the same waterways were used by various persons and companies it was necessary that those persons and companies have a log brand or mark to identify their logs and timbers. Log brands or marks were put on the logs and timbers by a **roller** before they were put in the waterways to be floated to market. The timber and log brands could be recorded in the office of the Judge of Probate in each county through which the logs or timbers were floated.

Often times, the milling of logs into lumber was done at distant locations. Depending on the size and shape of the water body either individual logs, **log rafts**, or raft of sawn **timbers** were formed and floated down to these mills (the latter being called a **deal**).

One or two raft riders, equipped with a long sweep oar and a long, spiked pole (pike) would ride each raft to keep it in the channel and free from sand bars and **snags** in the river. Some riders had shoes with special cleats affixed to sole. Most, however, preferred to go barefoot (claiming they could "understand" the log better barefoot). The rafts were sometimes held together by lengths of "bullis" or wild grape vine or chain shackles wound around spikes or with chains looped through rings (called **log dogs**).

**Rafting** was a specialized trade. Skilled log-riders were highly desired and hired on contract by logging companies. Once these raft riders reached their destination, they would spend days walking back (or later taking the train) to the logging site or to their next job. Various metal pieces (like dogs and shackles) were put into large wooden barrels and taken back up to the logging site via wagons.

Many of these dense logs heavy with resin sank during their transport to mills. These sunken logs (often called **sinkers** or **deadheads**) can still be found today littering streambeds throughout the Southeast.

The forests near larger streams were the first to be heavily logged to take advantage of the easy access to this transportation. It wasn't until the advent of steam technology that it was economically feasible to log many areas of the forest interior. Much of the (structural) **lumber** and timbers were **exported** from southeastern seaports like Savannah, Charleston, Port St. Joe and New Orleans to distant countries who relished the wood of longleaf **heartpine**.

### **Key Words and Concepts:**

[bulk goods](#), [cant](#), [cant hook](#), [caralog](#), [deadhead](#), [driver](#), [export](#), [heartpine](#), [Lindsey wagon](#), [log dog](#), [log raft](#), [lumber](#), [peavey](#), [pike](#), [rafting](#), [roller](#), [sinker](#), [snag](#), [timber](#), [yoke](#).

**Bulk Goods:** Heavy and/or large commodities like lumber, logs, timber, coal, barrels of turpentine, cotton bales, and the likes. Bulk goods could be transported by rail, horse drawn wagons, paddle-boats or bundled together and floated to the markets.

**Cant:** A squared off piece of timber that was initially a round log. The pieces cut off the log to make the square cant were called slabs. Slabs were often discarded or burned by lumber companies.

**Cant Hook:** A specialized piece of logging equipment used to leverage large timbers around. A swiveled hook attached to the end of a stout pole not more than 3 feet long. Cant hooks are still in use today in the forest industry. Similar to a peavey, but of an earlier design. Also called a cant dog.

**Caralog:** A large two-wheeled cart that was used to move logs. The wheels had wooden spokes and a metal rim. Tar was used to lubricate the axels of the cart. Oxen, mules, or horses were used to move the caralog.

**Deadhead:** A submerged pine log. Because longleaf pine trees were dense with resin, many logs sank (or partially sank) as they were floated down rivers and streams to sawmills in the early 20th century. The rot resistant heart pine of the log meant that most trees did not decay once submerged. Often, this created a navigation hazard for decades to come. However, these sunken logs also provide valuable refuge for the diverse fish, turtles, and invertebrates found in the southeast. Deadheads are also called sinkers, sleepers or submerged sawyers.

**Driver:** A person who controls the movement or direction of a team of horses, mules or oxen. An oxen-driver was also called a bullwhacker or a bull puncher.

**Export:** Goods and products shipped to another nation or region for sale. Both turpentine and lumber from the longleaf pine forest were widely exported.

**Heartpine:** An industry term used to call the heartwood of longleaf pine trees. Usually described as a reddish-brown color with dense wood. Because of its high resin content, the wood was usually very strong and rot resistant.

**Lindsey Wagon:** An eight wheeled wagon patented in 1899 in Laurel, MS and designed for hauling heavy loads of logs over uneven and rough landscapes. At the time this wagon was revolutionary and greatly increased the productivity of logging.

**Log Dog:** Tool used in the logging industry used to keep log rafts together. Log dogs were essentially shackles affixed on either end with two spikes. Each spike was driven into a log and the shackles held the logs together. Another variation used to hold logs together was basically a large staple called a raft dog. Logs that were held together were said to be "dogged" together.

**Log Raft:** A series of cut logs held together and floated downstream to a sawmill. A large auger (about 5 feet) called a raft auger was used to bore holes near the ends of the logs and they were arranged side by side using "lash poles" (smaller saplings laid perpendicular to the log raft). Next "lash poles" were nailed to the raft with wooden pigs (large wooden dowels or pegs). Often, logs were bored on land. Only the most skilled experts could bore holes in a log while it

was afloat. Later the sapling and peg method was replaced with metal raft shackles or dogs. Many logs could be lashed side by side forming a large "platform" raft or smaller rafts, three to four trees wide could be dogged together to form a "snake raft". The later were preferred in smaller, more sinuous streams. A raft made of squared off (cant) timbers was called a "deal".

**Lumber:** Boards sawn from logs and used for high-quality pieces in construction, e.g., flooring or paneling. Longleaf pine produces high quality heartpine lumber.

**Peavy:** A logging tool. A hybrid between a pike and cant hook developed in 1870 by a blacksmith named John Peavey. The tool accomplished what both the pike and cant hook were designed to do...roll and push logs. Also called the American peavey. The stout wooden handle is called a stock.

**Pike:** A logging tool. Although it's full name is a "jam pike" it is commonly called "pike" by loggers. A spike on the end of a long pole used to pry and push around rafted logs.

**Rafting:** A means of transporting goods to processing facilities or markets. Logs were often rafted to sawmills (see [log raft](#)). However, it was not uncommon for large barrels of turpentine to be lashed together and floated down stream.

**Roller:** A logging term used to describe the man who end-stamps logs for identification, and then piles the logs together for transportation elsewhere. A stumping or marking hammer was used to stamp the log with a distinctive mark.

**Sinker:** see [deadhead](#)

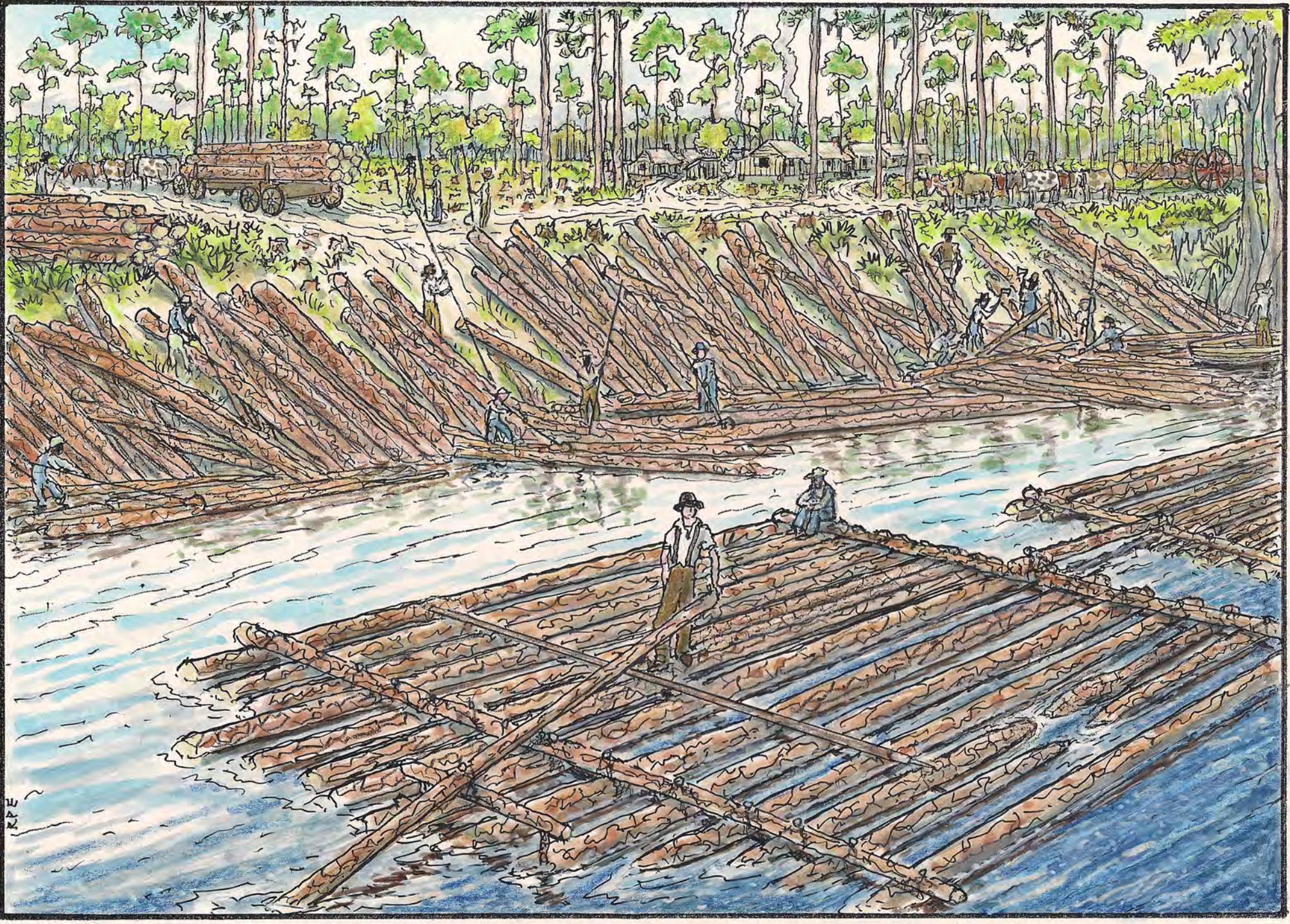
**Snag:** A standing dead tree. Also called a widowmaker. Home for many critters in the longleaf pine forest and a conduit through which lightning can pass and create fires.

