

Glossary

Abiotic • Biodiversity • Biotic • Carbon Cycle • Carnivores • Chlorophyll Condensation • Deciduous • Ecosystems Evaporation • Food chain • Food web Forest ecosystem • Herbivores • Nitrogen Cycle • Photosynthesis • Pioneer species Precipitation • Prescribed fire • Respiration Stomata • Succession • Terrestrial Transpiration • Water Cycle • Wildfire

Something to try at home – Use the glossary above and see if you can find the definition for each of these words in the booklet. If you're not sure, look the word up in a dictionary.



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Forestry in the Classroom Series



Kentucky's Forest Ecosystem



An Educational Series for Grades 4, 5 and 6

Fire in the Kentucky Forest Ecosystem

Wildland fires are fires that burn in forests, on prairies, or over other large natural areas. They may start naturally or they may be started by human activity.

Wildfires are uncontrolled wildland fires that usually burn large areas of land. They are typically started by lightning or by a careless human act. In Kentucky, arson (the deliberate act of lighting a fire with the intent to damage or destroy) is the number one cause of wildfires.



Photo by Carolyn Cromer

When these fires occur, the Kentucky Division of Forestry has wildland firefighters that respond. These men and women have specific training to fight wildland fires.

In the past, we thought that most wildland fires were bad and we tried to stop these fires from burning. We know that wildland fire is neither good or bad, it is simply a natural part of the environment.

Many plants need occasional fire to reproduce, and fire offers other benefits to the natural environment. For example, when fire burns decaying branches and stumps, the nutrients from the plants are released into the soil, making them available to new plants.

Since 1987, the Kentucky State Nature Preserves Commission uses prescribed fire as an effective natural areas management technique. Prescribed fires are small, controlled fires.



Photo by KSNPC Staff

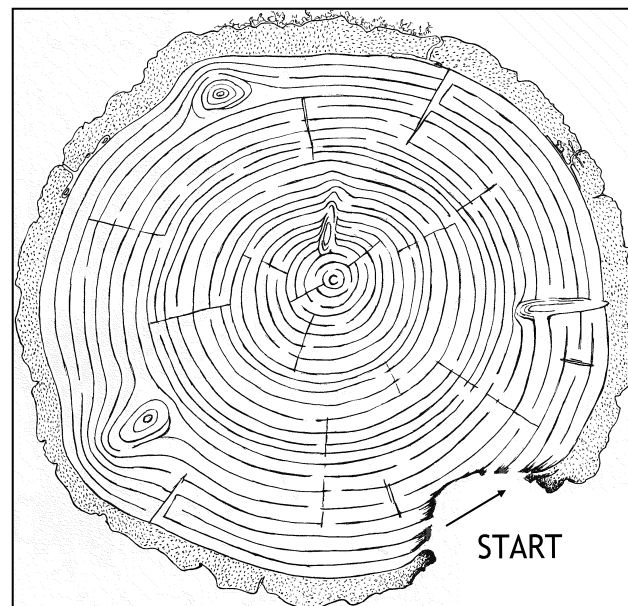
Prescribed fire helps to restore or improve

the conditions of fire-dependent natural communities within selected state nature preserves. These natural communities often provide habitat for rare, threatened and endangered species.

The reintroduction of fire into a disturbance-dependent community can help control the spread of shade-casting woody plants and invasive exotic species that compete with native plants for sunlight and resources.

Populations of Short's goldenrod and slender blazing star, two endangered species, have increased due to more sunlight and open space resulting from repeated burning. Without fire, these grassland plant communities would be invaded by shrubs and ultimately overtime would turn into woodlands.

On the Daniel Boone National Forest, USDA Forest Service personnel use prescribed fires to reduce the thick growth of plants near the ground level which provides a lot of potential fuel.



Ecosystems are dynamic interactions between plants, animals, and microorganisms and their environment working together as a functional unit. A forest is a large ecosystem.

Forests grow in a wide variety of climates. Kentucky's forests are temperate deciduous. The word "deciduous" means exactly what the leaves on these trees do: change color in autumn, fall off in the winter, and grow back again in the spring.



Photo - KSNPC Files

So what is a forest ecosystem? All the organisms (trees, shrubs, herbs, bacteria, fungi, and animals, including people) together with the surrounding air, soil, water, organic debris, and rocks, interacting inside a defined boundary.

The term biotic means living or having lived. Examples of biotic factors would include a frog, a leaf, a dead tree, or a piece of wood.



