



Unit 5) Forests

Kansas is usually described as a prairie state, bringing to mind wide expanses of grassland and fields of grain. Historically, periodic prairie fires kept much of the state treeless, particularly the western half. Today, Kansas has more forestland (woodland) than such states as Nebraska, North Dakota, Nevada, Delaware, and Rhode Island. According to the Kansas Forest Service, acre for acre, the forests in Kansas are some of the best and most productive in the United States.

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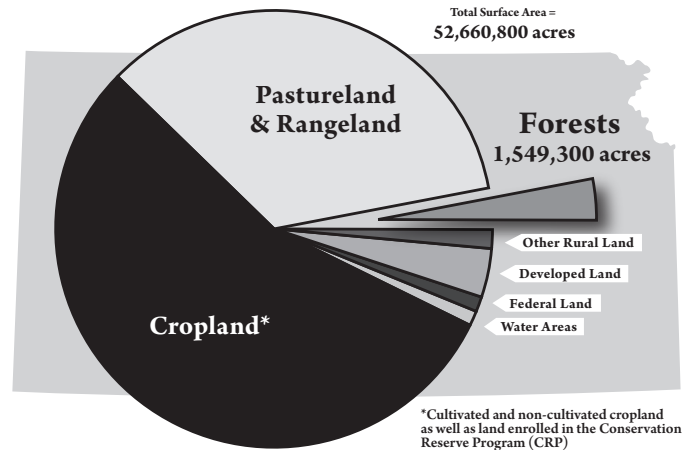
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SURFACE AREA OF KANSAS – FORESTS



Source: 2003 Natural Resources Inventory, USDA NRCS

"To exist as a nation, to prosper as a state, and to live as a people, we must have trees."

Theodore Roosevelt, 26th President of the United States

In Kansas and other Great Plains states, the central hardwood forests of the United States transition into grassland and cropland. According to the Kansas Forest Service, when European settlers came to what is now the state of Kansas, there were an estimated 4.5 million acres of forestland in the area (8.5 percent of the state's land area). By 1936, when the first recorded statewide inventory of forestland was conducted, less than 30 percent of the estimated original forestland acreage remained.¹ Since then, forestland in Kansas has steadily increased in size. According to the 2005 Kansas Forest Inventory, forestland covers 2.13 million acres in Kansas, over 4 percent of the state's total land area. However, the statewide inventory does not include all the trees in Kansas, only those meeting a specific criteria based on the size of area covered by trees and the density of the trees within that area.

The majority of the forestland in Kansas is found in the eastern one-third of the state, most of which is adjacent to streams and rivers.

TREE TALK

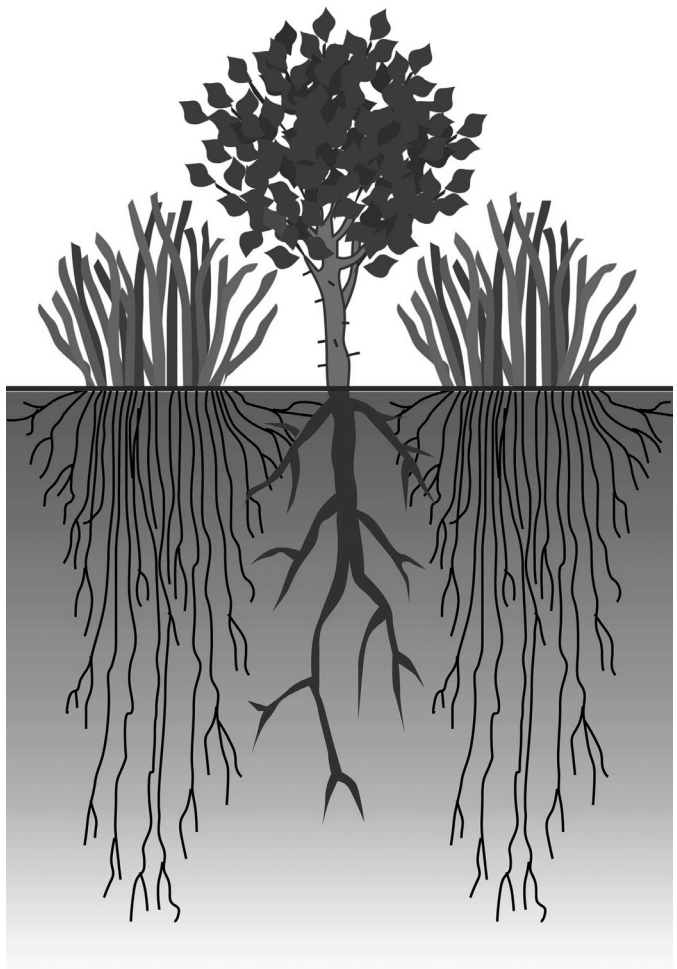
"The creation of a thousand forests is in one acorn."

Ralph Waldo Emerson, American essayist, poet, and philosopher

DEFINITION OF A TREE

It isn't always easy to define what a tree is. Not all trees are tall. The dwarf prairie willow, which is common in the sandy areas of Reno and

TREE VS. PLANTS COMPARISON



Tree Growth

Source: USDA NRCS

Harvey counties and is often found in the sandstone areas of eastern Kansas counties, may only grow to be 18–39 inches tall. Some trees, like the saguaro cactus, have spines rather than leaves or needles.

However, trees do share some characteristics that distinguish them from other plants. For example, a tree has one main woody trunk that supports the structure of the entire tree. A tree stands on its own roots and as the crown (upper branches and leaves) of the tree spreads, the roots extend to keep up with the circumference of the crown. The total root spread of a tree under the ground can actually be far wider than the crown of the same tree. Since tree roots need oxygen as well as water, the majority of a tree's roots will grow just above the level below which the soil is permanently wet. Most trees will drown if their roots are submerged in water for very long so a tree will spread its roots over a large area to capture as much of the rainwater that soaks into the ground as possible. This also allows a tree to collect nutrients and water from a much larger area than most plants.

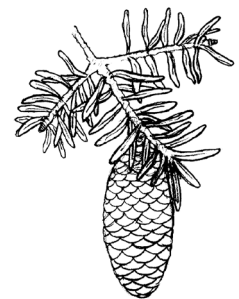
Trees also live longer than most other plants. Trees are a type of perennial but unlike iris or tulips, trees do not die back each year. Many trees do become dormant each winter but the trees remain alive and continue to grow taller and thicker each year. Annual extensions of the twigs become branches and then huge limbs—building the framework of the tree taller and wider if space allows.

Source: USDA NRCS

CLASSIFICATION OF TREES

Worldwide, there are over 20,000 different species of trees. Over 800 different species grow in North America. Over 125 different species of trees grow in Kansas. The types of flowers and seeds trees produce (if any), how they reproduce, and how they grow are used to categorize trees. Labels, such as coniferous or deciduous, broad-leaved or needle-leaved, and hardwoods or softwoods, identify categories of tree species. The terms “hardwoods” and “softwoods” are especially confusing because these terms refer to broad categories of tree species, rather than specific trees based on the hardness or the weight of the wood produced from those trees.

Coniferous trees are also called conifers. Most conifers have thin, needle-like leaves. Pines, hemlocks, redwoods, spruces, and firs are all types of conifers. Conifers bear (produce) cones. Some of the cones, like juniper berries, don't look like typical "cones." Conifers include the world's largest trees and hold all the world's age records for trees. Most needle-leaved trees are evergreens. Evergreen trees have leaves year-round rather than being bare in the winter. Evergreen trees do not drop all their needles at once.