**Timber:** Products of a tree used in construction, e.g., structural beams, railroad ties, bridge timbers. More desired for their strength and durability rather than their looks. Longleaf pine makes very strong, very rot-resistant timbers. Also the term yelled by a lumberjack as a cut tree is falling.

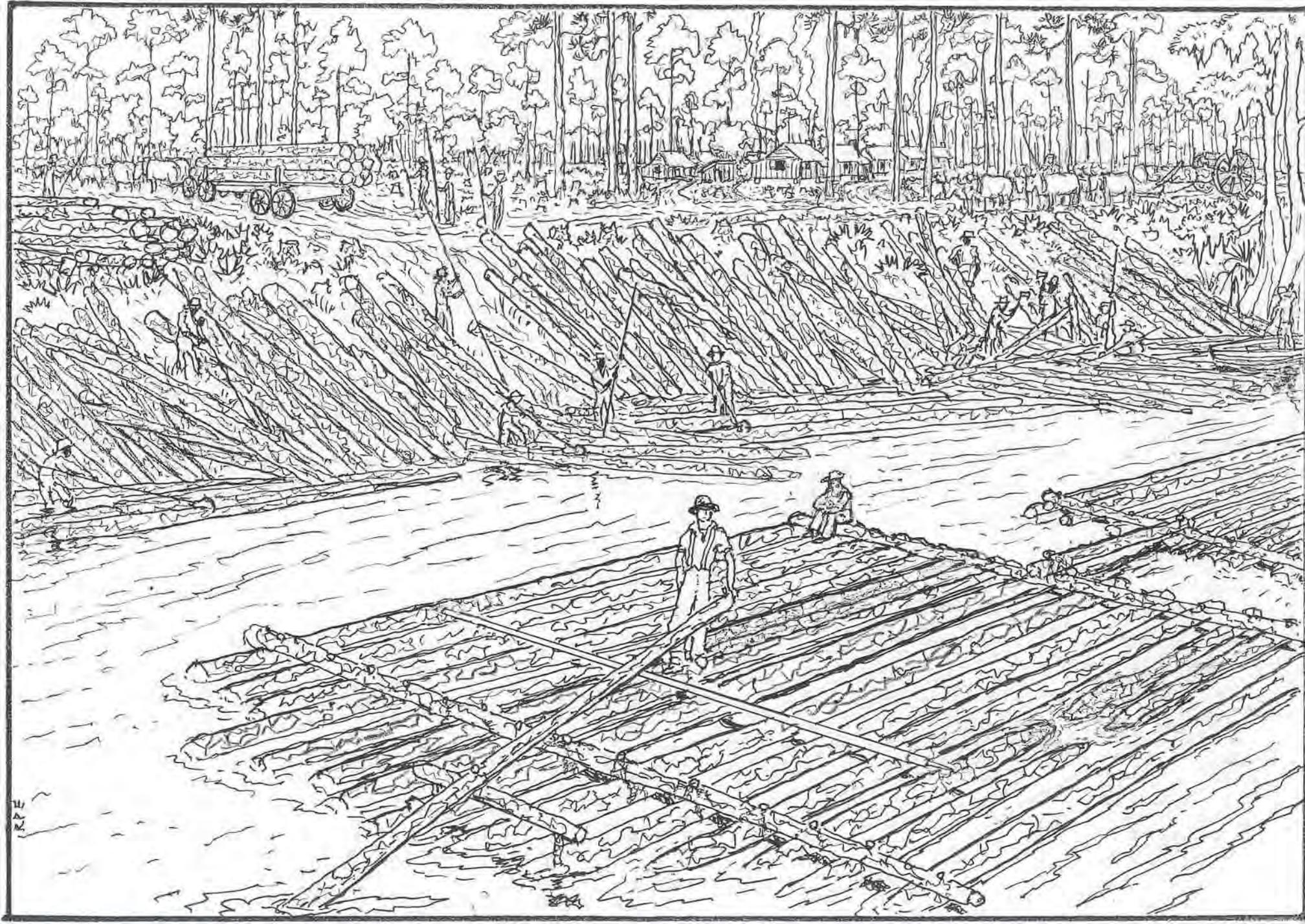
**Yoke:** Stable gear that joins two draft animals at the neck so they can work together. Also used to describe a group (or yoke) of oxen.

### **Suggested Activities:**

- Explain the role of a specific state's river systems in its technological and economic development

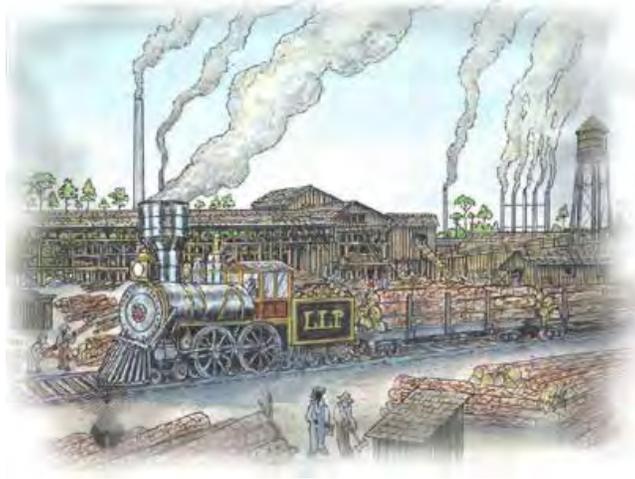


RPE



W.A.M.

## Steam Engines Made Hauling Wood Much Easier and Opened Up Most of the Longleaf Forest to Logging



(Bolded words in text indicate key words and concepts)

### Student Information:

**Steam engines** made logging much easier. Loggers built railroad tracks along ridges and logged on both sides of them. Trains replaced rafts as the best way to move heavy logs to the sawmill.

### Teacher Information:

The exhaustion of the white-pine forests in New England by the end of the nineteenth century saw northern investors and land speculators purchasing large areas in the south covered with vast acreage of longleaf pine. With this investment came advances in technology to step-up production and increase efficiency of logging. Before the use of steam power, it was not cost effective for a company using mules and oxen to log much more than a mile or two from streams and rivers. This meant millions of acres of backcountry longleaf forests were untouched prior the twentieth century. Steam power, however, opened up the entire longleaf pine forest landscape to logging. Few areas were spared from **logging**. By 1907, the 5 ½ million acres of old-growth longleaf pine forests were being cut per year.

Timber companies built **spur lines** along ridges across the south and logged the slopes on either side. These lines were also called **tram lines** (named after the train) or **dummy lines** (because they weren't considered a "real" rail line connecting one community to another). Because these rail lines were often haphazardly laid onto the ground, the wheels of the flatcars had several inches of left/right and up/down "play" in them. Still it was not uncommon for trains to "jump" the tracks.

Early steam locomotives burned wood (usually pine) for fuel. The stack on these wood-burning locomotives was designed to bulge at the top. This bulge was engineered to act as a spark

arrester and lessen the threat of wildfire. Sparks coming off of train wheels, however, were responsible for starting many fires in the woods.

Some companies used **steam skidders** powered by "**donkey engines**" to haul logs to the trackside where they were then loaded on rail cars. Although efficient, these machines were very destructive to the regeneration of the forest as logs were carelessly skidded over young longleaf pine seedlings. Trains could move large amounts of **bulk goods**, including wood, efficiently and they soon overtook water transport as a shipping choice.

The **milling** of wood was also powered by steam. Prior to the use of steam, most mills were powered by water and were limited in where they could be located. Such mills were not efficient and did not produce much sawn wood. With steam, mills were often built close to railheads and became the focal points for mill towns. At first, most mills were constructed of wood. However, fire was a constant threat and many a mill was burnt to the ground. Over time, mills switched to using metal in their construction.