The term abiotic means non-living, or never having lived. Examples of abiotic factors would include gold, rock, bicycle, brick, and cement. Biotic and abiotic factors combine to create a system or more precisely, an ecosystem. This variety and complexity of species interacting in the ecosystem and the abundance of each is called biodiversity.



Kentucky's diverse landscape includes the eastern Kentucky mountain ridges, the forest edge of central Kentucky and the bottomlands of western Kentucky.

The eastern part of Kentucky has Appalachian mixed mesophytic forests. The dominate trees in this area are yellow-poplar, American beech, white oak, sugar maple and eastern hemlock. Here you will find black bears, wood frogs, elk and ruffed grouse.

The central part of Kentucky has a lot of forest edge trees such as eastern red cedar, sassafras, hackberry, hickory and bur oak. Here you will find deer, turkey, and coyotes.

The western part of the state has a lot of bottomland species. The dominate trees are green ash, sweetgum, pin oak and cherry bark oak. Here you will find migrating ducks, turtles, cranes and red-tailed hawks.



What do the forests near you look like? Can you identify any the trees in your backyard?

Something to try at Home - Go to a natural place and find a leaf, have a family member help you look up what kind of tree it belongs to in a tree identification guide. Your local library will have some guides.

Succession - Lifecycle of a forest

Trees, like all living things, have a lifecycle that includes birth, growth, injury and disease, aging, and death. As trees go from birth to death, their physical form changes, as well as their role in the forest ecosystem.

Conditions in the forest change, existing plant and animal species give way and new ones establish themselves. This pattern of changing conditions and species over time is called succession.

If you see an area that has shrubs and small trees then you can determine that this is a very young forest. A forest with large trees and a closed canopy, which does not allow much sunlight through, is likely a mature forest. Depending on the tree species and soil type it is possible to have very small trees that can be over 100 years old.

In Kentucky, typical indicators of a mature forest are large hardwood trees that are well spaced among each other with little understory vegetation. The lack of understory vegetation is a result of the trees canopy closure, which blocks sunlight from reaching the ground.

Some changes in a forest are rapid, dramatic events: forest fires, timber harvests, floods. Other changes are gradual and continuous processes: the decay of leaves, the growth of trees, the movement of water. Both natural events and human choices shape forest cycles. Over time, many changes create cycles of life, birth, death and rebirth. Human choices create new patterns in the forest's natural cycle of change over time.

The Native Americans living in Kentucky forests were mostly Shawnee and Cherokee. They cleared small patches of land for Indian corn, squash, tobacco and beans. They also burned the forests regularly to clear large swaths of the forest to improve habitat for game animals. They harvested all the materials to build their homes, transportation, and house wares from the trees in the forests with stone tools and fire. Narrow saplings were used for wigwam and long house poles. Inner bark of white oak was turned into lashing, rope and thread. Hickory bark was used to tan hides. Sugar maple sap was boiled into syrup.