Conifer

Source: USDA NRCS



Seeds

Source: USDA NRCS

TREE CATEGORIES

Softwoods– conifers and needle-leaved trees.

Needle-leaved– trees with thin, needle-like leaves; includes evergreens and most conifers.

Coniferous (conifers)– trees whose seeds develop inside cones; for example, pine, hemlock, redwood, spruce, and fir; considered softwoods.

Evergreens– trees that have leaves year-round; considered softwoods.

Hardwoods– broad-leaved trees.

Broad-leaved– trees with flat, broad leaves; for example, oak, willow, birch, maple, cottonwood, and palm.

Deciduous– trees that shed all their leaves every year; includes most broad-leaved trees in North America; considered hardwoods.

Instead, these trees produce new leaves each year, dropping only the oldest leaves from a two- to four-year cycle. Needle-leaved or coniferous trees are also called softwoods.

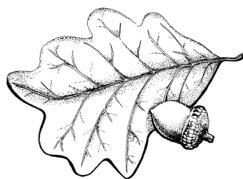
Deciduous trees are trees that lose all their leaves every year. In North America, almost all broad-leaved trees—trees with flat, broad leaves—are deciduous trees. This group includes oaks, willows, birches, maples, cottonwoods, and palms. Broad-leaved trees are also called hardwoods.

Like all plants, trees must be pollinated to produce seed to ensure continued survival of the species. Most forest trees, including conifers, are pollinated by the wind. Trees that need to attract insects to carry their pollen often grow at the edge of the forest. Honeybee hives are often placed in or near orchards to ensure proper pollination of fruit trees.



Evergreen

Source: USDA NRCS



Deciduous (Oak Leaf)

Source: USDA NRCS



Apple Blossom

Source: Wm. E. Carnahan, USDA

Forest– an area with trees.

FORESTS IN KANSAS

“Reading about nature is fine, but if a person walks in the woods and listens carefully, he can learn more than what is in books...”

George Washington Carver, American agricultural chemist and inventor (attended school and lived in Minneapolis, Kansas)

What is a forest? There are over 250 definitions of the word “forest,” but the presence of trees determines whether an area is a forest. Basically, a forest is an area with trees. The statewide inventory of Kansas forest resources does not include all trees in Kansas, only those meeting a specific criteria. In Kansas, the inventory of forest resources includes timberlands, windbreaks, riparian forests, tree farms and tree plantations, orchards, and urban and community forests. The inventory does not include trees growing on Christmas tree farms, living snow fences, or trees growing on private property in towns and cities.

TIMBERLANDS

Timberlands are areas capable of producing wood for commercial and industrial uses. The timberlands along the eastern border of Kansas are actually part of the western margin of the large eastern deciduous forest of the United States. In Kansas, most timberland stands are of natural origin and are mainly hardwoods. Planted timberlands are almost always species such as black walnut that are highly valued for the lumber. Each year, Kansas timberlands grow enough wood to build 1,000 homes.²

WINDBREAKS

Windbreaks, also called shelterbelts, are trees planted in single or multiple rows spaced at regular intervals. The number of windbreaks in Kansas dramatically increased after the devastating dust storms of the early 1930s in an effort to minimize wind erosion and further loss of valuable topsoil. When wind speeds exceed 13 miles per hour, fine soil particles move easily. A windbreak reduces the speed of the wind and can reduce the impact of the wind over a horizontal distance from 10-30 times the height of the trees growing in the windbreak.

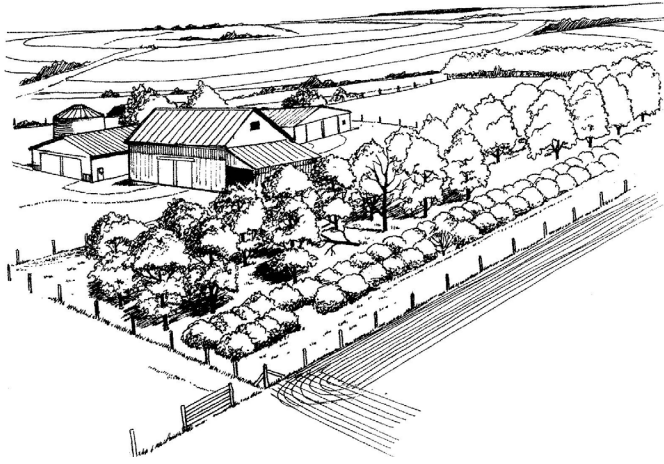
KANSAS INVENTORY OF FOREST RESOURCES**INCLUDED:**

- timberlands
- windbreaks
- riparian forests
- tree farms
- tree plantations
- orchards
- nut farms
- urban and community forests

NOT INCLUDED:

- Christmas tree farms
- living snow fences
- trees on private property in towns or cities

Source: Kansas Forest Service



Windbreak

Source: USDA NRCS

This also reduces the drying effect of the wind and slows the loss of soil moisture. According to the Kansas Forest Service, Kansas has more than 78,000 windbreaks that cover 114,000 acres. The combined length of the windbreaks in Kansas is more than 20,000 miles³ and more windbreaks are being planted each year. These windbreaks provide important travel corridors for wildlife, as well as wildlife habitat for many species.

In the winter, windbreaks trap and retain moisture from winter snows, increasing soil moisture. Windbreaks also protect crops, farmsteads, and livestock from chilling winds. By reducing the velocity of winter winds, windbreaks significantly lower stress on livestock and reduce feed energy requirements. The results are better animal health, lower feed costs, and increased profitability for agricultural producers.

RIPARIAN FORESTS

Ribbons of forested habitat follow major streams and rivers throughout the state of Kansas, even those areas that are susceptible to periods of drought. Areas of trees and shrubs that grow naturally along streams and rivers are called riparian shrublands or riparian forests, depending on the type of vegetation growing in the area. Riparian areas that are planted to shrubs or trees and related plants are called riparian forest buffers or riparian forest buffer strips. These streamside forests slow the flow of excess rainfall over the land and are designed to catch soil and excess nutrients before they enter the stream or river and are carried downstream.

Research has proven that trees stabilize streambanks better than other types of vegetation. Tree roots hold the soil in streambanks in place during periods of heavy rainfall or snowmelt, reducing the amount of sediment that enters the water and protecting water quality downstream. Riparian forest buffers



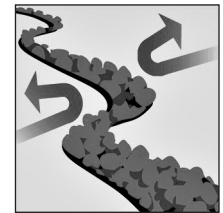
Riparian Forest

Credit: Julia Stoskopf-Debes

planted between cropland and streams can reduce fertilizer, pesticide, and sediment runoff into streams by as much as 90 percent, according to the Kansas Forest Service.

The use of riparian buffers is not limited to agriculture. Nonpoint source pollution, the leading cause of water quality problems, comes from both rural and urban sources. For example, a riparian buffer might be planted between a large parking lot and an adjacent stream. As contaminants such as oil, antifreeze, paper trash, mud, salt, and animal wastes are washed out of the parking lot by rainfall, the trees, shrubs, and other plants in the riparian buffer would collect debris and filter the water before it entered the stream. The quality of the water in the stream would be improved, not only for that community, but also for other communities downstream.

Riparian forest buffers also trap and filter flood debris. The stiff stems of trees and shrubs resist and slow the speed of water coming out over the banks of a stream or river during a flood. Trees reduce flood damage by keeping unwanted debris out of fields and communities. By slowing the flow, trees also help to store floodwater and recharge groundwater supplies.