When all the timber that could be reached from a spur was cut, the trains backed out, pulling the rails up behind them. Old rail beds or tram ways are common across the southern landscape today. Steam locomotives that were not sold to other logging companies or to commuter railroads were usually scrapped for metal. Today only a handful of these steam workhorses of the lumber industry remain.

### **Key Words and Concepts:**

[bulk good](#), [donkey engine](#), [dummy line](#), [logging](#), [milling](#), [spur line](#), [steam engine](#), [steam skidder](#), [tram line](#)

**Bulk Goods:** Heavy and/or large commodities like lumber, logs, timber, coal, barrels of turpentine, cotton bales, etc. Bulk goods could be transported by rail, horse drawn wagons, paddle boats or bundled together and floated to the markets.

**Donkey Engine:** A small, steam powered engine of one to four horsepower that burned wood for fuel (later, combustion engines replaced the steam engine). An extremely valuable innovation in early logging. The correct name is the Dolbeer Logging Engine named after its inventor John Dolbeer in 1881. Although it had many uses, the engine was used in logging for dragging logs through the forest, or lifting and carrying them on an aerial cable tramway. When mounted on a railroad car, the donkey engine instantly becomes a convenient steam crane for use in building the railroad.

**Dummy Line:** a term used in railroad logging to describe railroad tracks that did not connect communities nor seem have any direction to them. Also called [spur](#) or tram lines.

**Logging:** Cutting trees to produce forest products such as lumber, poles, paper, and the likes.

**Milling:** Making a finished product from a raw material at a sawmill.

**Spur lines:** Dead end rail lines built to enable logging in remote areas. Also called [dummy lines](#).

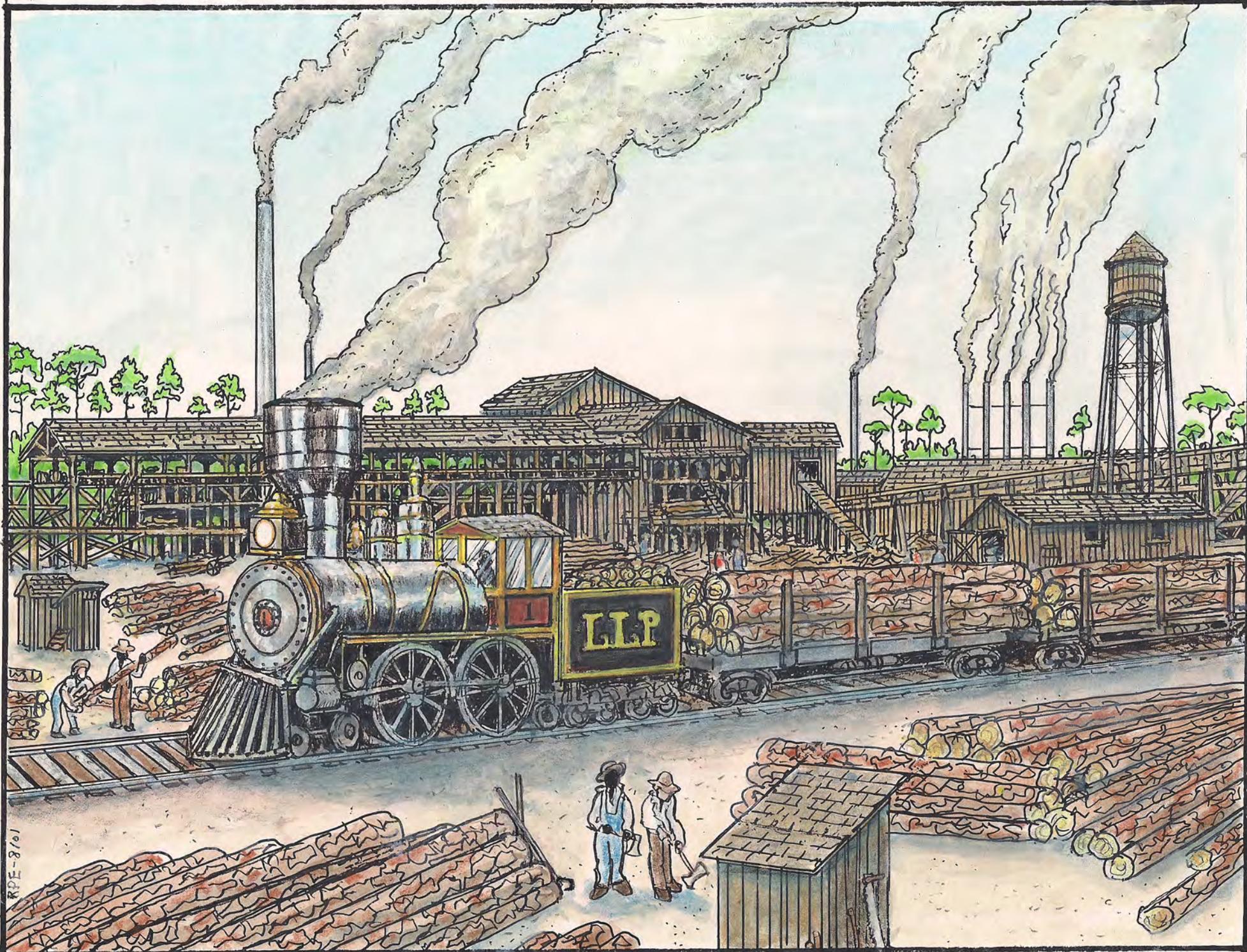
**Steam engines:** Engines powered by boilers to drive powerful locomotives and other machinery.

**Steam skidder:** A steam (and later electrically) driven device operating on or near a railroad track, which skids logs by means of a cable. Also called a steam jammer.

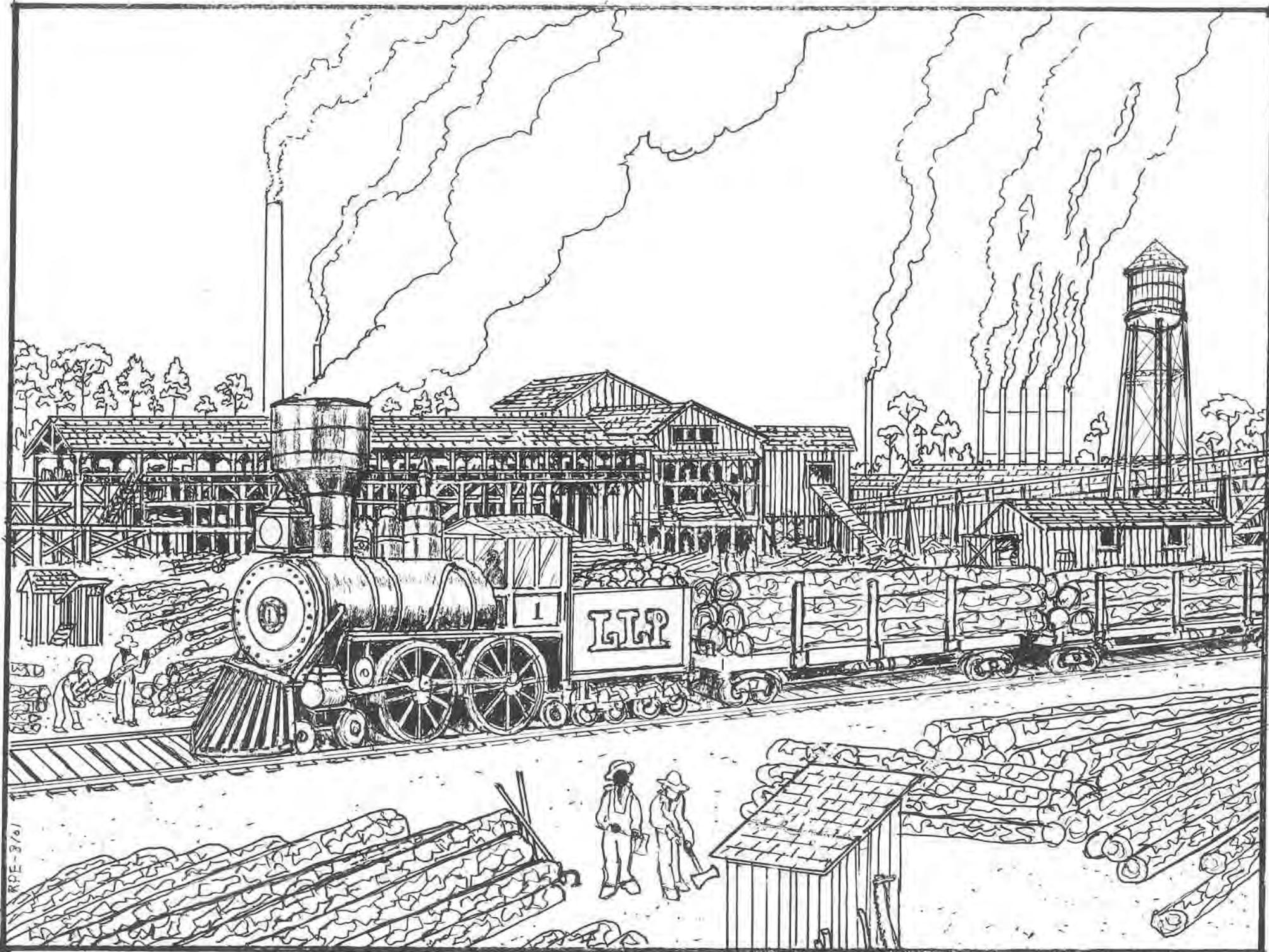
**Tram Line:** See [dummy](#) or [spur](#) lines.