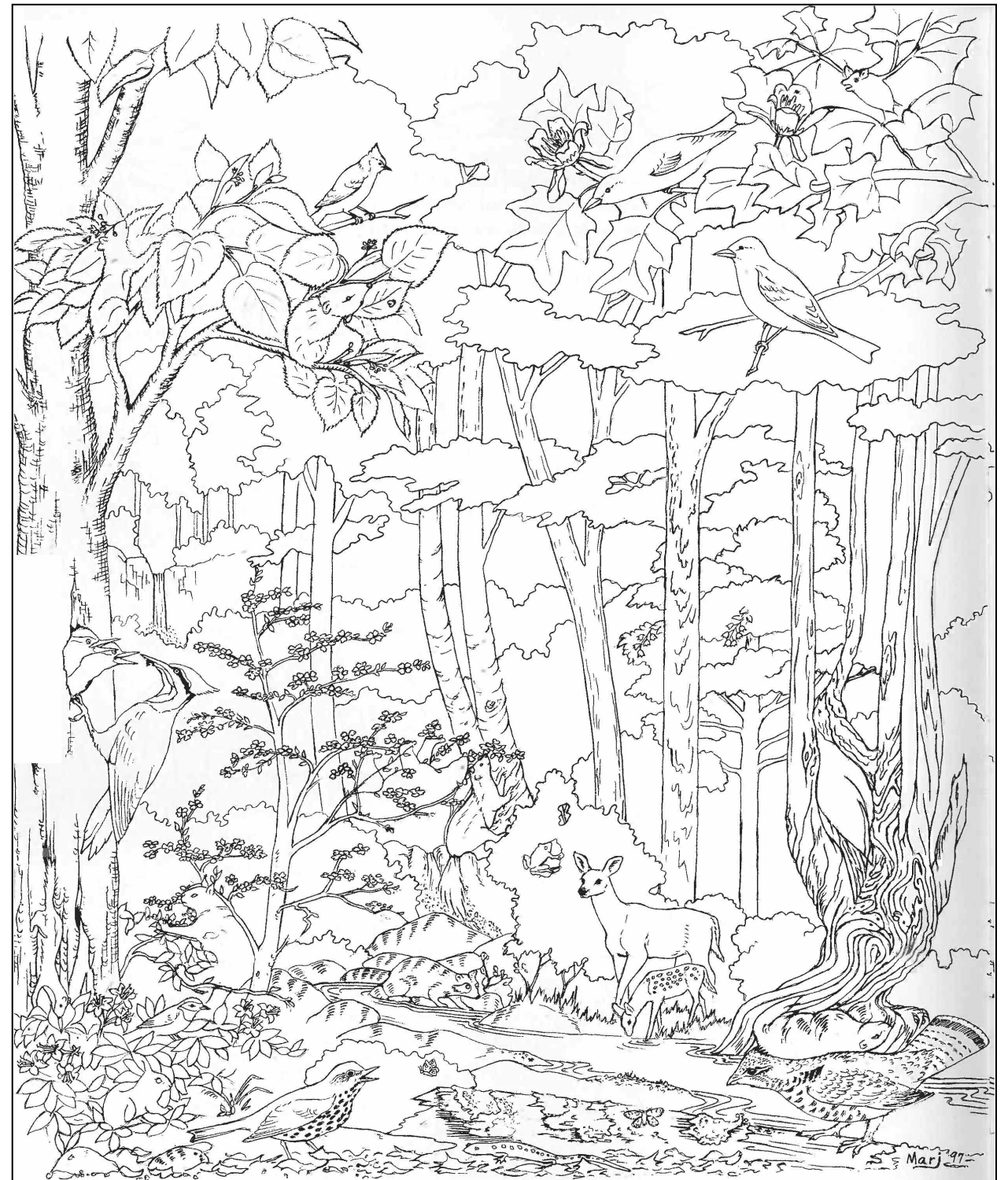


Like the native people, the colonial settlers cleared the land for agriculture and used wood as material for homes, transport, and housewares but with the significant difference of forged iron tools and oxen.

The iron furnaces of the early to mid 1800's used huge amounts of hardwoods. A big plus for the early Kentucky iron makers was the abundance of big hardwood trees, used for charcoal production. Each furnace was the center of an integrated community. The old Kentucky blast furnaces are now silent and still. Why? Nature could not replenish the big hardwoods as fast as they were being removed to make charcoal for the furnaces. Most of Kentucky's forests today are second and third growth forests.



BOONES FURNACE, KY



In this Kentucky forest ecosystem, can you find 3 biotic factors and 3 abiotic factors?

Biotic factors: _____

Abiotic factors: _____

Food Chains and Food Webs

Kentucky's forests are a complex living system. While their appearance is often dominated by trees, healthy forests are composed of many different animals and plants that interact with and depend on each other. The biodiversity of Kentucky's forests is what keeps the ecosystem running. It allows for the food chain to work.

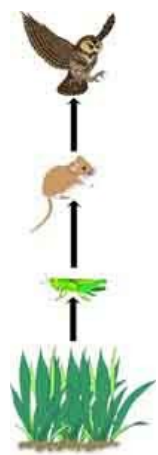
A food chain is a simplified way of showing energy relationships between plants and animals in an ecosystem. It all starts with the sun!

Plants, like animals, need food. Unlike animals, green plants make their own food through the process of photosynthesis.

Sunlight is pure energy, but it cannot be directly eaten or stored. Photosynthesis is the process by which green plants change the energy in sunlight to a form of energy that can be stored for later use. Plants use the sun's energy to change carbon dioxide and water into carbohydrates (simple sugars like glucose). All life depends on this process!

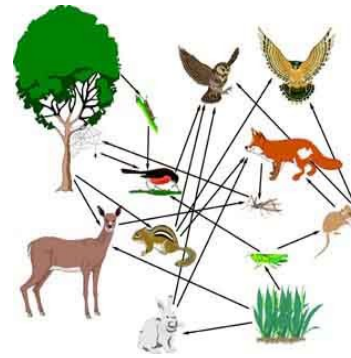
Food chains follow a single path as animals eat plants and each other. For example, the sun provides food for the grass. The grass is eaten by a grasshopper who is then eaten by a frog. The frog is eaten by a snake which is eaten by a hawk.