Riparian Buffer

Source: FISRWG

TREE FARMS

Tree farming in Kansas is rooted in the Homestead Act of 1862 that opened the Kansas Territory for settlement and land ownership. Newspapers and land agents encouraged prospective settlers to bring fruit trees and shrubs with them. Settlers and immigrants planted trees and orchards to recreate the familiar landscapes they had left behind and also to provide food and income. The Timber Culture Act of 1873 provided free land if 40 acres of the homestead claim was planted to trees that were kept in growing condition for 10 years. An amendment to the act in 1878 reduced the requirement to 10 acres. Kansas had more timber claims filed than any other state. In Kansas, land patents from timber claims were issued for over two million acres.⁴ Trees commonly planted on timber claims included cottonwood, mulberry, ash, locust, Osage orange, catalpa, and hackberry. Remnants of the homesteaders' trees can still be found throughout Kansas.

The statewide inventory of Kansas forest resources includes trees found on nut farms and in orchards. According to the U.S. Department of Agriculture, pecans are the only



Honey Locust

Credit: Wayne Stoskopf

TIMBER CLAIMS

Kansas had more timber claims filed than any other state under the provisions of the Homestead Act of 1862 and the Timber Culture Act of 1873.

Source: Kansas Forest Service

AGRICULTURAL CROPS

Fruit, nuts, and Christmas trees are considered agricultural crops, rather than horticultural crops, in Kansas.

Source: Kansas Agricultural Statistics Service

native tree nuts grown for commercial use in the United States. The U.S. is the world's largest pecan producer. According to the Kansas Agricultural Statistics Service, the pecan is the most important commercial nut crop in Kansas. Hazelnuts (filberts), almonds, and English walnuts are also grown in Kansas. The black walnut is a valuable timber tree that is native to Kansas and the nuts are also collected and harvested in Kansas. Most commercial orchards in Kansas are apple orchards or peach orchards.

In Kansas, nuts, fruit, and Christmas trees are all considered agricultural crops. However, the trees growing on Christmas tree farms are not included in the statewide inventory of forest resources.

URBAN AND COMMUNITY FORESTS

Urban and community forests encompass all the trees, shrubs, and associated vegetation in and around population areas, ranging from small towns to large metropolitan areas. This includes trees growing on street right-of-ways, in parks and cemeteries, in recreational areas, and on other public properties.



*State Champion Water Oak,
Pittsburg State University*

Credit: Kansas Forest Service

Trees in communities and urban areas reduce the rapid runoff from rainstorms, improve air quality by providing wind protection and filtering the air, and reduce energy consumption by providing shade and reducing wind speeds. A number of scientific studies have found additional health and social benefits produced by community forests, including a greater sense of community, more social interaction, lower crime rates, reduced mental fatigue and irritability, and reduced stress levels. Currently, the urban and community forests in Kansas occupy approximately 1.5 million acres and continue to expand rapidly.

While not counted as part of the urban and community forests in the statewide inventory, trees on private property provide similar health and social benefits. In addition, according to K-State Research and Extension, homeowners can reduce annual home energy costs by as much as 25 percent with the correct use of trees around a home. Carefully placed trees can provide cooling summer shade, protection from chilling winter winds, and can maximize heating from winter sunlight.

LIVING SNOW FENCES

Living snow fences may look similar to windbreaks but they serve a different purpose. Living snow fences are rows of trees and shrubs planted to keep snow off roads, reducing snow-removal and

related energy costs and making the roads safer for winter driving. Living snow fences may be narrower than windbreaks, containing fewer rows of shorter trees and shrubs. Living snow fences were first planted in the 1900s to protect railroad lines and major highways. According to the Nebraska Forest Service, a living snow fence can capture up to 12 times more snow per foot of height than a slatted or picket fence and can have a service life of up to 75 years. Living snow fences are not included in the statewide inventory of forest resources in Kansas.

NATIONAL FORESTS IN KANSAS

At one time, there was a national forest in Kansas, according to the Kansas State Historical Society. In 1905, President Theodore Roosevelt signed an Executive Order creating the Garden City Forest Reserve, reserving 30,000 acres for the federal government from homesteading claims. In 1906, the government planted the first 80,000 trees on the forest reserve. In 1908, the area was expanded to encompass 302,000 acres in Finney, Kearny, Hamilton, Grant, and Haskell counties. It was renamed as the Kansas National Forest. Although thousands of trees were planted in the artificial forest, very few survived. In 1915, President Woodrow Wilson ordered the experiment stopped and almost all of the land was made available for homesteading.

The National Forest Service does own and manage the Cimarron National Grasslands near Elkhart, which encompasses 108,175 acres. Located in Morton and Stevens counties, this is the largest parcel of public-owned land in Kansas. The third highest point in the state of Kansas is located on the area.

THE KANSAS NATIONAL FOREST

1905— presidential executive order creates "Garden City Forest Reserve."

1908— renamed as the "Kansas National Forest."

1915— national forest abandoned; land made available for homesteading

FOREST ECOSYSTEMS

*"The monarch oak, the patriarch of the trees,
Shoots rising up, and spreads by slow degrees.
Three centuries he grows, and three he stays
Supreme in state; and in three more decays."*

John Dryden, English poet and dramatist

Each area of land where trees are growing is an ecosystem, formed by the interaction of all the living organisms and the physical and chemical factors in the environment in which the organisms live. Forest ecosystems can be described as layers of trees and plants or divided by the functions of the organisms living in the forest.

Water is an important part of any forest ecosystem—not just for the trees and organisms living in the forest but also for people living far beyond the forest's boundaries. The headwaters for nearly all of the major rivers in the United States are found in forests. About two-thirds of the United States' freshwater originates on forested lands. The forests in Kansas are significantly affected by the availability of

Forests

rainfall. In areas of greater rainfall, there are more trees and plants so the trees tend to grow taller as they compete for sunlight, rather than water. In areas of the state where there is less water, there is less competition for sunlight so trees and plants grow lower to the ground and the roots penetrate deeper in the soil in search of water.

Forests also provide valuable wildlife habitat. Some Kansas woodland animals are more abundant today than ever before due to the expansion of woodlands over lands that were originally prairie.

FOREST LAYERS

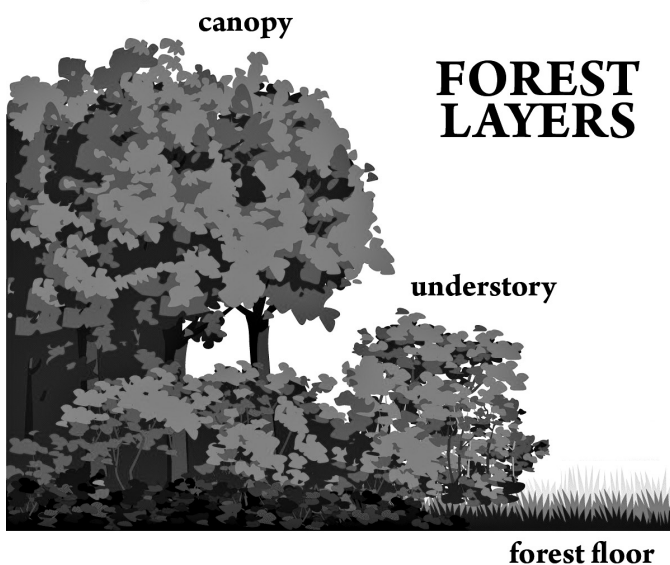
All forests are made up of layers of plants. There are three main layers: the canopy, the understory, and the forest floor. However, the number of layers in an individual forest will depend on several factors, such as the age of the forest and the climate.