### **Suggested Activities:**

- Discuss pollution and the Industrial Revolution.
- Explain the importance of natural resources and land regions to the beginnings of industry and the development of a specific state's economy.



RPE-8/01



RPE-3/61

## Wild Hogs Rooting Up Longleaf Pine Seedlings



(Bolded words in text indicate key words and concepts)

### **Student Information:**

Believe it or not, wild pigs ate countless numbers of young longleaf pine seedlings—earning them the nickname of the Piney-wood’s Rooter. Pigs are not native to the United States but were introduced by explorers and early settlers to the longleaf pine woods.

### **Teacher Information:**

**Non-native** plants and animals can have devastating effects on native ecosystems. Without natural predators to keep non-native species numbers in check, the population of these “**exotics**” can quickly explode and “invade” the habitat of native species. Three of the more nasty **invasive** species in the longleaf pine range include kudzu, red-imported fire ants, and cogon grass.

Pigs were an important source of meat to early European explorers and settlers to the longleaf pine woods. Without refrigeration, bacon kept best “on the hoof” rather than butchered. In addition, pigs needed very little care and were often left to fend for themselves by feeding in the woods—eating anything from acorns to small snakes. It’s understandable that once out in the woods, many of these pigs escaped captivity and became wild (known locally as wild or **feral** hogs, piney-wood’s rooters, **wood’s hogs** or **razorbacks**). Because pigs have few natural predators besides man, once they were introduced into the wild, their population increased dramatically.

For longleaf pine trees, the role of introduced pigs had long-lasting negative effects. One favorite food on which wild hogs fed voraciously was the soft root system of young longleaf pine seedlings. Pigs’ snouts rooted up longleaf pine seedlings and the succulent root system was consumed. Reports have been made of one hog being able to eat up to 400 longleaf pine seedlings per day.

In the wake of the hog **population explosion** in the wild, young longleaf seedlings suffered. This was especially significant in areas cutover by loggers. Without any young seedlings left to replace the cutout trees, the landscape looked desolate. Over time, foresters realized the connection between feral hogs and forest regeneration. With hogs present in the forest, it could not regenerate. In some areas, entire **cohorts** of trees are missing due to consumption by woods hogs. In 1946, forester William Wahlenburg wrote: “the razorback hog is the arch enemy of longleaf pine, particularly on the moister sites and when other range food is scare. Hogs break off, girdle or uproot seedlings to get the pungent **phloem** near the root collar”.

Razorback hogs also played an important role in the culture of those living amongst the piney woods. Although, these undernourished hogs were often riddled with a variety of different worms and parasites, they could (in hard times) be slaughtered and used as a meal for a family. A well-used southern colloquialism says that a person who is scrawny looking is “as skinny as a razorback hog”. Hog lard could be mixed with a various plants found in the woods to treat illnesses. A tree that was rubbed on by a hog was thought to cure neck aches when the afflicted individual rubbed their neck on the same tree.

### **Key Words and Concepts:**

[cohort](#), [exotic](#), [feral animal](#), [invasive](#), [non-native](#), [phloem](#), piney-woods rooter, [population explosion](#), [razorback](#), [wood's hog](#).

**Cohort:** A generation born during the same time frame (year, season, month, etc.). A cohort of seedlings are ones germinated in the same seed year (for longleaf pine, this may be every several years).

**Exotic:** Something not found in an area naturally. In most cases it was introduced to an area by man. With few natural predators, these exotics can reproduce unchecked, e.g., fire ants, kudzu, feral hogs.

**Feral Animal:** Domestic animals gone wild. Physical changes are usually noted in offspring such as teeth elongating, coat growing longer and changing colors as in the case with feral hogs.

**Invasive:** Something involved in an invasion or aggressive attack. For example, kudzu is a very invasive plant and can quickly take over an area.

**Non-native:** See [exotic](#).

**Phloem:** The tree equivalent to veins of the human body. Essentially it is a system of tubes that transport sugar and other organic nutrients throughout the plant.

**Piney-woods rooter:** Barn yard pigs which have essentially gone wild (or feral); also called razorback or wood's hog. These pigs had an acquired appetite for longleaf pine seedlings and often devoured entire cohorts of longleaf pine seedlings. Some said that hogs that fed exclusively on pine seedlings tasted like turpentine. Often riddled with parasites, the hogs were

malnourished and often looked half starved. In fact, the bony spinal column showing is what earned the hogs the name razorback.

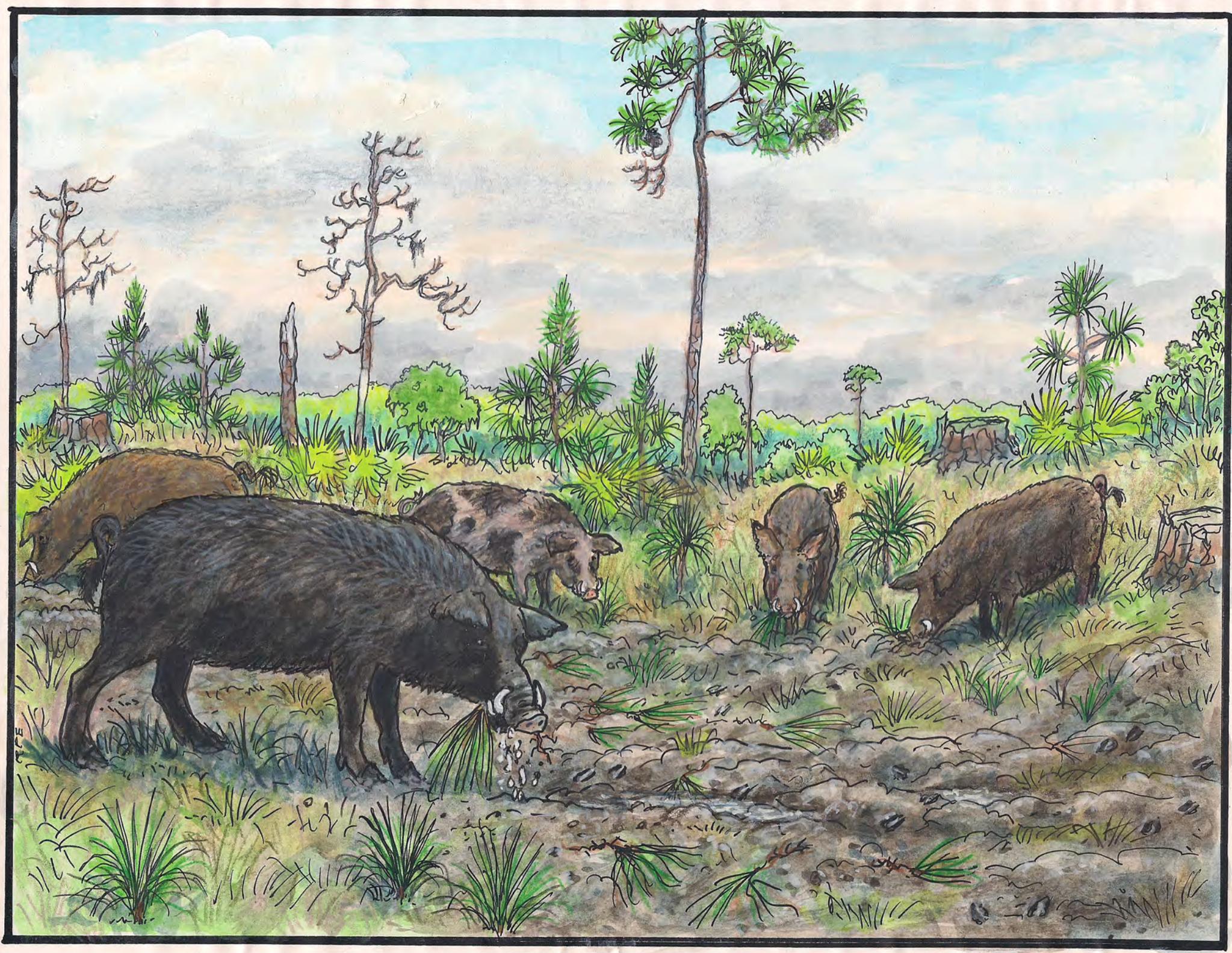
**Population explosion:** A large (and often unexpected) increase in the population of some plant, animal or insect. Often times, the population surpasses the ability of an area to sustain them. Without food to sustain themselves, population explosions can be followed by large die offs or population busts. Usually, in the absence of natural predators, non-natives experience population explosions.