Food webs show how plants and animals are interconnected in many ways to help them all survive. Trees produce acorns which act as food for many mice and insects. Because there are many mice,



weasels and snakes have food. The insects and the acorns also attract birds, skunks and opossums. With the skunks, opossums, weasels and mice around; hawks, foxes and owls can find food.

All organisms are dependent on one another for proper nutrition. There are many different names for the different organisms in a food chain/web. Herbivores (plant eaters) get their nutrition from plants which are called producers. Carnivores (meat eaters) get their nutrition from animals. Both herbivores and carnivores are consumers.



This chain of energy transferring from one organism to another can continue for quite awhile, but it eventually ends. Dead animals are broken down and used as food or nutrition by bacteria and fungi. These organisms (decomposers) break down complex organic compounds into simple nutrients that the plants can use, completing the cycle.

Use the word list below to fill in the blanks in the food chains. They all start with the sun!

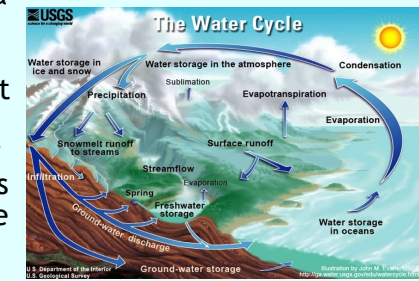
_____, Rabbit,
 Berries, _____, Snake,
 _____, Chipmunk, Opossum,
 _____, _____, _____,
 _____, _____, _____,

Chickadee, bear, deer, red fox, mouse, caterpillar, grasshopper, acorn, clover, robin, chipmunk, owl, rabbit, skunk, opossum, berries, snake, oak leaf

The "Cycles"

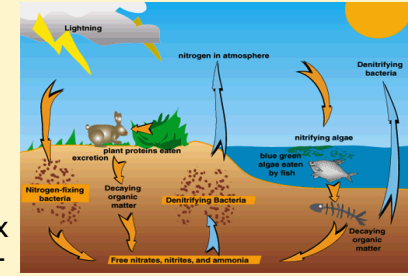
In nature, the materials needed by all organisms in an ecosystem are reused or recycled. Nitrogen, carbon, water, oxygen, and other nutrients move through ecosystems in a predictable pattern or cycle.

The water cycle is full of those "TION" words like condensation, precipitation and evaporation. Another "TION" word is transpiration. Transpiration is when trees release water vapor as part of the photosynthesis process. There are little holes underneath the leaves called stomata. The stomata allow water to escape the tree just like the pores in our skin do. This is one of the reasons it is cooler and more damp in a forest. Transpiration acts like a big air conditioner. Trees cycle a lot of water through the water cycle.

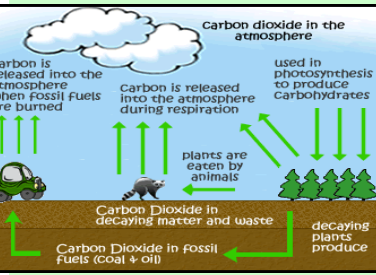


Something to try at Home - Fill a bowl with fresh water, mix baking soda into the water. Place an aquatic plant (you can find them at places that sell fish) inside a drinking glass and lower the glass sideways into the bowl of water until the glass fills with water and no air bubbles are left in the glass. Then turn the glass upside down in the bowl without letting in air. The glass should rest on the bottom of the bowl. Aim a light at one side of the glass. Small bubbles will form on the leaves. This is oxygen! You can see the plant taking in carbon dioxide from the baking soda and water and releasing oxygen.

The nitrogen cycle describes the path of the element nitrogen through nature. Nitrogen is the most abundant element in the atmosphere (~78%). However, gaseous nitrogen must be 'fixed' into another form so that it can be used by living organisms. There are specialized bacteria whose function it is to fix nitrogen, converting it, so that it can be used by plants. The nitrogen cycle is important for forests because it is essential for photosynthesis. Natural forested ecosystems tend to accumulate and cycle large amounts of nitrogen.



Carbon is one of the most important elements found on earth. It is found in all living organisms. In fact, living things are full of carbon! Trees are carbon storage reservoirs. Trees store carbon as part of photosynthesis. During photosynthesis, plants combine carbon dioxide from the air and hydrogen from water to make carbohydrates. Some of these carbohydrates are stored in the tissues of the plant. Others are used by the plant for energy. When the plant is eaten, the cells of the animal break down the plant's tissues during digestion.



This releases the stored carbon and other nutrients into the animal's system. As the animal breathes out, carbon is released and the cycle begins again.

cycle begins again.