The canopy layer is the top layer of the forest, composed of the branches and leaves of the tallest trees. The canopy receives the most sunlight so it is the food-making layer of the forest. During photosynthesis, the tree's chlorophyll—the green pigment in leaves that captures sunlight's energy—works with the water and carbon dioxide absorbed by the tree to produce the sugars that feed the tree, and oxygen is produced and released by the tree's leaves.

When a tree takes carbon dioxide out of the atmosphere through the process of photosynthesis, carbon is stored in the wood of the tree. This storage of carbon is called carbon sequestration. The carbon is not released back into the atmosphere until the wood decomposes or the wood is burned. According to the Society of American Foresters, one mature tree absorbs approximately 13 pounds of carbon dioxide over one year's time. Through photosynthesis, trees also filter other nutrients and pollutants out of the earth's atmosphere and store those in the wood.

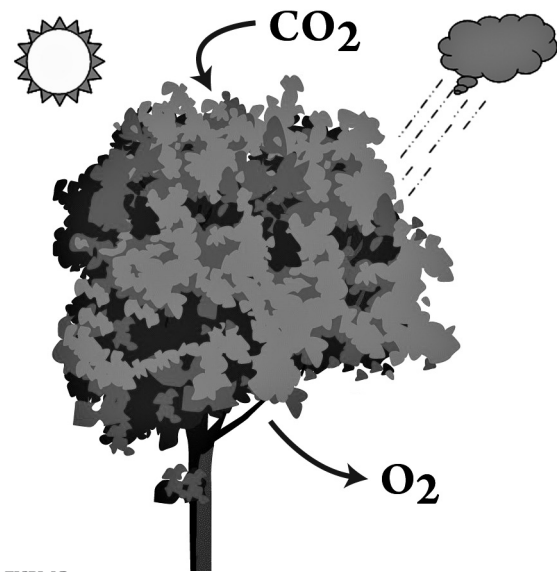
When it rains in a forest, the canopy plays a significant role in reducing soil erosion. Most of the rainfall does not strike the soil directly. Instead, the rain is intercepted by the tree canopy where the leaves absorb the impact of the raindrops.

The term "understory" refers to the layers growing under the canopy trees. A layer of trees makes up the top layer of the understory. This layer may include offspring of the canopy trees that may eventually grow tall enough to become part of the canopy themselves,



Source: FISRWG

PHOTOSYNTHESIS



Source: FISRWG

as well as smaller trees of different species that have adapted to growing in the shade of the taller canopy trees. The understory may also include a layer of shrubs—woody plants that have many stems. The next layer down may include grasses, ferns, wildflowers, seedlings, and other smaller plants. When it rains, the layers of vegetation in the understory help absorb the impact of the raindrops and cushion the impact of the water striking the forest floor.

The forest floor is the bottom layer of the forest. Fallen branches and leaves, mosses, and woody debris can be found on the forest floor. An average large, healthy tree that lives for 60 years could grow and shed 3,600 pounds of leaves (2,000 leaves per year).⁵ As they decompose, those leaves are returning nutrients to the soil around the base of the tree each year. The layers of vegetation and the debris covering the forest floor protect the soil from extreme temperatures. The decaying leaves and organic matter on the forest floor cushion falling raindrops. On forested land, the flow of excess water across the surface of the land is slower. The roots of the trees also secure the soil against the forces of wind and flowing water, significantly reducing soil erosion.

By slowing runoff, plant debris on the forest floor allows sediment and sediment-bound nutrients or contaminants to settle on the surface of the forest floor, building layers of soil. Tree roots catch the soil particles and bind them together. Root growth and plant residue improves the soil structure. Some water slowly filters down to the soil layer and seeps into the soil and replenishes the groundwater. Nutrients and contaminants are immobilized in the soil layer,

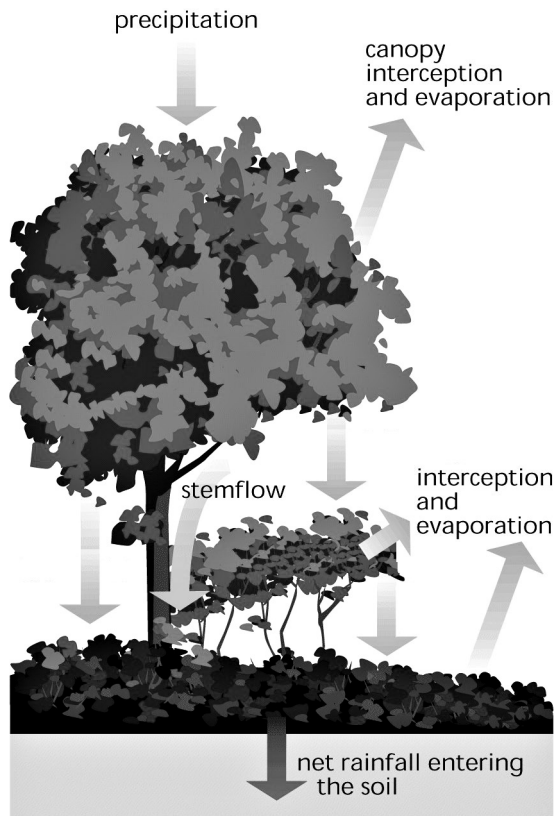
FOREST LAYERS

Canopy— top layer of tallest trees.

Understory— often more than one layer; smaller trees, shrubs, and plants, such as weeds, wildflowers, ferns and grasses.

Forest floor— bottom layer; fallen leaves, moss, and woody debris.

RAINFALL INTERCEPTION



Source: FISRWG

processed by soil microbes or absorbed by plants and trees as they pull water into their roots.

Water is pulled into a tree's roots, up through the trunk to all the branches and through the smaller branches and twigs to the leaves. At openings along the surfaces of the leaves, transpiration occurs. Water is drawn from the leaves and released back into the atmosphere to fall again as rain or snow, completing the hydrologic cycle.

THE FOREST SYSTEM

Another way to describe a forest is to view it as an ecosystem and classify the organisms in the ecosystem by their functions: producers, consumers, or decomposers.

In a forest ecosystem, the producers are the trees and other green plants that make food through the process of photosynthesis. As a tree grows, it collects minerals and nutrients from the soil and



Producers: Trees

Source: USDA NRCS

air around it. These nutrients, including carbon, nitrogen, and phosphorus, are used by the tree to make new bark, roots, leaves, branches, twigs, and wood.

In a forest ecosystem, the consumers include living organisms that feed on the trees and green plants directly and those that consume indirectly by eating other organisms that have already fed on the trees or green plants. One example of direct consumption would be a squirrel that eats the pecans from a pecan tree. The coyote or hawk that catches and eats the squirrel would be an indirect consumer in the forest ecosystem, as would a woodpecker that eats the insects that are feeding on a tree. Sometimes, there is a relationship between a producer and a consumer that is necessary to the survival of one or both species. For example, the seeds of the yew tree are coated with toxins. However, fruit-eating bird species such as those in the thrush family feed on yew berries for the fleshy coating of the berries. The poisonous seeds pass through the digestive system of these birds and are "planted" throughout the forest. The yew tree would not continue to reproduce without these birds and their ability to eat the berries and remain unharmed.