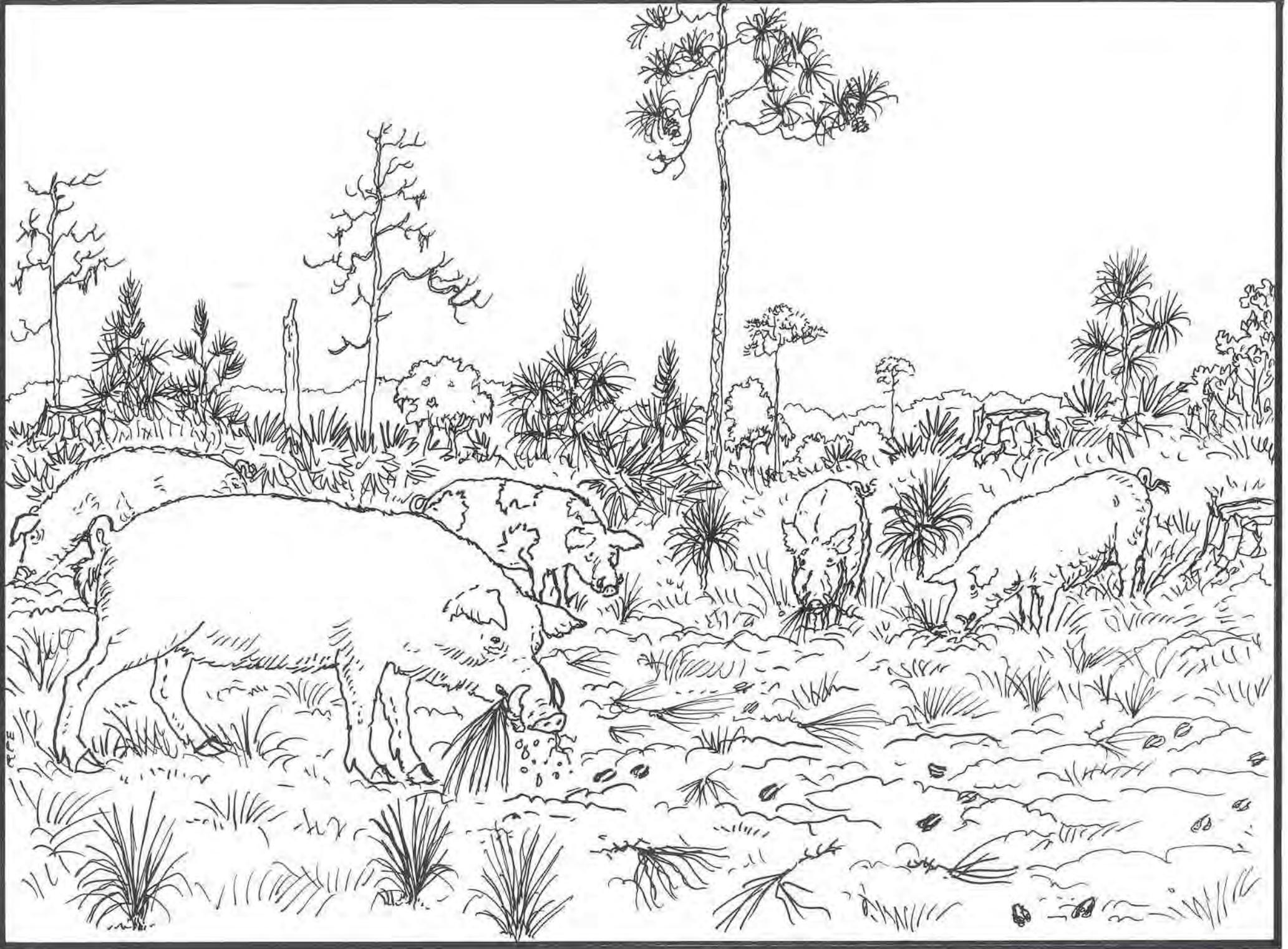
**Razorback:** See [piney-woods rooter](#). Some have suggested that unlike the piney-woods rooter, razorback hogs were direct decedents of the hogs brought to North America by early European explorers. Furthermore, some have suggested that razorback hogs occupied different areas than the piney-woods rooter (also called the wood's hog or feral hog). Razorbacks were said to occupy ridge-tops while wood's hogs occupied lower lying areas. Such distinction, however, is likely based on speculation and folklore.

**Wood's Hog:** See [piney-woods rooter](#).

### **Suggested Activities:**

- Describe the damage that non-natives wild hogs can do in a longleaf forest.
- Relate structural characteristics and behavior of various animals to their roles within an ecosystem.





## Planting Loblolly Pine in Cutover Longleaf Pine Forests by Civilian Conservation Corps Enrollees in the 1930's and 40's



(Bolded words in text indicate key words and concepts)

### **Student Information:**

During the years of the Great Depression, times were tough for many Americans. To help fight off these hard times, the thirty second President (Franklin D. Roosevelt) created jobs for millions of unemployed young men to do projects which helped protect the environment. These people formed what was called the Civilian Conservation Corps. In much of the South, land that was logged of all of its trees stretched as far as you could see. Young longleaf pine trees were difficult to find and hard to plant, so instead of longleaf the Civilian Conservation Corps planted this barren land with loblolly pine or slash pine.

### **Teacher Information:**

Accepting the Presidential nomination on July 1, 1932, New York Governor Franklin Roosevelt planned a fight against **soil erosion** and declining **timber** resources by utilizing the unemployed of large urban areas. He proposed to recruit thousands of unemployed young men (mostly white males between the ages of 18 and 25 years old), enroll them in a peacetime army, and send them into battle against the destruction and erosion of our natural resources.

The **Civilian Conservation Corps** (aka CCC) camps were set up all over the United States. The men planted trees, built public parks, drained swamps to fight **malaria**, restocked rivers with fish, worked on flood control projects and a range of other work that helped to conserve the environment. Between 1933 and 1941 over 3,000,000 men served in the CCC. The pay was \$30 dollars a month with \$22 dollars of it being sent home to dependents. Throughout the Corps, more than 40,000 illiterates were taught to read and write.

CCC enrollees throughout the country were credited with renewing the nation's decimated forests by planting an estimated three billion trees from 1933 to 1942. In the South, CCC

enrollees began to plant large areas of cutover land with pine seedlings. Unfortunately, the forestry community at the time saw longleaf pine as a slow-growing tree and difficult to regenerate. So, in place of **native** longleaf, **off-site** loblolly or slash pine were carefully planted in tidy rows, amid the skeletons of the ancient pine forests. This new crop of **loblolly** and **slash pine** plantations were less tolerant of fire than longleaf pine trees. In order to protect this new investment of trees, a crusade spearheaded by the **Southern Forestry Educational Project** was initiated to preach that fire was a destructive agent in the landscape and needed to be snuffed out. This message was later passed on to **Smokey Bear**.

### **Key Words and Concepts:**

[CCC](#), [Civilian Conservation Corps](#), exotic, [loblolly pine](#), [malaria](#), [native](#), [off-site](#), [slash pine](#), [Smokey Bear](#), [soil erosion](#), [Southern Forestry Educational Project](#), [timber](#).

**CCC:** See [Civilian Conservation Corps](#)

**Civilian Conservation Corps:** (also called CCC) Government agency formed to relieve the mass unemployment of the Great Depression and to restore abused lands in the 1930's. In the southeast, many in the CCC were used to replant cutover longleaf forests with slash or loblolly pine. They were also used to help put out fires.

**Exotic:** Something not found in an area naturally. In most cases it was introduced to an area by man. With few natural predators, these exotics can reproduce unchecked, e.g., fire ants, kudzu, feral hogs.

**Loblolly Pine:** A common southeastern pine species which grows fast and provides good fiber crops and valuable lumber. It grows on a variety of sites. It is not very tolerant of fire (especially at smaller sizes). It is also called "old-field" pine because of its ability to rapidly colonize areas abandoned by agriculture.

**Malaria:** A disease caused by parasites that is transmitted through the bite of an infected mosquito; marked by sudden fits of chills and fever. At one time, this disease was very common in the South. Many people living on coast escaped the hordes of mosquitoes in the summertime by moving inland into the longleaf pine forests.

**Native:** Naturally found in an area. Opposite of non-native or [exotic](#).

**Off-site:** Not found in that area unless man intervenes to put it there.

**Slash Pine:** A southeastern pine species particularly well adapted to a variety of soils. It produces good quality forest products. It is not as tolerant of fire as longleaf pine trees.

**Smokey Bear:** A campaign initiated in 1944 to preach the importance of fire prevention in forests. An affectionate black bear called Smokey Bear was adopted as its mascot. The Smokey Bear campaign is the longest running public service campaign in US History. Smokey's forest

fire prevention message remained unchanged for 50 years until April 2001, when the Ad Council updated his message to address the increasing number of wildfires in the nation's wildlands.

**Soil Erosion:** The gradual wearing away of soil (land) by water, wind and general weather conditions. Generally, once trees and plants are removed from an area, erosion is greatly accelerated.

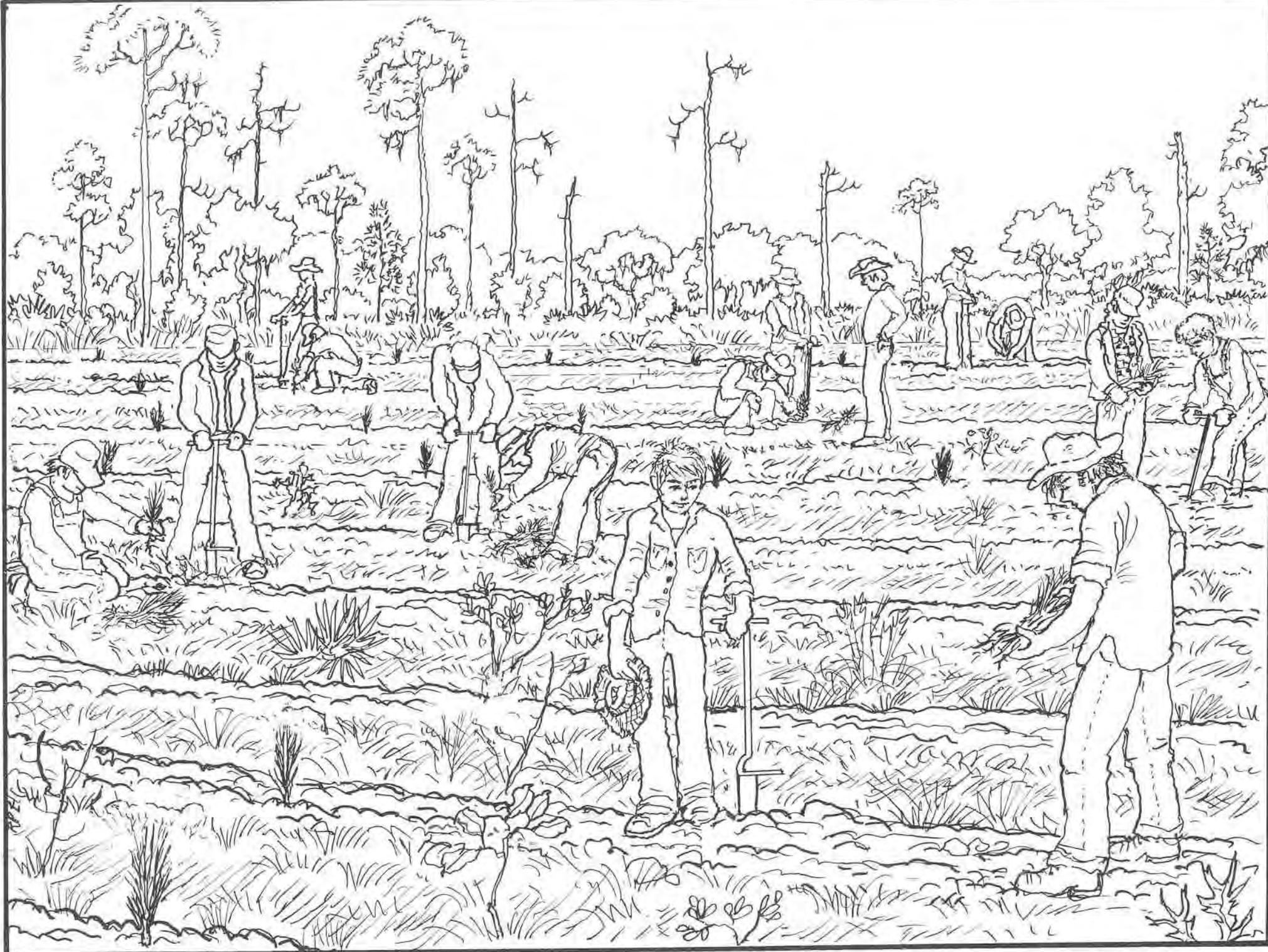
**Southern Forestry Education Project:** A movement sponsored by the American Forest Association aimed to teach people in the south the evils of fire in the forest (pre-Smokey Bear). In 1927, the "Dixie Crusaders" armed with special trucks, generators, and motion picture projectors hit the roads to preach the message of fire prevention to the uninformed. During the few years that the project was funded, over three million people were reached throughout Florida, Georgia, Mississippi, and South Carolina.

**Timber:** Products of a tree used in construction, e.g., structural beams, railroad ties, bridge timbers. More desired for their strength and durability rather than their looks. Longleaf pine makes very strong, very rot-resistant timbers. Also the term yelled by a lumberjack as a cut tree is falling.

### **Suggested Activities:**

- A discussion on the Great Depression
- Explain the development of industry and trade in a specific state, nationally and internationally, in the late 19<sup>th</sup> century using maps, globes, and time lines
- Describe the economic conditions of a specific state in the early 20<sup>th</sup> century
- Explain the effect of the economic boom of the 1920's and the era of the Great Depression on the different socioeconomic groups in a specific state
- Describe changes to the Earth's surface caused by natural and man-made forces





## Longleaf Pine is Making a Comeback



(Bolded words in text indicate key words and concepts)

### Student Information:

Today, more people are interested in helping to bring longleaf pine forests back to the South. Landowners are planting longleaf pine seedlings on their land. However, many people still do not know the importance of longleaf pine forests and all the critters that live in it. We need you to help spread the word.

### Teacher Information:

Bringing back the longleaf pine forest will take a **partnership** of many public and private individuals and organizations. The road to recovery for the longleaf pine forest continues to be long and difficult. For decades, the forestry community has not favored longleaf pine forests. For this reason, the forest has slowly (almost imperceptibly) disappeared from the landscape. Presently, a region-wide effort is underway to **restore** longleaf pine to a portion of its former range. Many groups are involved in this effort. One of the leaders is **The Longleaf Alliance**. The Alliance coordinates the efforts of others and acts as a **clearinghouse** of information to landowners, researchers, educators, natural resource professionals, state and federal agencies, and conservation groups.

Since private landowners own the majority of the land in the southeast, they must be included in order for restoration of the longleaf pine forest to be effective. Many private landowners have begun to appreciate both the economic and ecologic importance that longleaf pine forests can play in their own and their children's future. Also, more people are beginning to wonder "what happened to the longleaf pine forests I remember from my childhood?" Many of the areas currently being planted with longleaf pine are old **agricultural** fields and **pastures** (areas that were longleaf pine forests over 100 years ago).

A major advance to enable this resurgence of interest has been improved tree seedlings and planting techniques of longleaf pine trees as well as government (monetary) incentive programs.

Many private landowners are much more likely to consider longleaf as a choice for their lands than even five years ago.

In order, to help recover the populations of **endangered** species like the **red-cockaded woodpecker**, public land managers like the **U.S. Forest Service** are beginning to emphasize the restoration of longleaf pine forests on **National Forests** and other **public lands**.

You can help get the word out by teaching your students about the need to restore the once grand longleaf pine forests.

### **Key Words and Concepts:**

**agricultural, clearinghouse, endangered, free-range, National Forests, partnership, pasture, public land, red-cockaded woodpecker, restoration, The Longleaf Alliance.**

**Agriculture:** Farming, raising crops and livestock for human use. Prior to the discovery of irrigation and use of fertilizers, many of the soils in which longleaf pine forests grow were poorly suited for agriculture.

**Clearinghouse:** A central agency for collecting and giving out information

**Endangered:** A plant, animal or insect that is in imminent danger of extinction. Can be federally endangered (in peril of global extinction) like the red-cockaded woodpecker or American chaffseed plant or state endangered (in peril of extinction from a region) such as the gopher tortoise in Mississippi.

**Free-range:** Practice, no longer allowed, of releasing livestock into the forest to forage. Fences were used to keep livestock out of agricultural areas. Brands and ear notches were methods used to identify ownership.

**National Forests:** A system of publicly owned forestlands scattered across the nation and managed for multiple uses by the U.S. Forest Service. Compared to the forests in western United States, little of the southern longleaf pine landscape is contained in National Forests – most is privately owned.

**Partnership:** Collaboration. Working together to accomplish a common goal. Bringing back the longleaf pine forest will take a partnership of many individuals.