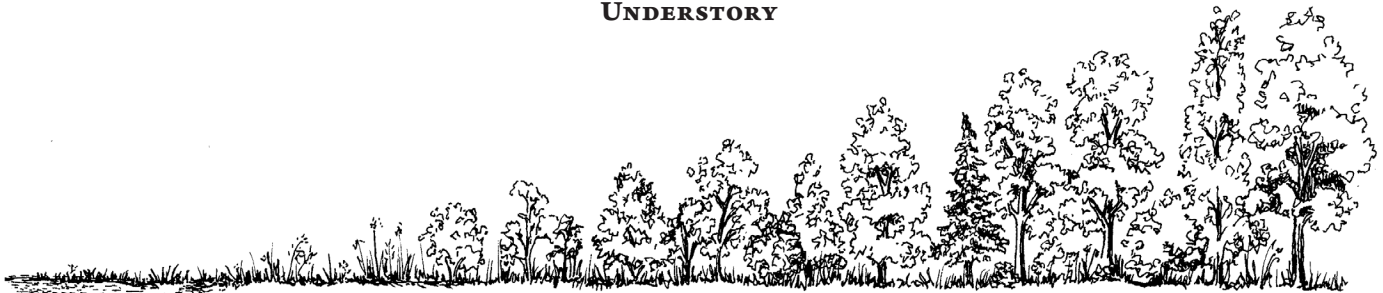


Consumer: Squirrel

Source: USDA NRCS

The decomposers in a forest ecosystem recycle nutrients and make them available for either producers or consumers to use.

UNDERSTORY



**Annual
Grass/Forb**

**Perennial
Growth/Forb**

Shrub

Young Woodland

Source: USDA NRCS

ORGANISMS IN THE FOREST

Producers— plants that make food through photosynthesis; includes trees and other green plants.

Consumers:

Direct consumers— living organisms that feed on trees and green plants; for example, squirrels, deer, termites, and wood-eating insects.

Indirect consumers— living organisms that feed on direct consumers; for example, the hawk that eats the squirrel, the coyotes that feed on a deer carcass, and the woodpecker that drills into a tree to catch wood-eating insects.

Decomposers— living organisms that recycle nutrients and make them available for producers or consumers; includes fungi, bacteria, insects, and earthworms.

Decomposers such as fungi, bacteria, and earthworms are always at work on the forest floor, breaking down the fallen leaves and woody debris into nutrients that rebuild the soil. When a tree dies, fungi, bacteria, and wood-eating insects such as termites and beetles are usually the first to feed on the dead tree. They soften the wood and the wood-eating insects create tunnels through which water, small animals, and other fungi and bacteria can enter. Some of the insects lay their eggs in the softened wood and the larvae of those insects then feed on the wood when they hatch. As the decomposition slowly progresses, the tree is turned into humus, a rich layer of soil.



Decomposer: Earthworm

Source: USDA NRCS

WILDLIFE HABITAT

Wildlife can be found in all types of Kansas forests, ranging from trees in city parks and farmstead windbreaks to Christmas tree farms and native timberlands. Wildlife species have three essential needs for survival: food, water, and cover. Cover is necessary for nesting, resting or “loafing,” escape, and protection from the elements. Natural or planted forestlands can be excellent wildlife habitat, providing food, cover, and travel corridors. Woodlands produce seeds, berries, leaves, nuts, and fruit, all of which can be food for different wildlife species. Some tree species depend on wildlife to distribute and “plant” seeds. For example, squirrels may hide or lose acorns, which then have a chance to grow into oak trees.



Source: USDA NRCS

Kansas forests provide critical habitat for forest-dependent species, such as the eastern spotted skunk, broadhead skink, and northern spring peeper. Kansas forests also provide important habitat for wild turkeys, deer, and squirrels. A habitat may be a large area or a single tree with the

necessary features. A web-spinning spider’s habitat might be just one branch of a large tree. Other wildlife species such as rabbits, quail, and raptors utilize the woodland edge—the border where two different types of cover come together. Dead trees provide habitat for many species. In addition to the fungi, bacteria, and wood-eating insects that feed on a dead tree as part of the decomposition process, other animals or birds make nests inside decaying trees or seek shelter there. Other species feed on the fungi, insects, or animals already living in the decaying trees. Many birds use snags—standing dead trees—for nesting sites. These birds nest in holes or cavities in the snag.



Source: USDA NRCS

Trees provide shade for streams, rivers, and wetlands. This lowers the water temperature and improves the habitat for fish and other aquatic life. The lower water temperature increases the presence of oxygen while reducing the rate of evaporation and slowing the release of unwanted chemicals from sediment. Overhanging roots provide good fish habitat while fallen leaves and small branches create organic matter, the basic food source for fish and other aquatic life. Large trees and limbs that fall into rivers and streams provide habitat for fish and aquatic organisms. Along streams or by the edges of ponds or lakes, wood ducks nest in tree cavities as high as 60 feet above the water. Once the ducklings tumble out of the nest and down to the water’s surface, they never return to the nest.



Source: USDA NRCS

WORKING FORESTS

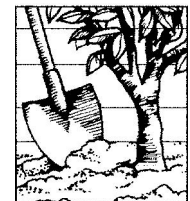
“Plant trees. They give us two of the most crucial elements for our survival: oxygen and books.”

A. Whitney Brown, actor and writer

Trees are a very useful natural resource. Even when a forest is set aside as a wilderness area, the trees feed and shelter wildlife, filter water, and store carbon while releasing oxygen and water into the atmosphere. Forests reduce soil erosion, provide recreation opportunities for people, and provide food and over 5,000 other products.

RENEWABLE RESOURCES

A renewable resource is a naturally occurring resource that can be replenished through natural cycles and management of biological growth and reproduction. Trees are a renewable resource. The forests in the United States are actually expanding, not shrinking! In the United States, 1.5 billion tree seedlings are planted each year and, according to the Society of American Foresters, more trees are grown



Source: USDA NRCS

FOREST FACT

Forests cover about one-third of the United States, about the same amount of land covered by forests 100 years ago.

Source: National Association of State Foresters

through replanting and natural regeneration than are harvested. Since 1930, 64.5 million acres of trees have been planted in the United States—an area equal in size to the states of North Carolina, Virginia, and Maryland combined.⁶ Today, forests cover about one-third of the United States, about the same amount of land covered by trees back in 1907. The 747 million acres of forestland in the United States today is approximately 71 percent as much as there was in 1630.⁷

KEY WORDS
Forestry —the science of managing and caring for forests.
Silviculture —the art and science of growing and managing woodlands and forests to achieve desired outcomes.
Agroforestry —the integration of tree and shrub plantings into agricultural systems.

THE SCIENCE OF FORESTRY

In the United States, the importance of the science of forestry was not recognized until the early 1900s. Forestry is the science of managing and caring for forests. The art and science of growing and managing forests and woodlands to achieve desired outcomes is called “silviculture.”

“Agroforestry” is the integration of tree and shrub plantings into agricultural systems to optimize production and conservation benefits. Agroforestry practices include field, farmstead, and livestock windbreaks; riparian forest buffers adjacent to streams, ponds, and wetlands; woodlots and tree farms; wildlife habitat plantings; and living snow fences.

Forests may be managed to meet one, several, or many goals. The key for private landowners and public officials is to determine the goals and strike a balance between uses if there are any conflicts. Forestlands in Kansas present many of the same management challenges as larger forests in other states. However, the Kansas forestry industry is unique because over 95 percent of Kansas forestlands are privately owned and over one-half of those are 50

KANSAS FORESTS

Over 95% of Kansas forestlands are privately owned.

Source: Kansas Forest Service

acres or less in size, according to the Kansas Forest Service. An inventory of approximately 20 percent of the forestland in Kansas is conducted each year, collecting data from identified plots using satellite imagery, remote sensing technology, and global positioning system (GPS) devices to determine the exact locations of plots not physically visited. The data is examined by researchers from the Kansas Forest Service and other state and federal agencies and used to determine changes in the size and health of Kansas forests.

Since trees require many years to mature, a forest landowner is making a long-term investment in his or her property. Forest management can involve planting, pruning, and thinning trees; removing undesirable trees; timber harvesting; road or trail construction and maintenance; application of chemicals to thwart attacks by insects or disease; and even forest fire management.

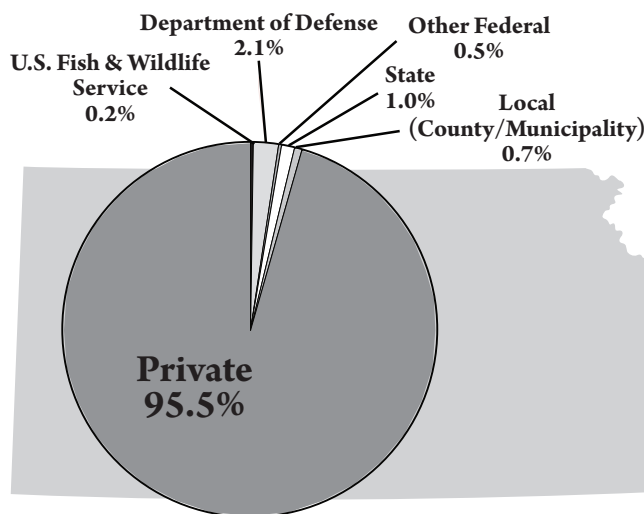
Undesirable trees are removed when they hinder the growth of new seedlings or crop trees. Crop trees are the best trees in a stand that will be harvested as logs (timber). These trees are selected because they are tall, straight, free of stem defects, have large crowns, and usually have larger trunk diameters than other trees of the same species. These trees are pruned to increase their log quality. The log produced from a tree trunk that is free of defects when the tree is harvested is worth more than a log with defects in the wood, such as lumps, bumps, or knots. Thinning removes trees that are about the same height as crop trees and is done over time to allow the crop trees to slowly adjust to the added sunlight.



Source: USDA NRCS

Mature trees are sold based on the value of the logs that can be cut from the tree. The value of the logs is based on an estimate of the lumber that will be produced from the tree, calculated using log diameter and length. Kansas has more than 70 active sawmills and timber buyers in the state. Many are small sawmills, either stationary or portable, and provide an excellent market for landowners with only a few trees to sell at a time. According to the Kansas Forest Service, wood and lumber manufacturers in Kansas employ over 3,500 people.

KANSAS FOREST OWNERSHIP



Source: Kansas Forest Service



Sawmill

Source: Kansas Forest Service

FOREST FACTS

- More than 5,000 products are made from trees.
- Each year, the average American uses wood and paper equal to a 100-foot-tall tree with an 18-inch diameter.
- Over 50 percent of the paper consumed in the United States is recovered for recycling.

Sources: Society of American Foresters and American Forest & Paper Association

FOREST PRODUCTS

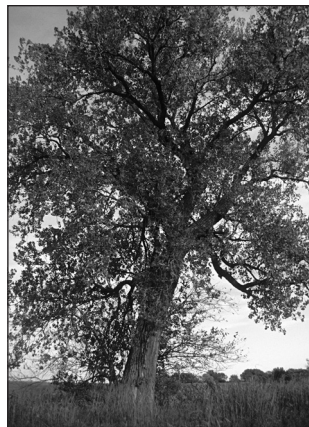
More than 5,000 products come from trees. Paper products include books, computer paper, envelopes, napkins, boxes, newspapers, and magazines. Lumber is used to build homes, shipping pallets, and fences. Other wood products include fine furniture, garden mulch, cork boards, baseball bats, and pencils. Nuts and fruits provide food for people and wildlife. Tree extracts and fibers are used in many health and food products, ranging from toothpaste and deodorant to milkshakes and cinnamon. Tree fibers are also used in carpets and fabrics, such as silk and rayon. Rubber for bicycle tires comes from the rubber tree while cacao beans from the tropical cacao tree are used to make chocolate and cocoa products. Advanced technologies have developed products so that almost 100 percent of a tree can be used when it is harvested today. Also, the need to harvest many older (taller) trees has been reduced by developing engineered wood products that are made by gluing and laminating together wood from small logs from younger trees.

According to the Society of American Foresters, the average American uses wood and paper equal to a 100-foot-tall tree with an 18-inch-diameter trunk each year. Today, most of the trees that are used to make paper are grown specifically for that purpose and harvested as a crop. Paper mills also use recycled paper, as well as wood chips and sawdust, to make new paper. Today, much of the paper used in the United States is recycled paper. Most newspapers contain recycled paper and most cereal cartons are made of 100 percent recycled paperboard, layers of paper or paper pulp that have been pressed together to make them strong. In 2005, a record 51.5 percent of the paper consumed in the U.S. was recovered for recycling—51.3 million tons, an average 346 pounds for each man, woman, and child in the country.⁸ While Kansas forests are not managed for paper production, there are many opportunities to recycle paper and wood products throughout the state.

Trees from Kansas timberlands are harvested as logs, which are processed through sawmills in the state. The sawmills process the logs into lumber, mainly for use in the furniture and pallet industries. Lumber from the Kansas state tree, the cottonwood, is used extensively in the pallet and crate industries. It is lightweight and readily available since the cottonwood is the most

Cottonwood Tree

Credit: Bob Gress, GPNC



abundant tree species in the state. In-state sawmills also market byproducts, such as wood chips, mulch, sawdust, and firewood. Higher-quality “vener logs” harvested in Kansas are shipped to other states or countries to be sliced into very thin sheets of veneer, wood which is overlaid on less expensive wood to provide an expensive-looking product for a more affordable price. Veneers are used in paneling and in the furniture industry.

Black walnut is a valuable timber tree in Kansas. However, it takes a long time before a black walnut tree is ready for timber harvest—as long as 80 years! The wood of the black walnut tree is hard and beautiful when finished. It is highly valued as lumber and veneer and is used for flooring, furniture, musical instruments, gunstocks, plaques, trophy bases, picture frames, and other novelty items. Almost every high school trophy case contains an example of this wood as the Kansas High School Activities Association has used it for all state award trophies in recent years.

Black walnuts are also an important nut crop in Kansas, with over 37 tons of black walnuts collected in an average year. The black walnut is one of the few crops still picked by hand. The shell of the black walnut is a hard, natural abrasive when ground into fine particles. It is used for polishing, to clean jet engines, as filler in dynamite, as a filtration medium, and as an ingredient in cosmetic and dental products.

Pecan trees are grown and harvested for veneer logs in Kansas. Pecans are also an important commercial nut crop. In Kansas, the pecan industry is located in the southeastern and east-central areas of the state. Kansas State University maintains a Pecan Experiment Field



Pecans

Credit: Scott Bauer, USDAARS

east of Chetopa, Kansas, where research is conducted to find pecan varieties most suitable for the growing conditions in Kansas. In 2005, over three million pounds of pecans were harvested in Kansas, according to the Kansas Agricultural Statistics Service.

The first records placing a value on orchard products in Kansas date back to 1860, and Kansas fruits have won many prizes. One of the first awards was the gold medal awarded to the Kansas State Horticultural Society for its display of fruits at the Pomological Congress in Philadelphia in 1869.⁹ Today, most orchards in Kansas are apple orchards. However, the acreage planted to apple trees has been decreasing rapidly in recent years while the acreage planted to peach trees has stayed almost the same. Kansas orchards also produce pears, plums and prunes, cherries, apricots, and nectarines.