**Pasture:** A field covered with grass or herbage and suitable for grazing by livestock. When the woods were free-range, cattle men generally did not worry about lack of food for the animals. As a rule of thumb, generally one cow could be sustained on 20 acres of native grasses. However, as fencing laws were passed and cows were herded into smaller areas, food became limiting. Trees were cut to allow more light to reach the ground and native grasses were replaced with non-native pasture grasses.

**Public land:** Land paid for and supported by public tax dollars.

**Red-cockaded woodpecker:** A species of woodpeckers which nests only in living pines and prefers mature, open and park-like longleaf forests. This bird is endangered with global extinction. Also called a peckerwood by Georgians.

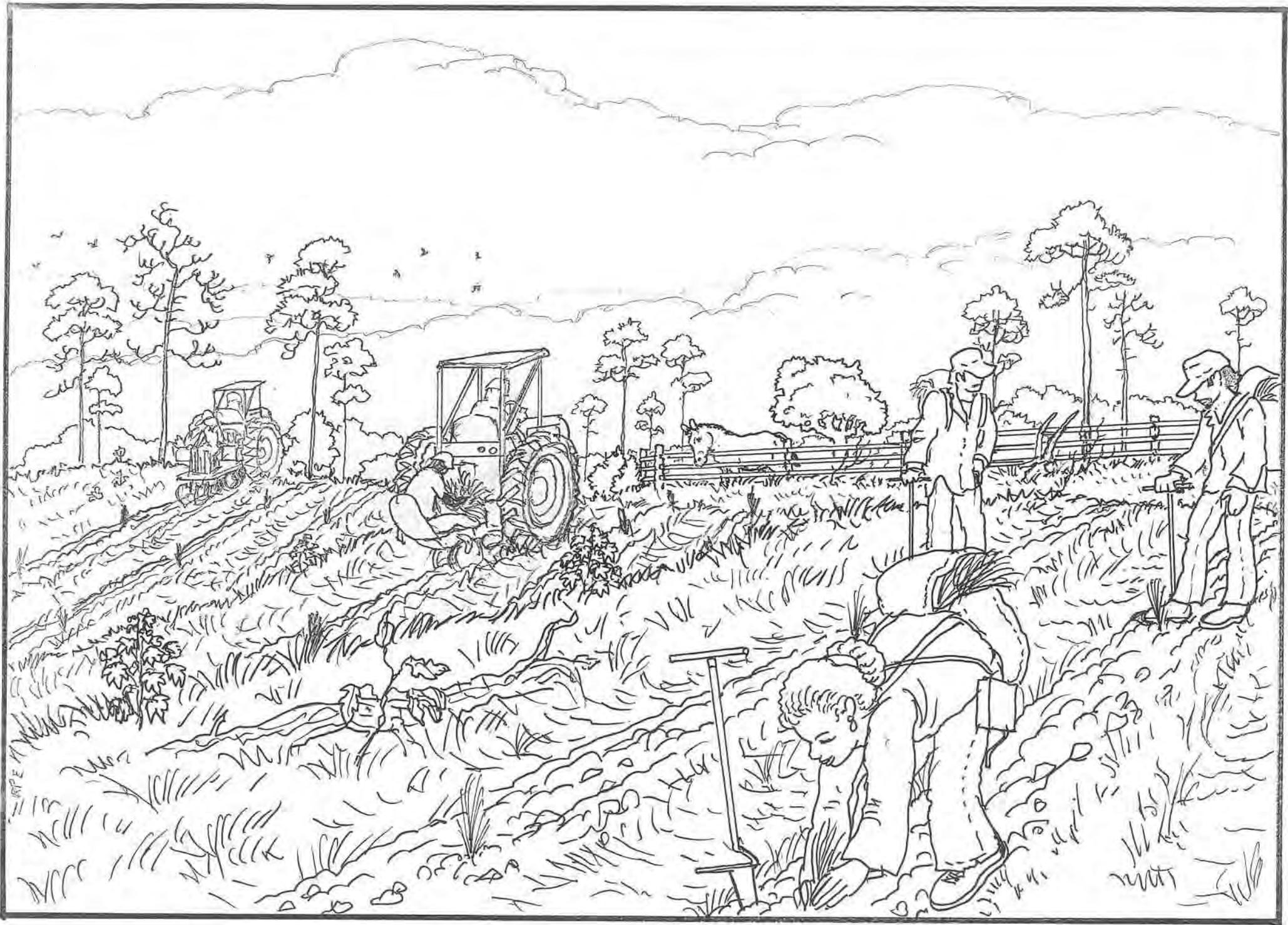
**Restoration:** Putting things back the way they used to be. In the case of longleaf pine forests, refers to getting back the trees, the understory community and the animal communities that once inhabited them.

**The Longleaf Alliance:** A non-profit conservation organization whose mission is the restoration of the longleaf pine forest ecosystem across its range, emphasizing its economic and ecological values through research, education, and outreach.

### **Suggested Activities:**

- Describe a specific state's changing economy in the 20<sup>th</sup> century
- Demonstrate an understanding of the relationship among science, technology and society's past and present.





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# SLICING THE LONGLLEAF PIE

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*Extension  
Activity*



THE  
L O N G L E A F  
A L L I A N C E

# Slicing the Longleaf Pie



Historically the Southeast had 90 million acres of 'longleaf pie.'



By 1970, < 6 million acres remained.

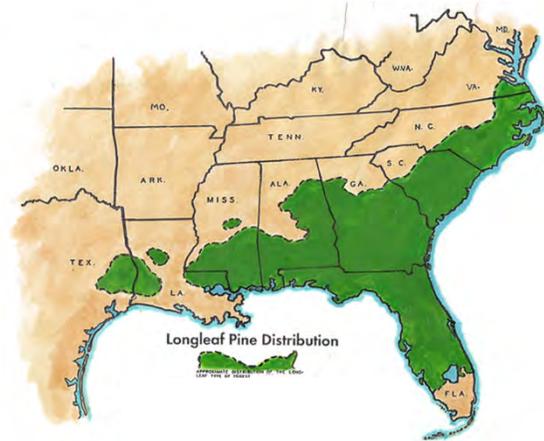


By 1990, only pie crumbs (3 million acres) remained.



Historically, longleaf pine ecosystems dominated the Southeast. Once covering over 90 million acres, only 3 million acres remained in the early 1990s.

This is a staggering decline, but these abstract numbers are hard to visualize. And why does the loss of longleaf habitat matter?



Imagine the historic range of longleaf pine as a **yummy PIE**. As representatives of the diverse plants and animals calling longleaf home, we all get a slice of the 'longleaf pie.'

**Overtime the pie was eaten**—longleaf habitat was lost to due conversion to non-forest uses, replacement by other tree species, and exclusion of frequent fire from the landscape.

**Without enough 'longleaf pie' for everyone, the loss of longleaf pine ecosystems resulted in the decline of many plants and animals** requiring longleaf and its associated habitats. Today, many species in longleaf habitats are considered at-risk of extinction.

## DON'T HAVE PIE?

Use fake money to demonstrate longleaf decline. Start with \$90, sharing the bills with everyone in the group. Take the money back, citing reasons for longleaf losses, until only \$3 dollars remain.

*Tip courtesy of Colleen Bower, Carver Creek State Park Superintendent, NC State Parks.*



'Slicing the Longleaf Pie' is an extension activity for The Longleaf Alliance's 'Learning with Longleaf' curriculum. Find the whole series at [longleafalliance.org/what-we-do/education-outreach/next-generation](http://longleafalliance.org/what-we-do/education-outreach/next-generation).

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# TUMBLING LONGLEAF ECOSYSTEM

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*Extension  
Activity*



THE  
LONGLEAF  
ALLIANCE

The Tumbling Longleaf Ecosystem activity was first developed by the North Carolina Forest Service to promote the Longleaf Pine Initiative.

# Tumbling Longleaf Ecosystem

The block tower represents a longleaf pine ecosystem.  
Color coded blocks with symbols represent ecosystem components.



Longleaf Pines



Groundcover Plants



Wildlife



Good Fire



Take turns removing one block at a time.

Removing a block represents a loss from the ecosystem due to:

Natural processes – succession, predator & prey relationships

Natural disturbance – storms, floods, drought, lightning strikes

Human disturbance – development, fire suppression, non-native species

Place the removed block to the side.



DO NOT return the removed block to the top of the tower.

Why? Once a part of the ecosystem is lost, it may not be immediately replaced.

Continue to remove blocks until the tower falls.



Who made the longleaf pine ecosystem fall?

Don't blame the last person to pull a block! Everyone who removed a block helped make the tower fall.



Could the removal of one color of block cause the tower to collapse?

Altering one ecosystem component could change the nature of the ecosystem or result in its total loss.

Restore the longleaf ecosystem.

Restack the blocks to create a new tower to represent restoration activities such as:

+ Planting longleaf trees

+ Conducting a prescribed fire

+ Planting native grasses and flowers

+ Creating good habitat for wildlife

Play Safe!



+ DO NOT stack removed blocks on top of the tower.

+ Enter the play zone ONLY on your turn.

+ WAIT for others to move before removing a block.



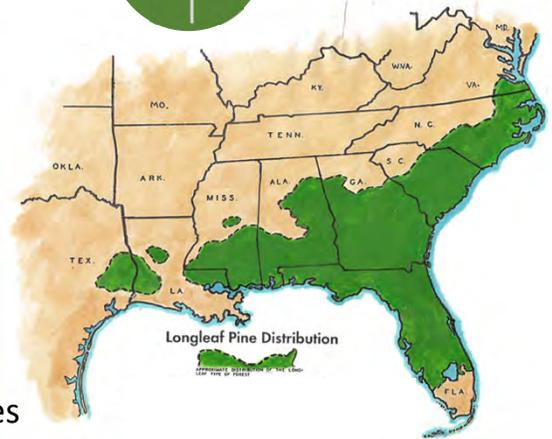
'Tumbling Longleaf Ecosystem' was developed by the N.C. Forest Service to promote longleaf pine in North Carolina. More longleaf lessons are available at [longleafalliance.org/what-we-do/education-outreach/next-generation](http://longleafalliance.org/what-we-do/education-outreach/next-generation).

# Why Longleaf?



Historically, longleaf pine ecosystems dominated the Southeast. Once covering over 90 million acres, only 3 million acres remained by the early 1990s.

Longleaf habitat was lost to due conversion to non-forest uses, replacement by other tree species, and exclusion of frequent fire from the landscape.



Longleaf ecosystems are one of the most diverse systems in the world! Much of this diversity resides in plants on the forest floor. Native grasses like wiregrass and bluestems & flowering plants, especially 'sunflowers' (the Composite family) and 'peas/legumes' (the Fabaceae family), are common understory species. Several plant species are rare and/or found nowhere else, including some carnivorous plants like the Venus flytrap and white-topped pitcher plant.

A diverse native groundcover, maintained by periodic fire, supports diverse wildlife populations including games species like quail, turkey, & fox squirrels, rare species such as the red-cockaded woodpecker, songbirds, amphibians, reptiles, and pollinators.



## What is Good Fire?

Frequent, low intensity, and often large scale, surface fires were the dominant factor shaping longleaf pine ecosystems. This frequent fire regime, over generations, selected for longleaf pine's fire-resistant attributes. Today, landowners and land managers use prescribed fire to achieve specific objectives and to mimic the natural processes that shaped the landscape.

*Longleaf pines are "built by fire" with many fire-resistant attributes.*

- + Young longleaf stay in the grass stage, focusing growth underground in their roots while their long, dense needles protect the growth bud above ground. When a fire occurs, burned or scorched needles are replaced with new growth.
- + Once it initiates height growth, the young tree quickly "rockets" upward, moving its bud above typical flame lengths.



- + Thick, flaky bark protects the inner bark from low intensity surface fires.
- + Longleaf pines shed their needles, making excellent fuel for future fires.

*Prescribed fire is "good fire" that provides many benefits.*

- + **Fuel reduction** - Low intensity prescribed fires reduce wildfire risk.
- + **Competition control** - Removing weeds and competing woody plants creates a more favorable environment for recruitment and growth of native plants.
- + **Habitat** - Fire maintains open conditions which is good for native plants, providing excellent food and cover for wildlife.
- + **Control insects & disease** - Brown-spot needle blight is controlled with prescribed fire in young longleaf pine stands.



# Tumbling Longleaf Ecosystem – Facilitator Guide

An interactive way to distribute information about longleaf pine ecosystems and the role of GOOD FIRE!

<p>The block tower represents a healthy longleaf pine ecosystem.</p>	<p>Each color-coded block represents a component of the ecosystem—longleaf pines, groundcover plants, wildlife, and fire.</p>  <p><i>Note — To place an emphasis on the role of fire in longleaf ecosystems, this game does not address abiotic ecosystem components (water, air, soil).</i></p>	<p>The tower is set up with alternating rows of 3 blocks.</p> <p>For the 1<sup>st</sup> layer, place 3 blocks next to each other.</p> <p>For the 2<sup>nd</sup> layer, place 3 blocks perpendicular to the previous layer.</p> <p>And so on...</p> 
<p>Take turns removing one block at a time.</p>	<p>Try out different strategies to determine which color to remove. There are multiple ways to play.</p> <ul style="list-style-type: none"> <li>+ Roll a dice with corresponding colors.</li> <li>+ Use a spinner with corresponding colors.</li> <li>+ Assign specific colors to players.</li> </ul>	<p>Also consider assigning a single color for ALL participants to remove to speed up the play of the game and/or to emphasize the role of a specific ecosystem component.</p>
<p>Provide examples why these components might be lost as blocks are removed.</p>	<p>Tailor examples to the participant demographic.</p> <ul style="list-style-type: none"> <li>+ Natural processes – succession, predator &amp; prey relationships</li> <li>+ Natural disturbance – storms, floods, drought, lightning strikes</li> <li>+ Human disturbance – development, fire suppression, logging, non-native species</li> </ul>	<p>Example – when a green “pine” block is removed early on, you might say:</p> <p><i>A longleaf pine was cut down for timber, but cutting down a few trees did not destroy the tower.</i></p> <p>The participants can see that the tower is still standing.</p>
<p>DO NOT return the blocks to the top of the tower.</p>	<p>Why? Once a part of the ecosystem is lost, it may not magically reappear.</p> <p><i>Example – a mature tree with a red-cockaded woodpecker cavity takes years to replace.</i></p>	<p>Note — Placing blocks to the side will keep the tower shorter and safer. See additional safety considerations on page 2.</p>
<p>Continue removing blocks until the tower falls. Discuss the results.</p>	<p>Ask participants to explain what happened.</p> <ul style="list-style-type: none"> <li>+ <i>Who is to blame for destroying the longleaf pine ecosystem?</i></li> <li>+ <i>What would happen if we removed all the fire blocks?</i></li> <li>+ <i>Could the extinction of a plant/animal cause the tower to collapse?</i></li> </ul>	<p>Participants may be quick to blame the last person who pulled a block, but anyone who took a block helped make the tower fall.</p>
<p>Reconstruct the longleaf tower.</p>	<p>Recruit the participants to “restore” the longleaf ecosystem.</p> <p>While restacking the blocks, name the restoration activities – <i>plant trees, sow grass seed, conduct a prescribed fire, etc.</i></p>	<p>This is an important take home message about restoration and management while also setting up the tower for the next round.</p> <p>Double win!</p>

# Tips for Creating a Tumbling Longleaf Ecosystem Set

## Finding or making your block set –

This activity was originally created using a giant tumbling block set, but smaller sets work too. If using a large set, consider the size and weight of the blocks.

- + **Hollow block sets** are ideal to reduce the hazard of heavy falling blocks.  
*\*Similar to Super Tumbling Timbers set by S&S Worldwide.*
- + **Colored block sets** are available to buy online, but many have more than 4 colors included.  
*\*Don't rule these sets out as the additional colors could provide an extension to the ecosystem lesson. For example, what happens when an invasive species is introduced to an ecosystem? Demonstrate this by asking the participants to add different colored blocks into the empty spaces and see the tower transform.*

## Customize the blocks to emphasize the different ecosystem components.

- + **Paint** – Easy to do, but painting the whole block changes the finish and reduces the ability for the blocks to slide easily. Recommend painting the ends only.
- + **Stickers** – Turn artwork into custom stickers to add to the ends. This is a great way to have both the words, images, and colors on each block.
- + **Vinyl cutouts** – Very durable & holds up great.

## Plan your play space.

- + A small platform or wooden crate makes a great playing surface that is low to the ground.
- + Suggest using a tarp to designate the “play space” for young kids, emphasizing one player at a time in this area.
- + Indoor spaces: the falling blocks can be quite loud in closed spaces and on hard floors. If using inside, consider a carpet to help muffle the sound.

**Safety Considerations:** Toppling of heavy wooden blocks pose a falling risk, especially for children. To minimize this risk:

- + DO NOT stack removed blocks on top of the tower.
- + Keep the game low to the ground (on a small table/platform).
- + Set up a safety play zone with only 1 person near the tower per turn.

**Signage!** Provide handouts or signs to explain the game.

### A note on engaging people about “Good Fire”-

The block tower is an excellent way to visually demonstrate the role of good fire in longleaf ecosystems. Try engaging folks who may not want to play the game with a quick take home message, such as:

- + *This block tower represents a healthy longleaf ecosystem, with trees, understory plants, wildlife, and natural FIRE.*
- + *Many habitats, like longleaf pine, are shaped by fire. The plants and wildlife that live here depend on fire to create good habitat.*
- + *What would happen if all the red fire blocks were removed? The ecosystem would quickly change (or collapse).*