Pears

Credit: Keith Weller, USDAARS

Christmas trees are another Kansas forestry product. According to the National Agricultural Statistics Service, there are over 150 Christmas tree farms in the state. Christmas tree farming generates an estimated \$10 million in business annually in the state of Kansas.¹⁰ Before 1959, there were no Christmas tree farms in Kansas. That year,

the Delp Christmas Tree Farm, at St. John in Stafford County, became the first Christmas tree farm in the state. Another Christmas tree farm also started that year in Riley County but it no longer produces Christmas trees. Most farms plant seedlings or containerized trees that are 2-4 years old. Those trees will grow in the field another 6-10 years before being harvested. Some trees never grow in a good shape to be harvested for a Christmas tree and will be cut down and sold as wreaths or swags or for use as greenery.

Charcoal is also a forestry product. There is a large charcoal plant in southeastern Kansas that produces briquettes for outdoor cooking. This plant primarily uses byproducts from other sawmills. Charcoal is a fuel product. Today, in developing countries, charcoal is the main fuel people use to cook their food.

KANSAS FOREST SERVICE

"The cultivation of trees is the cultivation of the good, the beautiful, and the ennobling in man, and for one, I wish to see it become universal."

Julius Sterling Morton, Arbor Day founder

The Kansas Forest Service provides technical assistance for citizens and the forest industry and coordinates programs and activities throughout the state. The state office of the Kansas Forest Service is located in Manhattan, Kansas, and there are six district offices throughout the state. Although it is a state agency, the Kansas Forest Service is organized within Kansas State University's College of Agriculture in the Department of Horticulture, Forestry and Recreation Resources.

ARBOR DAY

J. Sterling Morton was a pioneer, journalist, and editor of Nebraska's first newspaper. In 1872, he proposed that the Nebraska State Board of Agriculture establish a tree-planting holiday named Arbor Day. Several other states also observed Arbor Day in the 1870s while schools nationwide began the tradition of participating

in Arbor Day activities in 1882. Following several years of Arbor Day contests, activities, and celebrations, Arbor Day became a legal holiday in Nebraska in 1885. At first, National Arbor Day was observed on the birthday of J. Sterling Morton, April 22nd. Today, the National Arbor Day Foundation designates the last Friday in April as National Arbor Day although some states celebrate Arbor Day at other times more appropriate for tree planting.

The Kansas Legislature has designated the last Friday in April as Arbor Day in Kansas. One program sponsored by the Kansas Forest Service is the Kansas Arbor Day National Poster Contest for fifth grade students.

TREE CITY USA

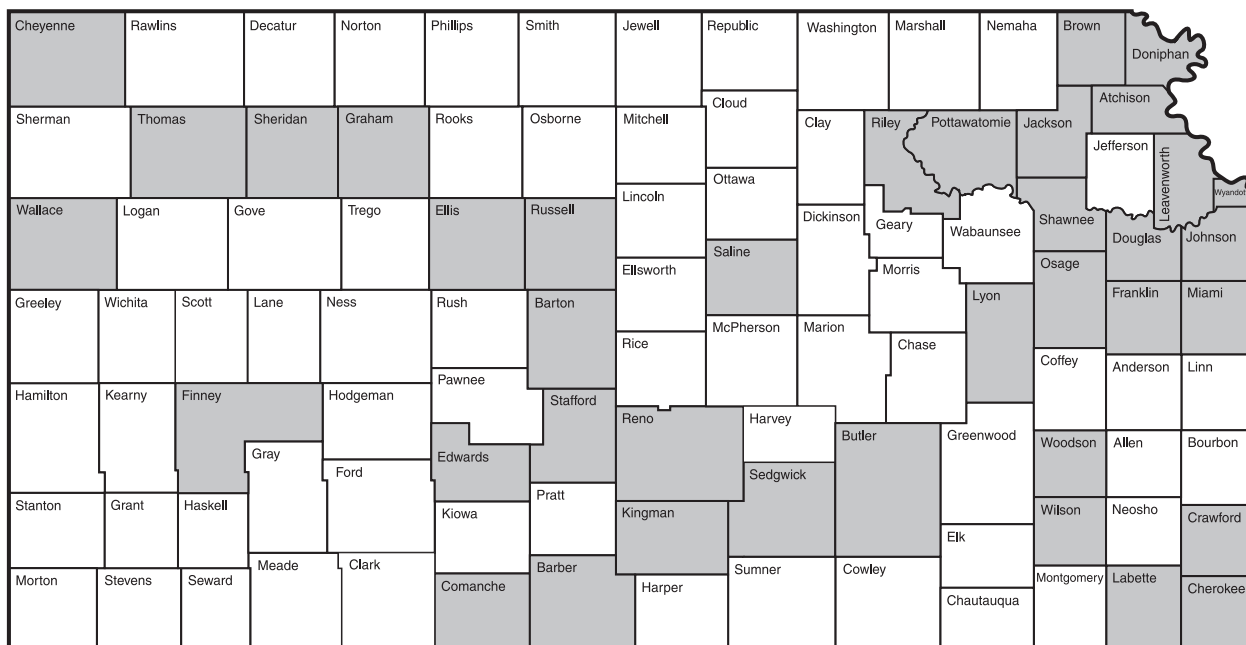
The Kansas Forest Service and the National Arbor Day Foundation sponsor the Kansas Tree City USA Certification and Recognition Program. The Tree City USA award is presented annually to communities that have outstanding tree management programs. In Kansas, 115 communities representing 70 percent of the state's population participate in the Tree City USA program.

KANSAS CHAMPION TREES

The Kansas Forest Service coordinates the Kansas Champion Tree Program. The purpose of this program is to locate and measure the largest trees of the various species found in the state. Currently, the list of champion trees includes 141 champion or co-champion trees located in 38 counties. The Kansas Forest Service's website includes an online database that lists the Kansas champion trees by both tree species and county (www.kansasforests.org).



COUNTIES WITH KANSAS CHAMPION TREES



Source: Kansas Forest Service

TREES IN OUR LIVES

"Someone's sitting in the shade today because someone planted a tree a long time ago."

Warren Buffet, American investor, businessman, and philanthropist

It may seem that the forests in Kansas are not that significant. After all, only 4 percent of the land area in Kansas is forestland while forests cover approximately one-third of the land area of the United States. Even so, Kansas forestlands provide important benefits, including wood, consumer and industrial products, wildlife habitat, erosion control, and improvements in water quality. Trees improve the quality of life in Kansas by providing scenic beauty, recreational opportunities, and protection from extreme weather conditions. Kansas may be a prairie state but Kansas forests are vital to the state's future. ■

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Career Profile:

ERIK WARREN

Artist, Erik's Originals

Erik Warren creates beautiful designs in wood every day. His artist's tool is a scroll saw, a stationary saw with a tiny vertical blade that can cut intricate designs for a wall hanging or create simple children's puzzles. The smell of aromatic cedar usually fills the air in Warren's workshop in Hays. The wood is soft, cuts easily, and does not require additional staining or painting due to the patterns and colors in the wood.

Warren's interest in the scroll saw began when he was in school over 20 years ago. He participated in a special training wood shop. At first, he was cutting boards used by other people in the wood shop. Warren became interested in their work and began using the scroll saw to produce puzzles and decorative crosses. While those are still popular, Warren's advanced skills also allow him to produce larger, more detailed pieces, such as decorative university mascots and custom pieces.

Now in his thirties, Warren's skill with the scroll saw provides an outlet for his energy, as well as a way of providing for his own future. Warren has autism, a developmental disorder that interferes with his ability to communicate with and relate to other people. His parents have worked hard to prove that a person with autism can be a productive member of society. Despite the challenges, Warren graduated from Hays High School and his family has created an environment that allows him to be a productive member of society.

Even though Warren focuses on his work for hours at a time, his work brings him pleasure. "I think his life is in his hands and when they are busy, he has peace of mind," says his father Jim Warren. Erik Warren's ability to express himself with words may be limited but his creations bring joy to many people.



Courtesy: Erik's Originals

Career Profile:**TONY DELP****Owner, Delp Tree Farm**

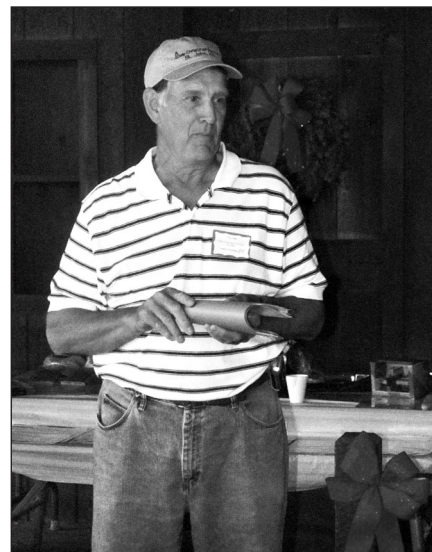
Delp Christmas Tree Farm started in 1959 and was one of the first Christmas tree farms in the state of Kansas. Cecil Delp, Tony Delp's father, got the idea of growing Christmas trees in the sandy soil near St. John while visiting cousins in the state of Michigan. That first year, Cecil Delp planted 17,500 Scotch pine trees. The Christmas tree farm became a 4-H project for Tony and his brother. They hoed the weeds between the trees—by hand—and worked on the farm during the summers.

Tony Delp went to college, graduating with a degree in mechanical engineering and lacking just a few credit hours of earning a master's degree in business administration. He worked in Dallas for seven years before deciding to return to St. John and continue the Christmas tree farm as a family business. With his wife and three sons, the farm expanded to 300,000 trees and shipped Christmas trees all over Kansas and into neighboring states. His sons grew up on the farm and ran the shearing crews, which employed as many as 30 high school students in the summer. Delp really enjoyed getting to know his sons' friends and working with the teenagers.

The Christmas tree business is very competitive and requires a long-term commitment. The Delps plant two- to four-year-old seedlings or transplants that must grow another eight to ten years before they can be harvested. Until 1981, the farm was dryland—completely dependent upon rainfall for water needs. Pipe irrigation provided more consistent water for the trees but the pipes had to be moved by hand. Each year, some trees are damaged or killed by disease or rabbits. Other trees never develop a good shape for a Christmas tree and the branches are used for wreaths and other greenery. Christmas trees are only sold during late November and December while bills must be paid and work must be done all year long to prepare for the Christmas season.

Delp had started a computer business and, in 1991, took advantage of an opportunity to work full-time at a bank in St. John. The number of trees at Delp Tree Farm was scaled back to around 15,000, where it remains today. Each year, 1,500-1,600 Christmas trees are harvested. Ninety percent of the Christmas trees are purchased by customers from the Great Bend, Pratt, and Larned areas. Other trees are shipped to garden centers and other Christmas tree farms in the state. Delp says, "We have the best customers that a business could hope for."

To stay competitive, Delp Tree Farm has chosen to grow different varieties than most of the other Christmas tree farms in the state. Placing the trees under center pivot irrigation has reduced labor costs. Delp Tree Farm continues to be a family affair, with Delp's sons choosing to come home and help at different times. "Operating the tree farm as a family has been a great experience for us," says Delp. The farm has one full-time employee, two part-time employees, and 12 seasonal employees, mostly during the Christmas season.



Courtesy: Delp Tree Farm

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* *Teachers & Advanced Readers*; AR - Accelerated Reading Level

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Prevost, John F. 1998

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Devouring Flames: The Story of Forest Fires

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My Favorite Tree: Terrific Trees of North America

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Old Elm Speaks: Tree Poems.

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Forests Showcase:**COTTONWOOD***Kansas State Tree*

The cottonwood was designated as the Kansas state tree in 1937. (The cottonwood is also the state tree of Nebraska and Wyoming.) It is the most abundant tree species in the state. Before Kansas was settled, mature cottonwood trees growing along streams and rivers survived the prairie fires due to their thick protective bark. Cottonwoods were widely planted by settlers in the late 1800s. In the 1930s and 1940s, more cottonwoods were planted as fast-growing tall trees in new windbreaks across Kansas.

Cottonwoods are deciduous trees. The leaves are triangular in shape with a long pointed tip and coarse round teeth on the edges. The flattened stalks that connect the leaves to the stem allow the leaves to flutter at the slightest breeze. Cottonwoods can reach a height of over 100 feet and can have trunk circumferences greater than 12 feet.

The wood of the cottonwood is light in color, easy to work, and lightweight. In the manufacture of furniture, it is used as the core material and other high-grade furniture veneers are overlaid on it. Cottonwood is also used in the construction of pallets, boxes, and crates for transporting merchandise. More cottonwood is harvested and processed than any other tree in Kansas.



Credit: Bob Gress, GPNC

Forests Showcase:**THE KANSAS SILK INDUSTRY: 1870–1897**

At one time, Kansas showed promise of becoming a silk capital of the world. In the 1800s, the French settlement of Silkville in Franklin County was the center of silk production in Kansas. Silk production also took place in the south-central area of the state.

Ernest de Boissiere, a Frenchman, founded Silkville in 1869 for the purpose of manufacturing silk. Early in 1870, de Boissiere planted 40 acres of mulberry trees.

**House at Silkville**

Credit: Grace Muilenberg, KGS

He imported silkworms from France and Japan

and brought families from France to Kansas. Those families included experts from the French silk industry. Ten thousand mulberry trees provided the leaves to feed the silkworms so they could spin their cocoons of silken thread. Looms in the silk factory turned out 250-300 finished yards of fabric a day. At the Philadelphia Centennial Exposition of 1876, a sample of the silk was awarded first prize. However, it proved difficult to compete with Italian and Japanese silk production and Silkville had stopped producing silk by 1886.

When Russian Mennonites immigrated to south-central Kansas in the 1870s and 1880s, many brought silk production skills to the region. At one point, more than 40 counties in Kansas reported silk production. In 1887, the State Board of Agriculture organized a special silk commission and authorized the establishment of a silk station in Kansas. The silk station was located at Peabody. It included ten acres of land planted to mulberry trees to grow the food necessary for the station's silkworms. A building was erected and the station bought cocoons, reeled, and sold the silk thread. The primary work of the station was to raise silkworm eggs for free distribution to residents of Kansas who would hatch and raise the silkworms. The silkworms fed on leaves of mulberry trees before forming the cocoons made of silk thread.

Many Kansas families participated in the silk venture, but in 1897, the state legislature ended the state funding and the Kansas silk industry was abandoned.

**Mulberry Leaves**

Credit: Mary Anne Stoskopf

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<http://erikoriginals.com>

Forestry for K-12

Society of American Foresters

www.safnet.org/aboutforestry/learn.cfm

Kansas Forest Service

www.kansasforests.org

Tools for Teachers

American Forest & Paper Association

Paper Industry Association Council

www.paperrecycles.org/tools_for_teachers/index.html

Tree Guide

Illinois State Museum

www.museum.state.il.us/muslink/forest/htmls/trees.html

Tree ID Animation

National Arbor Day Foundation

www.arborday.org

NOTES:

