We All Need Kansas Trees for Resilient Ecosystems!

Kansas Arbor Day
POSTER CONTEST

Welcome

Kansas Arbor Day
POSTER CONTEST

Dear Fifth Grade Educator,

Have you ever wondered about the trees around you and how you can tell one tree from another? If so, you're not alone. There are many characteristics, from a leaf to tree shape, that are unique for a single tree. When we plant several types of trees in our communities and our rural landscapes, we develop a rich biodiversity that makes the natural ecosystems that wildlife and people depend upon healthier and more resilient.

We have made some significant and notable changes to the Kansas Arbor Day Poster Contest this year. Beyond the creation of the new curriculum, we have changed the longstanding theme from ***Trees Are Terrific*** *to* ***We All Need Kansas Trees*** to affirm the importance of trees in our lives, communities, ecosystems and our state. We've also created a modern twist to the poster contest by adding a social media component to Extension Activity #2 that encourages teachers and other educators to show members of the KADPC Facebook Group the trees that they find in their communities and share any other experiences that their classrooms had learning outside. By creating a closed Facebook group, we've created a secure and professional place for members who interact there. The group welcomes tree board members, city forestry staff, educators, school staff and administrators and our poster contest partners.To join, you will need to follow the simple directions on page 28.

The use of part or all of the activities in this lesson plan is encouraged, but not mandatory, for participation in the state poster contest. You may adapt, alter or supplement these activities to meet the needs of your classroom.

Please follow the poster contest rules on page 34 and note a few new clarifications to the rules. Be sure that each poster is signed in the bottom right corner and that the theme is correctly spelled and punctuated. The poster should not be laminated, matted, mounted, framed or folded. For the local-winning posters advanced to the district-level of competition, please attach a completed School Winner Report Form (page 35) to the back of your local-winning poster. Several cities in Kansas participate in the Tree City USA program and have tree boards and/or city staff supporting forestry programs locally. These folks may be good points of contact for a local contest. **All local-winning posters must be to the office of your Community Forester (page 37) by February 7, 2020.**

I encourage you to join the Kansas Forest Service and our contest partners, below, in teaching the youth of our state that *We All Need Kansas Trees* for all that we gain when there are resilient ecosystems around us.

KANSAS FOREST SERVICE
KANSAS STATE UNIVERSITY

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The Kansas Arbor Day Poster Contest lesson plan supports Kansas College and Career Ready Standards for Science and multiple crosscutting concepts.

Hands-on activities teach students how to identify differences between trees, why biodiversity is important to wildlife and people and how to properly select and place trees.

Poster contest information, rules and School Winner Report Form are found on pages 33-35.

Local-winning posters must be submitted to your Kansas Forest Service Community Forester by *February 7, 2020.*

Step 1 Discover the Importance of Tree Diversity

Objectives

Students will be able to:

- Distinguish how trees are different from each other by the leaf, bark, fruiting structure or shape.
- Describe how to create resilient ecosystems that support wildlife and healthy and prosperous landscapes.
- Articulate how to determine the proper placement of trees for optimal benefit to people and wildlife.

Time Recommended:

Approximately 60 minutes of class time

Materials Needed:

- Ruler (one per group)
- Pencils
- White piece of printer paper (one per student or group)
- Crayon (one or two per student)
- Handout of *Rubric* and *Vocabulary* on pages 18 & 19
- Photocopy of *Tree Clue Sheet* (one per group) on page 17
- Photocopy of *Tree Information Sheet* on pages 20-21.

Students Who Demonstrate Understanding Can:

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Crosscutting Concepts:

- Scale, Proportion and Quantity
- Systems and System Models
- Patterns
- Energy and Matter

Teacher Background Information

Trees are widely appreciated for the bountiful products they produce and the beauty they contribute to our homes, communities and environment. Some vacation tours solely feature autumn foliage and educational tours often highlight special characteristics, such as size, shape or spring bloom that make one tree different from another.

Trees are as unique from one another as humans are. Tree shape, bark, leaves, flowers, fruit, twigs and buds are all ways to tell trees apart. For some, like the oak, the unique identifier is that it produces a fruiting structure called an acorn. The fan-shaped leaf of a Ginkgo is exclusive to that **species** as is the distinct tulip-shaped flower of the tuliptree.

These differences can create a rich biodiversity within a community or rural forest that supports wildlife, as well as our own life cycles. **Biodiversity** is the variety and complexity of species that are present and that interact in an **ecosystem**. Kansas native trees are noted for supporting a wide array of wildlife and insect species, such as butterflies, moths and bees.

Cultivating biodiversity is important in communities and rural areas to avoid losing an immense number of trees to insect damage, disease spread, storms or climatic extremes. Losing a large number of trees puts the community and people at risk of increased air pollution that can negatively affect the health of vulnerable people, increase water pollution, increase energy costs, reduce revenue in business districts and create hotter neighborhoods and homesteads.

Background: Without a Diversity of Trees, One Disease or Insect Could Destroy All Trees in An Area

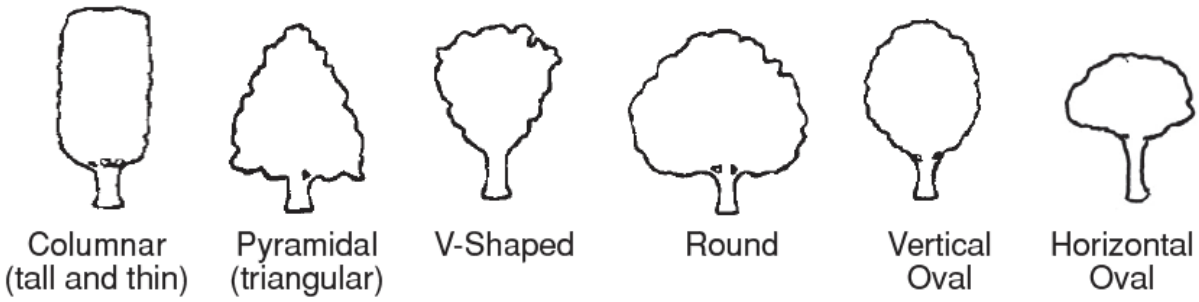
Insects and diseases can affect almost any tree but usually these are not life-threatening to the tree. For example, tiny insects on hackberry trees, called the hackberry gall psyllid, cause bumpy, wart-like **galls** to develop on the leaves. While these galls do not kill the tree, some people think the galls make the tree less attractive. However, a disease or insect will appear and almost completely destroy a particular tree species.

For instance, the American elm was once the most commonly planted **street tree** in North America. When a **fungal** disease, called Dutch elm disease, was found in this country in the 1930s and spread across the nation, it killed millions of elm trees, leaving many cities almost treeless. A tree species commonly planted when American elms were lost was the ash tree. In 2002, an **exotic** and **invasive** insect, the emerald ash borer, was detected in southeastern Michigan. It probably arrived in this country on wood packing materials. Since its initial detection in North America, it has spread to 35 states and five Canadian provinces. The insect attacks all **native** ash trees, interfering with the tree's ability to transport water and nutrients, causing untreated trees to die. Hundreds of millions of ash trees have already been killed in communities, forests and woodlands. In Kansas, the emerald ash borer has been detected in eight counties: Atchison, Doniphan, Douglas, Jefferson, Johnson, Leavenworth, Shawnee and Wyandotte. Ash populations in Kansas communities ranges anywhere from 5% to nearly 30%, causing either minor or devastating impacts and costs to infected cities. In 2019, the fungal **pathogen** of sudden oak death was found on rhododendron plants in Kansas. If the disease spreads to our forests and woodlands, millions of red, black, pin, shumard, blackjack, shingle and other oaks are at risk throughout the state. Besides not transporting firewood, the other best way to guard against a catastrophic loss of trees is to ensure that the landscape is diversified with many types of tree species from multiple **genera** and plant families.

EAB was first found in Wyandotte County in 2012 and now is found in seven other counties in Kansas, 35 states and five Canadian provinces. It attacks all native ash trees in North America. The transportation of firewood is a major way it has spread in the country and the monoculture plantings of ash trees in neighborhoods and subdivisions has created a costly situation to manage. Planting a diverse landscape with many types of trees reduces the risk of catastrophic loss to any one insect or disease.

Background: Trees Grow in Different Shapes and Sizes

When provided enough space to grow naturally, trees have characteristic **shapes**. Some shapes fit better in a space and serve different functions than others. For example, trees with rounded **crowns** are proficient in shading larger areas, like backyards, parking lots, or large areas in city parks. Mature pin oaks have an oval-pyramidal form that makes it a popular species for street-side planting. Pin oaks growing in their natural form, as pictured on the next page, exhibit upright and ascending branches useful for screening visual distractions and slowing summer winds.

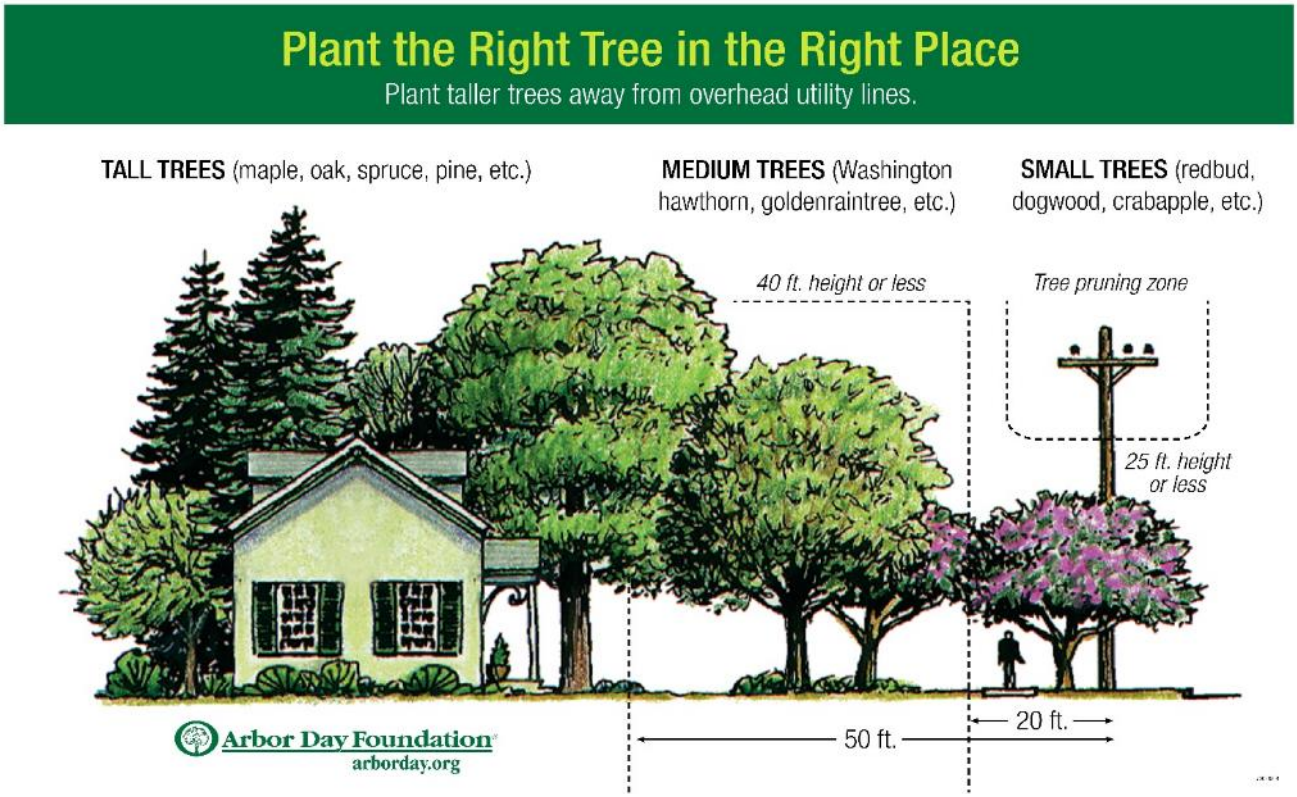


Pin oaks pruned for vertical clearance line streets in several cities.

Pin oaks line the boundaries of a city park, providing protection from summer winds and screening for this athletic field.

Other pyramidal-shaped trees, especially evergreens that are wider at the bottom than at the top, are better at breaking the wind nearer the ground. The eastern redcedar (pictured left) is a Kansas native tree that is utilized throughout the state in windbreaks and other conservation plantings where protection from winds is needed. Where narrow spaces exist, columnar-shaped trees are most suitable.

Size is also important in tree selection. Knowledge of whether a two-foot seedling will grow into a 20-foot tall tree that spreads 20 feet wide or an 80-foot tall tree with a 70-foot spread is critical in deciding where to plant a particular tree. Trees too large for a particular site can quickly crowd a house, block a view or get tangled in power lines.



Planting a tree in the right location is very important for a tree to live to its fullest potential. When people plant large-growing trees too close to overhead utility lines this requires electrical providers to remove vegetation from the lines to provide for public safety and reliable service. The graphic above illustrates the proper placement of trees where above-ground utilities exist.

When trees grow into overhead utility lines, they must be pruned away from power lines to remove the risk of electrocution and to provide for a reliable source of power. Choosing the correctly sized tree for planting near power lines is important. Trees with mature heights 25 feet or less, such as the eastern redbud, Japanese tree lilac, amur maple, serviceberry and smaller-growing crabapple are the best options.

This young eastern redbud established quickly and within two growing seasons, was well on its way to its mature size. It was chosen for planting near an overhead utility line that it would not interfere with.

Trees Come in a Variety of Sizes

Size and location of the tree, including available space for roots and branches, affects the decision on which species to plant.

BEFORE PLANTING, know what the tree will look like as it nears maturity.

(These examples are typical mature heights in city conditions. Check booklets published by local forestry professionals or books such as Manual of Woody Landscape Plants for the expected mature height and crown spread of trees you are considering.)

Background: Some Trees Need Certain Locations, Temperatures and Soils to Survive

Trees must be carefully selected so that they will flourish in the site that they are planted in. Several factors that influence tree growth are temperature, soil, soil compaction, moisture, light, air pollution and winds.

Temperature: The average lowest temperature of the year limits the growing range of many trees. Some trees grow best in cool climates while others do best in warm climates. Some tree species can tolerate a wide range of temperatures like Kansas often experiences throughout a year. Birch is an example of a tree where some species, like the river birch, tolerate the hot temperatures of Kansas better than other birch. To learn more about the temperature zones of the United States and to determine if a particular tree will survive in your part of Kansas, visit the USDA Agricultural Research Service website at https://planthardiness.ars.usda.gov/PHZMWeb/Default.aspx.

Baldcypress growing along a lake at Dillon Nature Center in Hutchinson

Soil and Moisture: Each tree species can tolerate wet or dry growing conditions to a certain degree. Some species do better in sandy soils, some grow better in rocky or clay-like soils. The soil in parking lots is often churned up during construction and can contain a great deal of salt from winter de-icing. The salt can affect growing conditions for many kinds of trees. Honeylocust is a tree that tolerates many types of soil conditions, including those higher in salt. Baldcypress is a tree that tolerates both wet and dry soils and soils that are compacted. In some areas of Kansas, the soil **pH** may be more alkaline than many trees prefer or can tolerate. In those circumstances, trees such as Ginkgo, Osage-orange, bur oak, chinkapin oak, American elm and lacebark elm are better suited. Iron chlorosis is a common affliction of pin oaks, red maples and other tree species that are not tolerant of high pH soils.

Light: Another important environmental factor to consider is the amount of light the tree needs to grow. Some tree species, like oak and most pines, require full sunlight to grow well. Other species, like the Japanese maple, are more shade tolerant. Trees placed in locations that do not provide what is needed for healthy growth will often experience shortened life spans.

Other factors: Other environmental factors, like high winds and air pollution, should be considered before a tree is selected and planted. For assistance in matching the right tree to the right location, view the resource page and the Right Tree For Your Soil map at the Kansas Forest Service website, consult with a K-State Research and Extension agent in your county, a certified arborist or with a garden center professional.

Background: A Greater Diversity of Trees Means a Greater Diversity of Wildlife

Trees play an important role in the web of life that exists in a rural or community forest. They provide food and shelter to many kinds of animals. Certain tree species can determine the insect, bird, and even some **mammal** populations that exist in the area. Without that tree the dependent animal would not be present.

Proper selection of trees and plants can provide beauty and shade while also providing a haven for wildlife. The presence of wildlife can make a backyard, schoolyard or park a special place for you and your family. As urban and suburban development displaces many birds, insects, reptiles, amphibians and animals from their natural habitats, it becomes increasingly important for people to provide sanctuaries for wildlife. When selecting trees to plant that benefit wildlife be sure to select trees that provide for their needs.

Food Trees: A diversity of trees with high food value for wildlife is the single best way to bring wildlife to a site. By selecting and planting a wide variety of trees for the landscape, woodland or ecosystem, dependent wildlife will have access to food year-round. Some tree species produce seeds in the spring, others produce their seeds and fruits in the summer or fall. Some trees keep fruit on the branches into the winter, like the Washington hawthorn (at right). Select species that produce high food value, seeds, berries, nuts and acorns.

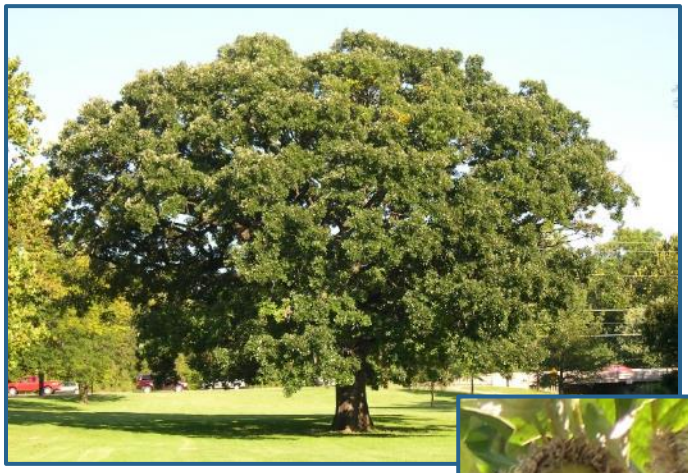
Shelter Trees: Birds and small animals need concealed places for nesting and hiding, protected from the eyes of predators. Planting **conifers (evergreens)** in groups, growing hedges with low branches, and using prickly or thorny plants in a few areas are all ways to provide wildlife cover and habitat.

Kansas Native Trees that Support Wildlife

American sycamore	Nesting for bald eagle and wood duck; food for multiple birds (goldfinch, chickadees, dark-eyed junco), muskrat, beaver, squirrels; shelter for cavity nesting birds (owls, great crested flycatcher, chimney swift) and even bears
Black cherry	Food source for numerous species of perching birds, game birds and mammals, such as the red fox, black bear, raccoon, opossum, squirrels and rabbits; host for butterfly larvae and attractive to pollinators
Bur oak	Food for birds and mammals, including woodpeckers, jays, flickers, squirrels, whitetail deer, turkey, wood duck, raccoons, rabbits, black bear, eastern chipmunk, rodents; loafing, roosting and nesting for numerous birds; food and host for butterflies, moths and multiple insects
Eastern cottonwood	Cover for many kinds of wildlife, including turkey and deer; browse for whitetail and mule deer; saplings used for beaver food and dam construction; supports many butterfly and moth larvae.
Eastern redbud	Food for bobwhite quail and other birds; browse for white-tailed deer; honey bees visit blooms
Hackberry	Food and nesting for birds; shelter for game birds and rabbits; browse and shelter for deer and host for butterfly larvae
Pawpaw	Food for multiple species of mammals (opossum, raccoon, fox, squirrel) and the zebra swallowtail
Persimmon	Nectar source for honey bees; browse for white-tailed deer; food for squirrel, fox, skunk, deer, bear, coyote, raccoon, opossum, game birds, wild turkey and songbirds

Wild turkey foraging for food next to the woodland that they had roosted in the night before.

Left: The American sycamore is often used for food and nesting for birds, like the bald eagle. Right: An eastern redbud blooming in spring may be visited by honey bees.



Top and Right: The bur oak can be planted throughout the state and provides food and shelter for numerous birds, mammals, insects and pollinators. Its large acorn is a favorite of wildlife.

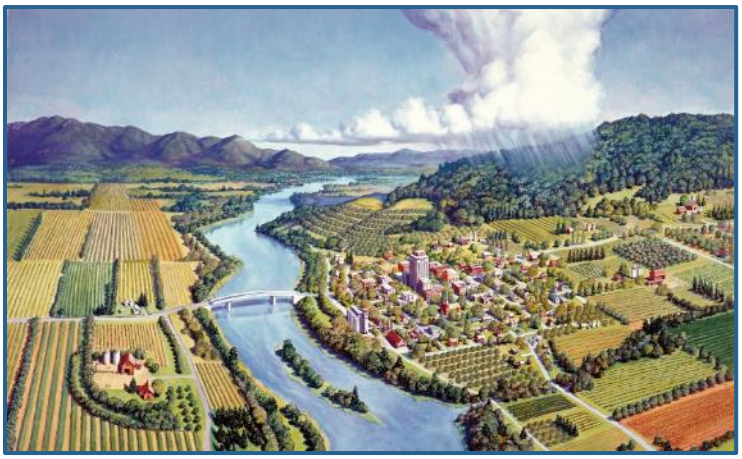
Top: The berry of a persimmon develops in the fall. Below: The drupe (fruit) of a hackberry.

*Left: The drupe of the black cherry. Below Right: An **immature** berry of the common pawpaw. When ripe, the fruit resembles a short and fat banana, prompting some locals to call it the Kansas banana.*

Background: Tree Diversity Ensures Resilient, Healthy and Prosperous Landscapes

Trees provide beauty and add value to a landscape and community. Trees cool our air, shield us from wind, shade our parks, streets and homes, block unattractive sites and bring wildlife to our yards. Business districts with trees often earn higher sales revenue than those without trees and attract new business and tourism. Shaded apartments rent more quickly, tenants stay longer and space in a wooded setting is more valuable to sell or rent. Trees also provide social benefits. Hospital patients recover more quickly from surgery if their room has a view of trees. Children with ADD/ADHD experience relief from symptoms and are better able to concentrate, complete tasks and follow directions after playing in greener natural settings.

Air and water quality have become increasingly important topics in Kansas where cities are expanding and development pressures and land conversion from forests to other uses threaten environmental quality. When trees are absent in communities, these localized areas become hotter than surrounding areas and are often labeled as **heat islands,** as pictured at left. These hotter areas affect communities by increasing summertime peak energy demand and air conditioning costs, air pollution and increased greenhouse emissions, and heat-related illnesses. Additionally, when trees are absent or lost in communities, human health can be negatively affected. Tree canopies intercept the common air pollutants **ozone, sulfur dioxide, nitrogen dioxide and particulate matter.** These pollutants are linked to increased incidences of asthma exacerbation, acute respiratory symptoms, acute bronchitis, acute heart attack, mortality, increased hospital admissions and lost school and work days. A 2012 analysis of trees in Douglas County revealed that an estimated 14 million trees there remove more than 3,800 tons of air pollutants each year. The value of that ecosystem service exceeds $17 million. The following two pages detail the health benefits of the trees in Douglas County. The full report can be found at https://www.fs.fed.us/nrs/pubs/rb/rb_nrs91.pdf.



The two pictures above depict a community, river system and rural lands with and without trees. When trees are absent or lost, wind and water erosion increases, field production diminishes, more particulates and air pollutants are in the air, siltation and pollution of creeks and rivers increases, and there is no protection from summer sun and winter winds. Communities without trees are less attractive to tourists and potential residents. The proactive planting of a diverse mix of tree species ensures that the community and rural landscape are more productive, more comfortable, healthy and provide fish and wildlife with food and shelter.

APPENDIX V. EFFECTS OF POLLUTION REMOVAL ON LOCAL HEALTH

Air pollution is a common problem in many urban areas and can have far-reaching effects, impacting human health, ecosystem health, and landscape materials. To calculate the effects of pollution removal on local health in Douglas County, we used the U.S. Environmental Protection Agency's Environmental Benefits Mapping and Analysis Program (BenMAP)[25] along with 2010 population statistics from the U.S. Census Bureau.[33] The model estimates the incidence of adverse health effects and associated monetary value that result from changes in pollution concentrations due to pollution removal by trees and shrubs.

The number of adverse health effects and associated economic value is calculated for ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and particulate matter <2.5 microns ($PM_{2.5}$) in Douglas County (Table 15 and 16).

Table 15.—Number of incidences of avoided health effects from pollutants, Douglas County, 2012[a]

Health Effect	NO_2	SO_2	O_3	$PM_{2.5}$
----------Trees only----------				
Hospital admissions	2.1	0.6	1.0	
Emergency room visits	1.0	0.5	0.5	0.4
Asthma exacerbation	834.3	84.9		284.8
Acute respiratory symptoms	54.9	9.2	1181.2	525.3
Mortality			0.4	0.8
School loss days			295.8	
Acute bronchitis				0.6
Acute myocardial infarction				0.4
Chronic bronchitis				0.3
Hospital admissions (cardiovascular)				0.1
Hospital admissions (respiratory)				0.1
Lower respiratory symptoms				7.3
Upper respiratory symptoms				5.8
Work loss days				91.0
----------Shrubs only----------				
Hospital admissions	0.9	0.3	0.5	
Emergency room visits	0.4	0.2	0.3	0.1
Asthma exacerbation	354.8	39.4		85.2
Acute respiratory symptoms	23.3	4.2	543.8	157.1
Mortality			0.2	0.2
School loss days			136.0	
Acute bronchitis				0.2
Acute myocardial infarction				0.1
Chronic bronchitis				0.1
Hospital admissions (cardiovascular)				0.03
Hospital admissions (respiratory)				0.03
Lower respiratory symptoms				2.2
Upper respiratory symptoms				1.7
Work loss days				27.2

[a] The same health effects are not analyzed for each pollutant. Blank cells indicate that the incidence is not estimated for that pollutant and health effect.

Table 16.—Associated value ($) of avoided health effects from pollutants, Douglas County, 2012[a]

Health Effect	NO_2	SO_2	O_3	$PM_{2.5}$
----------Trees, only----------				
Hospital admissions	73,300	17,200	24,800	
Emergency room visits	400	200	200	200
Asthma exacerbation	73,700	6,700		23,200
Acute respiratory symptoms	1,700	300	101,000	51,500
Mortality			2,823,000	6,314,800
School loss days			29,000	
Acute bronchitis				50
Acute myocardial infarction				32,900
Chronic bronchitis				84,200
Hospital admissions (cardiovascular)				4,000
Hospital admissions (respiratory)				3,000
Lower respiratory symptoms				400
Upper respiratory symptoms				300
Work loss days				14,500
Total value (trees)	149,200	24,400	2,978,000	6,529,000
----------Shrubs, only----------				
Hospital admissions	31,100	8,100	11,300	
Emergency room visits	200	100	100	50
Asthma exacerbation	31,300	3,100		6,900
Acute respiratory symptoms	700	100	46,500	15,400
Mortality			1,290,400	1,887,400
School loss days			13,400	
Acute bronchitis				20
Acute myocardial infarction				9,800
Chronic bronchitis				25,200
Hospital admissions (cardiovascular)				1,200
Hospital admissions (respiratory)				900
Lower respiratory symptoms				100
Upper respiratory symptoms				80
Work loss days				4,300
Total value (shrubs)	63,400	11,500	1,361,600	1,951,400
Total (trees and shrubs)	212,600	35,800	4,339,600	8,480,400

[a] The same health effects are not analyzed for each pollutant. Blank cells indicate that the value is not estimated for that pollutant and health effect.

Step 1

Recognize How Trees Are Different

Basic Activity

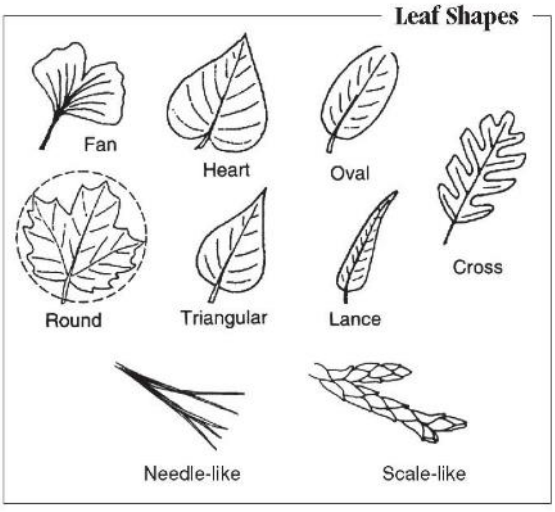
Instructional Sequence

Step 1. Assess your student's prior knowledge and awareness of trees by *asking them to describe the different types of trees they see on their way to school.* Record the responses, without comment, on the board. *Ask students how they can tell different trees apart.* Some leading questions to ask could include:

Does the tree have special fruits or seeds?
Does the tree have a unique shape?
Are the leaves broad and flat or are they needle-like?
Does the tree stay green year-round or does it lose its leaves?
What does the bark look like? (color, texture, thickness)

Step 2. Review the **Tree Clue Sheet** (page 17) terms and descriptors inside with students to familiarize them with what they will look for outside in their groups of two. Once outside, have groups look for and note their observations of leaves, seeds, leaf patterns and shapes. Have students feel the bark on several trees and then describe the texture and color. Encourage students to mimic the shape of the tree with their bodies. Return to the classroom.

Step 3. Hand out copies of the **Vocabulary Sheet**, **Rubric** and the **Tree Information Sheets** (pages 18-21) to each student.



ADDITIONAL EXTENSION OPPORTUNITY

To further investigate bark characteristics, have students do a bark rub on a dry and large tree. Have students remove the paper wrapping from a large crayon, place a thin white piece of paper against the bark and rub the side of the crayon against the paper, pressing only hard enough to see the pattern of the bark emerge on the paper. Have students describe what they see in their rubbings and match them as closely as possible with the following definitions.

Smooth: Without projections, bumps and other irregularities (Ironwood, American beech)

Scaly: Square-like bark pieces that overlap each other (White spruce, Eastern redbud)

Plated: Rectangular block-like pieces that don't overlap (Ponderosa pine, Persimmon)

Warty: Bumpy, wart-like protrusions (Hackberry, Pawpaw)

Shaggy: Exfoliates into long flat strips free at the base (Shagbark hickory, Silver maple)

Papery: Thin and looks like white paper (Paper birch, Quaking aspen)

Furrowed: Chunky vertical strips of bark that have deep grooves (Black walnut, Bur oak)

Fibrous: Layers of stringy bark that can be criss-crossed (Black locust)

Step 4. Tell students that they are going to investigate tree species appropriate for planting in a new city park, like a city forester would do. Explain that knowing how to properly plant and care for trees is important but planting the right tree in the right place is essential if they want to enjoy the trees for years to come.

Step 5. Before selecting trees for specific locations there are several important factors to consider. Start the investigative process by *asking students what they need to know about the park and/or the trees to properly place them.* Factors like how large the planting site is, presence of overhead or below ground utility lines, the mature size of each tree, whether the tree will produce shade for a park bench or playground or soil conditions are potential answers.

Step 6. To continue the discussion and further build student understanding about proper tree selection, ask these series of questions that can be answered from the **Tree Information Sheet** on pages 20-21.

a. *Ask students to look at the "Comments" section for each tree and identify a tree species that has problems with insects or disease.*
(Answer: Green ash and Lombardy poplar)

Lombardy poplars were once commonly planted because of their unique columnar (tall, thin) shape and rapid growth rate. Today, Lombardy poplars are affected by a canker disease that causes the trees to die after about ten years. Because of their disease problems, Lombardy poplars are not recommended for planting.

After Dutch elm disease killed millions of American elms in the 20th century, ash trees were a popular replacement in Kansas communities and is a native species readily found in rural forests in the state. The emerald ash borer is an exotic insect that our native ash trees have no natural defenses against. With its spread in North America and Kansas, ash trees are no longer recommended for planting.

b. *Ask students to look at the "Key to Tree Shapes" on the bottom of their worksheet. Have them identify the shapes of the trees highlighted and match them to the six shapes shown.*

c. *Ask students to identify which trees on the worksheet will grow to be the largest… and the smallest?*

d. *Ask students to identify environmental conditions in Kansas that might make it difficult to grow trees.*
(**Potential Answers:** Cold and hot temperatures, temperature extremes, flooding, drought, storm damage, alkaline soils, compacted soils, lack of light and high winds.)

e. Have students refer to the "Key to Ideal Site Conditions" at the bottom of the worksheet and *ask them to identify a tree that requires a wet soil to grow… and one that is tolerant of many different soil conditions.*

f. *Ask students to look again at the "Key to Ideal Site Conditions" at the bottom of the worksheet and have them identify a tree that needs full sun… and one that is shade tolerant.*

g. Have students identify some tree species that are most beneficial to wildlife.

- *Ask students what kinds of wildlife they would like to attract.*
- *What are some of the benefits and disadvantages of attracting wildlife?*

An example could include the fun of bringing many species of birds to your backyard versus problems with attracting large numbers of birds to city streets where bird droppings land on parked cars and business signs.

How a tree is to be used will determine which species of trees to select for shade, beauty, wind protection, screening and other purposes in the landscape. How trees are used also determines the benefits we receive from them.

Black squirrels gathering acorns from bur oak trees and perching on those trees in a city park.

Children playing on shaded playground equipment.

h. *Ask students to describe the benefits we get from trees. Record the responses on the board. If not mentioned by the students, other answers are:*

- Cooling our homes and communities
- Cleaning our air and water
- Shading streets, sidewalks, parks and structures
- Screening unattractive sites
- Fragrant needles or leaves
- Food for ourselves and wildlife
- More revenue from sales in business districts
- Houses sell faster and apartments rent faster
- Quicker recovery from illness and surgery
- Trapping dust, muffling noise

i. Have the students once again refer to the worksheet. Have them look at the diversity among the leaf shapes and the fruit produced by different trees. *Ask them to describe the shapes of the various leaves. Ask students to think about what tree, or trees, they would most like to play under... or view from a window... and why.*

People shopping and exercising in a shaded business district.

Trees on this hillside prevent soil and contaminants from entering this river system and collect air pollutants in their crowns.

j. Tell students that the last step of the planning process for the new city park is a public presentation for community members to learn about the park project, how the project will benefit the community and to ask questions. *Ask students to summarize what they have learned from the activity to make specific points in the presentation.* Points could include:

- It is important to plant several species of trees so that one disease or insect does not destroy all the trees in the park or the area.
- A high diversity of trees also means a greater diversity of wildlife are supported.
- Trees selected for the park will be different shapes and sizes to provide specific benefits, such as shade for the playground area or interest along the walking trail.
- The tree species were selected because they are suitable for certain locations in the park and can tolerate the climate and temperatures in Kansas.
- By selecting a diverse array of trees, the park project will contribute to a resilient landscape that makes the community a healthier and more prosperous place to live.

ADDITIONAL EXTENSION OPPORTUNITY

Have students research disease and insect issues found in Kansas and in surrounding states that can impact our state's trees. In addition to the issue, have students report on how the problem can be spread and the tree species it could impact. Examples of disease or insect problems found in Kansas are pine wilt, oak wilt, the emerald ash borer or Dutch elm disease. Potential threats to Kansas trees are thousand cankers disease of walnut, the Asian longhorned beetle, sudden oak death and the gypsy moth. For initial information, visit the Kansas Forest Service at https://www.kansasforests.org/forest_health

Many of the trees highlighted in the Basic Activity are native species, commonly planted or encouraged for planting in Kansas. However, not all are well suited for your part of the state or desirable in certain locations. To see listings of trees that will grow in your area of Kansas, visit the Kansas Forest Service at www.kansasforests.org/ Resources/Community Forestry or https://hnr.k-state.edu/extension/info-center/recommended-plants.

Tree Clue Sheet

Use this page to gather clues about a specific tree. Look closely before checking your responses. The tree will be either conifer OR broadleaf. Check only one set of responses.

❑ **Conifer:**
(cone-bearing)

❑ **Broadleaf:**
(Deciduous)

Leaves (Conifer)

___ **NEEDLE**

SHAPE:
____ round ____ triangular
____ flat ____ square

___ **SCALE**

NUMBER IN BUNCHES:

____ 1 ____ 2 ____ 3 ____ 4 ____ 5 ____ 6 or more

TEXTURE:
____ stiff ____ limber
____ sharp tip ____ blunt tip

LENGTH: _____ inches long

Leaves (Broadleaf)

ATTACHMENT:

___**Simple** (single-blade)

___**Compound** (more than 1 blade)

___ palmate (like a hand)
___ pinnate (like a feather)
___ bipinnate (2 x like a feather)

ARRANGEMENT:

___Opposite

___ Alternate

LEAF MARGINS:

_____ lobed

_____ entire

_____ toothed

LEAF SHAPE:
____ triangular ____ fan shaped ____ lance shaped
____ egg shaped ____ heart shaped ____ cross shaped
____ mitten shaped ____ 5-pointed star
____ round ____ pear shaped

Tree Shape

❑ Columnar
(tall and thin)

❑ Pyramidal
(triangular)

❑ V-Shaped

❑ Round

❑ Vertical
Oval

❑ Horizontal
Oval

Branching Patterns

OPPOSITE ❑
(branches across from each other at same level)

ALTERNATE ❑
(branches on a different level)

WHORLED ❑
(three branches at same level)

Seeds, Fruiting Bodies, Flowers

(Use the back of this sheet to describe or draw the flower or seed body, if it is present. Write down any special characteristics these have, including color, texture, and shape.)

Bark

COLOR:
____ brown ____ reddish
____ grey ____ white
____ black

TEXTURE:
____ smooth ____ deep
____ ridged ____ shallow

PATTERN:
____ diamond
____ horizontal
____ vertical

ATTACHMENT:
____ tight
____ loose

Vocabulary Words

Authority name – The name of the botanist who first described and published the plant name.

Biodiversity - The variety and complexity of species that are present and that interact in an ecosystem.

Broadleaf – Trees that bear fruit and flowers, with leaves that are flat, thin and usually shed annually.

Carbon Dioxide – A gas exhaled by animals and released from burning fossil fuels or in the process of decomposition.

Catkin – A cluster of many tiny flowers on a stem or stalk.

Conifer – Trees that bear cones and have needle-like or scale-like leaves.

Crown – The top or head of a tree.

Deciduous – Trees that lose their leaves in the fall.

Diversity – Variety of many different kinds.

Ecosystem – The interacting system of a biological community and its nonliving environment, and the place where those interactions occur.

Exotic – Introduced from another country, not native to the place where found.

Evergreen – Trees with leaves that remain alive and on the tree through the winter into the next growing season.

Fungal – Caused by a fungus.

Gall – A swelling on a plant often caused by insects

Genera (Plural for Genus) – A more or less closely related and definable group of plants comprising one or more species. Plants in a genus have more characteristics in common with each other than they do with components of other genera within the same family.

Growth Rate – How quickly a tree increases in size.

Hardiness Zone – The range of soil and weather conditions in which a tree can successfully grow.

Heat Island Effect – A term used when city temperatures run higher than those in nearby suburban and rural areas, primarily due to large areas of unshaded buildings and pavement.

Ideal – A standard of perfection or excellence.

Immature – Not fully developed.

Invasive –Growing and dispersing easily, usually to the detriment of native species and ecosystems.

Landscape Plan – A planned drawing of plants in a particular area.

Mammal – A warm-blooded animal, often with hair or fur, whose babies are born alive and feed with mother's milk, such as raccoon, deer, squirrel, mouse, bear or human.

Native – Living or growing naturally in a particular region.

Nitrogen Dioxide – A highly reactive gas formed quickly from emissions from vehicles, power plants, and off-road equipment that is linked with several adverse effects on the respiratory system.

Nomenclature – The devising or choosing of names for things, especially in a science or other discipline.

Ozone – Created when the oxides of nitrogen and volatile organic compounds react in the presence of sunlight. Breathing ozone can trigger a variety of health problems and also have harmful effects on sensitive vegetation and ecosystems.

Particulate Matter – A mixture of solid particles and liquid droplets found in the air. Very small particles can be inhaled deeply into lungs or absorbed into the bloodstream, causing serious health problems

Pathogen – A specific causative agent of disease.

pH – A measure of the acidity or alkalinity of a solution. Soils with a pH less than 7 are acidic, while those with a pH more than 7 are alkaline.

Resilience– The capacity to recover quickly from difficulties; toughness.

Species – A kind or sort

Street Tree – A tree planted near the street, often cared for by the city.

Sulfur Dioxide – A gaseous pollutant mostly contributed to the burning of fossil fuels by power plants and other industrial facilities. Negative health effects are difficulty breathing and exacerbation of asthma. In high concentrations, it can damage tree and plant foliage and decrease growth.

Tree Board - A group of unpaid volunteers, appointed by the mayor and assigned by ordinance, who oversee the planting and care of city-owned trees and represent the city government in that endeavor.

Design A Healthy and Diverse Community Forest Rubric

Pass out the rubric or put on the board at the start of the activity so students clearly understand the measured objectives.

0-2 Points INADEQUATE	3-5 Points NEEDS IMPROVEMENT	6-8 Points MEETS EXPECTATIONS	9-10 Points EXCEEDS EXPECTATIONS
✓ Less than 6 trees are "planted" in sites on the Worksheet. ✓ Less than 6 trees in your plan fit the described site needs. ✓ You are unable to explain why trees were selected for sites **A-J**. ✓ You do not participate in the class discussion of landscape plans. ✓ You do not make an effort to improve your landscape plan after discussion. ✓ Your final landscape plan does not create a healthy, diverse community forest.	✓ 6 or 7 trees are "planted" in sites on the Worksheet. ✓ 6 or 7 trees in your landscape plan fit the described site needs. ✓ You can explain why some trees were selected for at least 6 sites **A-J.** ✓ You participate a little in class discussion of landscape plans. ✓ You make some effort to improve your landscape plan after class discussion. ✓ Your plan is a start towards creating a healthy, diverse community forest.	✓ 8 or 9 trees are "planted" in sites on the Worksheet. ✓ 8 or 9 trees in your landscape plan fit the described site needs. ✓ You can clearly explain why each tree was selected for at least 8 sites. ✓ You actively participate in class discussion of landscaping plans. ✓ If needed, you make good improvements in your landscape plan after class discussion. ✓ Your plan results in a healthy, diverse community forest.	✓ 10 trees are "planted" in sites on the Worksheet. ✓ All 10 trees in your landscape plan fit the described site needs. ✓ You can very clearly explain why each tree was selected for each site **A-J**. ✓ You actively participate in the class discussion of landscaping plans. ✓ If needed, you make good improvements in your landscape plan after class discussion. ✓ Your plan results in a very healthy, diverse community forest.

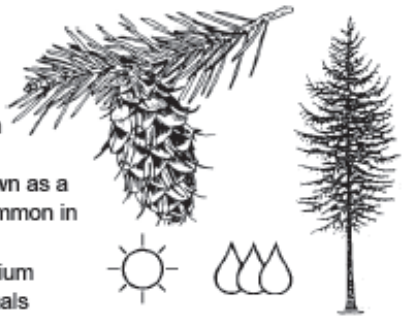


Top Left: White fir. Center: Bur oak. Right: Western soapberry.
Bottom Left: Ginkgo. Center: American elm. Right: Baldcypress.



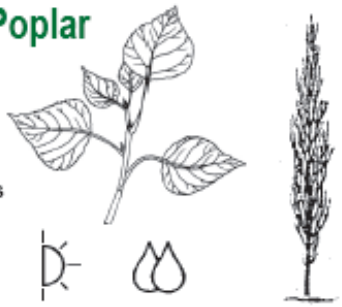
Tree Information Sheet — Side A

1 Douglasfir



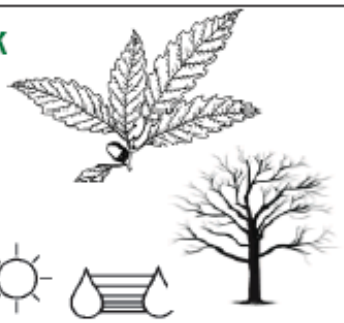
Height: tall
Spread: 20 feet
Growth Rate: medium
Fruit: cone
Comments: often grown as a Christmas tree; uncommon in Kansas.
Value to Wildlife: medium
Attracts: birds, mammals

2 Lombardy Poplar



Height: tall
Spread: 10t o15ft.
Growth Rate: fast
Fruit:no fruit, male clones
Comments: has problems with insects and disease; discouraged for planting.
Value to Wildlife: low

3 Chinkapin Oak



Height: medium
Spread: 40 feet
Growth Rate: medium
Fruit: acorn
Comments: a good rural and community tree.
Value to Wildlife: high
Attracts: birds, mammals

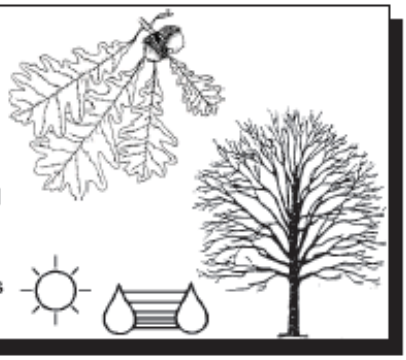
4 Ginkgo

Height: medium
Spread: 30 to 40 ft
Growth Rate: medium
Fruit: naked, smelly seed
Comments: yellow fall color. Because of smelly fruit, plant male trees.
Value to Wildlife: low

5 Norway Spruce

Height: medium
Spread: 25 feet
Growth Rate: medium
Fruit: cone
Comments: ideal windbreaker
Value to Wildlife: low

6 Bur Oak

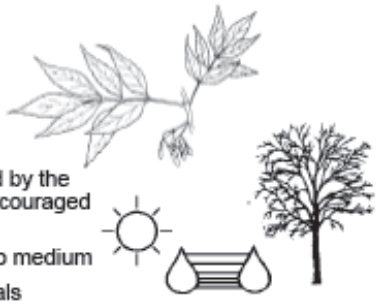


Height: tall
Spread: 50 to 70 ft
Growth Rate: slow
Fruit: acorn
Comments: a good rural and community tree
Value to Wildlife: high
Attracts: birds, mammals

7 Weeping Willow

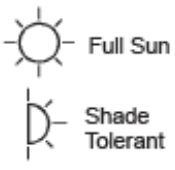
Height: medium
Spread: 35 feet
Growth Rate: medium
Fruit: small capsule
Comments: graceful tree with ground sweeping branches. Often storm damaged.
Value to Wildlife: low

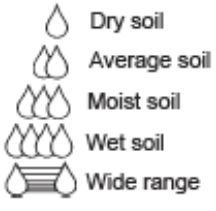
8 Green Ash



Height: medium
Spread: 25 feet
Growth Rate: fast
Fruit: winged seed
Comments: threatened by the emerald ash borer, discouraged for planting.
Value to Wildlife: low to medium
Attracts: birds, mammals

Key to Ideal Site Conditions:





Key to Tree Shapes:

Tree Information Sheet — Side B

9 Osage-orange

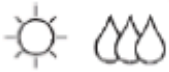
Height: medium
Spread: 40 feet
Growth Rate: fast
Fruit: aggregate fruit
Comments: very adaptable; because of thorns and big fruit, plant male trees in cities and by homes
Value to Wildlife: moderate
Attracts: birds, small mammals

10 Eastern White Pine

Height: tall
Spread: 50 feet
Growth rate: fast
Fruit: cone
Comments: soft needles in bundles of five.
Value to Wildlife: moderate
Attracts: birds, mammals

11 Persimmon

Height: tall
Spread: 40 to 70 ft.
Growth Rate: medium
Fruit: berry
Comments: tasty fruit when ripe but messy; avoid planting near paved surfaces.
Value to Wildlife: high
Attracts: birds, mammals

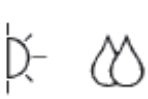


12 Honeylocust

Height: medium
Spread: 50 feet
Growth Rate: fast
Fruit: pod
Comments: tolerant of salt and most soils. Select a thornless variety for planting.
Value to Wildlife: moderate
Attracts: large mammals

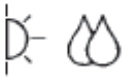
13 Eastern Redbud

Height: short
Spread: 20 to 30 ft.
Growth Rate: medium
Fruit: pod
Comments: has pretty purple blooms in spring.
Value to Wildlife: low



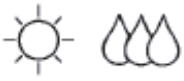
14 Serviceberry

Height: short
Spread: 20 feet
Growth Rate: medium
Fruit: berry-like pome
Comments: colorful fall foliage
Value to Wildlife: high
Attracts: birds, mammals



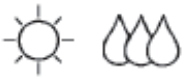
15 River Birch

Height: medium
Spread: 45 feet
Growth Rate: medium/fast
Fruit: catkin
Comments: has attractive exfoliating bark; often grown in groups.
Value to Wildlife: high
Attracts: birds, mammals

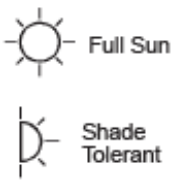


16 Eastern Redcedar

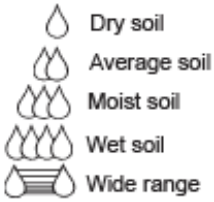
Height: medium
Spread: 20 feet
Growth Rate: medium
Fruit: berry-like cone
Comments: excellent for wind-breaks; birds love berries.
Value to Wildlife: high
Attracts: birds, small mammals



Key to Ideal Site Conditions:



Full Sun
Shade Tolerant



Dry soil
Average soil
Moist soil
Wet soil
Wide range

Key to Tree Shapes:

Columnar (tall and thin)
Pyramidal (triangular)
V-Shaped
Round
Vertical Oval
Horizontal Oval

Step 1

Design a Healthy, Diverse Community Forest

Extension Activity #1

Objectives

Students will be able to:

- Discern how to appropriately place trees in a community for optimal benefit to the trees, wildlife and people.
- Present and provide rationale for their planting plans that address space, size, conditions, intended benefits and species diversity.

Time Recommended:

Approximately 60 minutes of class time

Materials Needed:

- Scissors
- Glue
- Photocopy of *Tree Selection Sheet* (one per group) on page 24
- Photocopy of *Community Landscape Plan Worksheet (one per group)* on page 25
- Photocopy of *Tree Information Sheet* on pages 20-21
- Handout of Rubric on page 19 if not displayed on board

By Completing This Science Standard, Students Will Learn the Engineering Design Idea:

3-5 ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or cost.

Crosscutting Concepts:

- Scale, Proportion, and Quantity
- Systems and System Models
- Patterns

Introduction

This activity can be used to enrich and expand on the Basic Activity. It provides an opportunity for students to apply information learned by designing a community forestry landscape plan and better understand how local forestry programs function.

Instructional Sequence

Step 1. *Ask students who they think cares for the trees growing in your town.* Explain that city trees are trees in parks, along streets and on other lands owned by the municipality. In large cities like Lawrence, Manhattan, Olathe, Overland Park, Topeka and Wichita, a city forester oversees the care and management of these trees. In smaller cities, the forestry program may be administered by the public works or parks and recreation department and in small towns, the forestry program may be managed by a **tree board.** A tree board is a group of unpaid volunteers, appointed by the mayor and assigned by ordinance, who oversee the planting and care of city-owned trees and represent the city government in that endeavor.

Step 2. Tell students to pretend they are tree board members designing a tree planting plan for their community. To collaborate like a tree board might, break the class into groups of four students. Provide each group with the **Tree Selection Sheet** (page 24) and the **Community Landscape Plan Worksheet** (page 25). Have students refer back to the **Tree Information Sheet** to recall the previously discussed concepts to help determine which tree to plant in each lettered location. Student groups should share the responsibilities of selecting the tree, cutting and gluing the tree from the Tree Selection Sheet to the tree planting site they have chosen. Remind students that many different trees might work in some of the sites – but select only one tree for each site.

Some trees are suitable for several locations. Some trees, like the Lombardy poplar and the green ash, should not be planted because of the current problem with a canker disease that attacks the poplar and the emerald ash borer attacking ash.

Step 3. When the landscaping projects are complete, have students present their planting plans and rationale to another group to obtain feedback, making revisions to their plan where necessary. When done with the review process, use the answer key below to ensure the tree board teams understood the different tree options per site.

Assessment
Before students start the activity, hand out a copy of the rubric (page 19) or put the rubric on the board so students clearly understand the measured objectives.

Answer Key to Community Landscape Plan Worksheet

Site A: #3, #4, #5, #9, #12, #15, #16
Site B: #3, #4, #6, #9, #11, #12, #15
Site C: #13, #14
Site D: #1, #5, #10, #16
Site E: # 12 is best. #4, #6, #9, #15, #16 are acceptable.
Site F: #5, #10, #16 are best. #1 is acceptable.
Site G: #3, #6, #9, #12, #15
Site H: #7 is best. #4, #6, #9, #10, #12, #15 are acceptable.
Site I: #3, #4, #9, #12
Site J: #1, #3, #6, #9, #10, #11, #14, #15, #16

Top: Street trees cool communities, intercept air contaminants and slow rushing water to stormwater systems. Below and Right: Trees on school grounds provide shade, slow winds and provide children an inviting and calming place to learn.

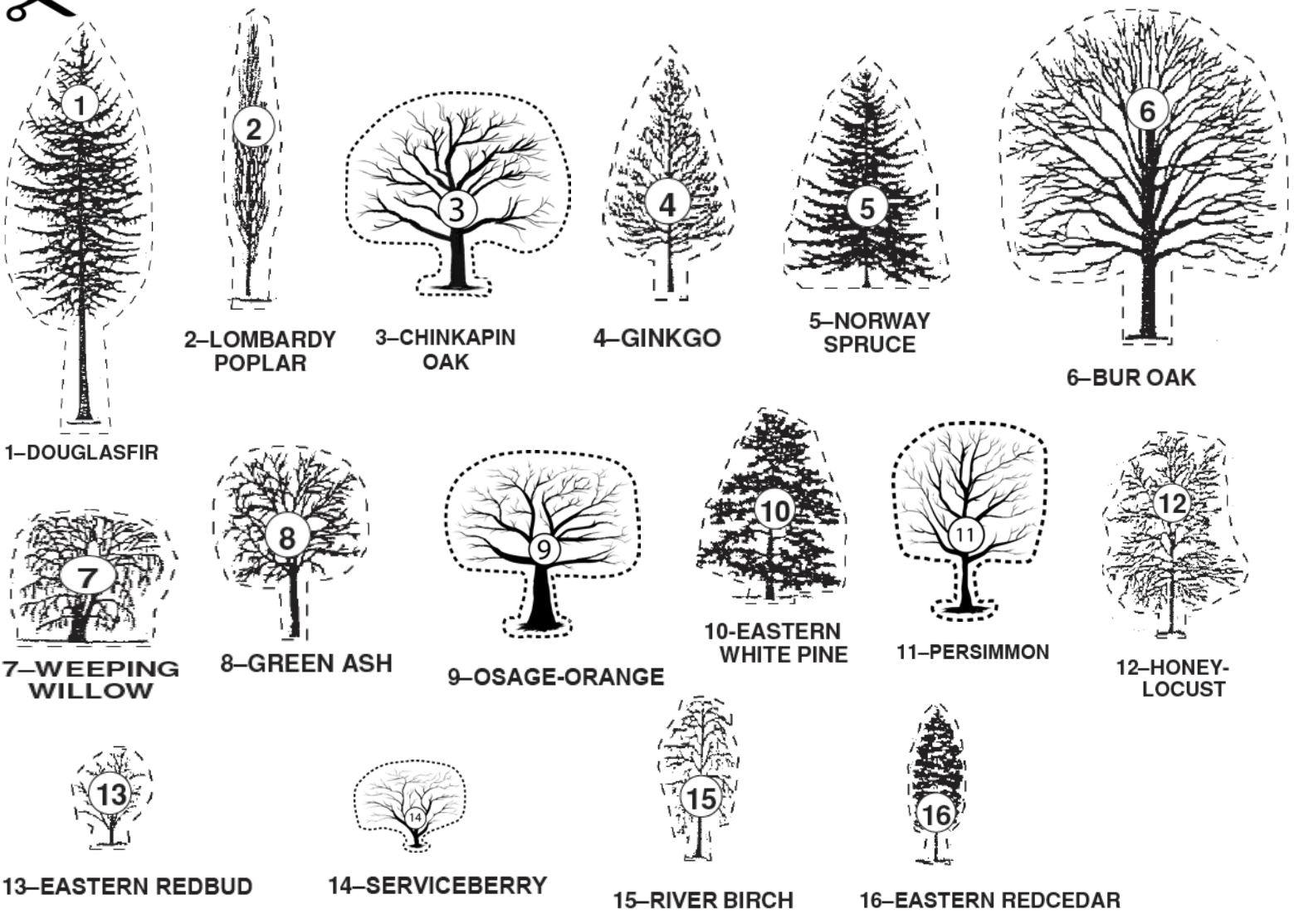
Top: Trees along streams and rivers in Kansas play an important role in cleaner water for people and wildlife.

Tree Selection Sheet

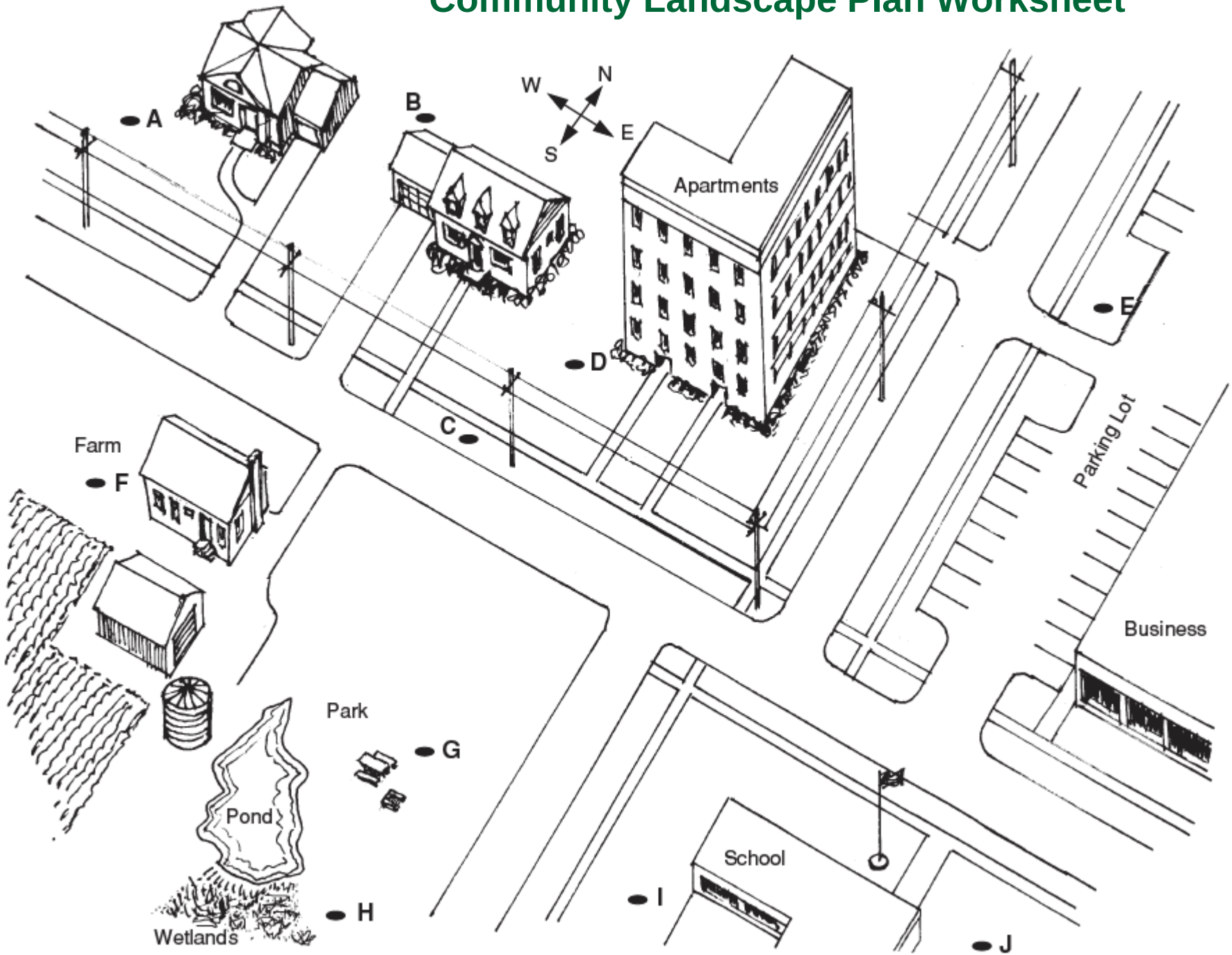
Imagine you are a tree board member developing a landscape plan that will result in a diverse and healthy community forest. Look at the Community Landscape Plan Worksheet. Notice that locations have already been identified for trees to be “planted” at sites A-J. Read through the list below and you’ll see that each site has different conditions and different tree needs. Using what you’ve learned, as well as referring to Tree Information Sheets A and B, select what you think is the best tree to “plant” in each site (Site A-J) on the Community Landscape Plan Worksheet.

Cut out the trees you select and lightly tape or paste them in the site locations on the Worksheet. Be prepared to explain why each tree was selected and planted where it was. While several different trees may work in <u>some</u> sites, select only <u>1</u> tree for each site.

Site A: Needs a medium-sized tree that will grow well in a front yard.
Site B: Needs a tree tall enough to provide shade and leave room near the ground for children to play in a backyard
Site C: Needs a street-side tree that will fit under a power line.
Site D: Needs an evergreen that holds its leaves year-round.
Site E: Needs a tree that can tolerate poor soil and salt from winter de-icing in a parking lot.
Site F: Needs a tree that can help break the wind just west of a farmhouse.
Site G: Needs a medium or tall shade tree under which people can picnic and relax that will also benefit wildlife.
Site H: Needs a tree that will grow in wet soil near a wetlands area.
Site I: Needs a medium-sized tree that will grow in a variety of soil conditions.
Site J: Needs a tree that will attract birds to an outdoor wildlife learning site.



Community Landscape Plan Worksheet



Step 1

Identify Trees Around You

Extension Activity #2

Objectives

Students will be able to:

- Use specific tree characteristics, reference guides and tools to identify tree species.

Time Recommended:
Approximately 90 minutes of class time

Materials Needed:

- Pencil and paper
- Photocopy of *Native Kansas Forest Trees* handout (one per child/group) on pages 29-30
- Photocopy of *Identify Trees in Your Community Handout on page 31*

Students Who Demonstrate Understanding Can: Analyze and interpret data.
Science and Engineering Practice 4

Crosscutting Concepts:

- Patterns
- Structure and Function

What's in a Name?

The binomial (two name) system of **nomenclature** was developed by Swedish naturalist, Carl Linnaeus, in the mid-1700s as a way to clearly identify one plant from another. The Latin language contains several words that can be used to identify a plant's characteristics or relate to its common name. For example, the scientific name of white oak is *Quercus alba*. Alba means white in Latin. *Quercus velutina* is the black oak, which has a velvet-feeling bud. When a tree has multiple common names, like Osage-orange, hedge, hedge-apple or Bois d'arc, it can be very confusing; thus, using the Latin name *Maclura pomifera* to refer to it eliminates questions about the tree being discussed.

The velvety buds of the black oak, Quercus velutina.

Introduction
This activity can be used to build upon the previous two activities by utilizing place-based learning to help students identify trees that are around them and in their communities. *Ask students how they think trees got their names? Is it possible that a tree could have more than one name? Would that make it easier or more difficult to identify a tree if more than one name was assigned to it?*

Common plant names are used by local people and may be different from state to state or country to country. To avoid the confusion of multiple common names being applied to one tree, taxonomists (experts in plant classification) assign a unique scientific name to each tree, based on the Latin language, to avoid the confusion that common names can cause.

Instructional Sequence
Step 1. Tell students they are going to use their newly-acquired knowledge about how tree shapes and sizes are characteristics that can help them identify trees on your school grounds or in the community. Several native Kansas trees in rural forests and woodlands can also be found in most Kansas communities, such as:

Eastern cottonwood	American linden (basswood)
Silver maple	Sugar maple
Green ash	White ash
Hackberry	Kentucky coffeetree
American elm	Siberian elm
Honeylocust,	White mulberry
Pin oak	Bur oak
Northern red oak	Eastern redbud
Osage-orange	American sycamore
Black walnut	Eastern redcedar.

Provide students with the 4-H publication **Native Kansas Forest Trees** on pages 29-30. Students will see how tree names are written with a common name and scientific name, such as *Fraxinus pennsylvanica* (scientific name), green ash (common name) and also the **authority name** (Marsh). When scientific names are handwritten, the genus (*Fraxinus*) and specific epithet (*pennsylvanica*) are always underlined (Fraxinus pennsylvanica). When typed, the scientific name is always italicized.

Ask students what things scientists would look for to classify and name a tree. Answers could be if they hold their leaves year-round, the type of seed they produce or if they produce flowers.

In preparation for going outside, visit the **Virginia Tech Dendrology database**, at http://dendro.cnre.vt.edu/dendrology/factsheets.cfm, search for the above listed trees by common name, and have students say or point out leaf shape, tree shape, bark character, fruiting structure and other identifying characteristics that they notice in the pictures.

Step 2. Before taking your class outside, have students split into teams of two or three and provide each team with the **Identify Trees in Your Community Handout** on page 31. The handout includes pictures of the native trees' leaves and fruiting structures covered in the classroom. This resource will help with several of the trees you are likely to see but *not all of them*. Depending on the resources and technology available to you, there are multiple ways to help your students identify the trees they find. Other ways to identify the trees are:

1. Have students sketch the leaf shape, fruit, flower and/or shape of the tree. Use the Virginia Tech Dendrology database or one of the web-based interactive tree identification keys in #3 below to match the characteristics drawn.
2. For iPhone users, download the LeafSnap application - http://leafsnap.com. Android users can download the PlantSnap app. Both of these applications are designed for the user to take a picture that the program uses to identify the tree.
3. Use an online identification key, such as the Arbor Day Foundation's "What Tree is That?" (https://www.arborday.org/trees/whatTree) or Iowa State University's Tree Identification Key (https://naturalresources.extension.iastate.edu/forestry/iowa_trees/tree_id.html) to follow a step-by-step process to fully or partially identify the tree.
4. Use the online and print resources listed on the right side of this page.

Step 3. Back in the classroom, provide student teams some time to identify trees they were unsure of. In addition to the common names, have students correctly write the scientific name for each tree. If writing names by hand, remind students that the genus and specific epithet should be underlined. If typed, the two parts of the name should be italicized.

When teams are done with their lists, compile a classroom list of the trees found and note where in the community the trees are located. *Ask students why they think trees were planted where they are and why they found the species they did.*

Other Tree Identification Resources

Cornell University Cooperative Extension: http://cortland.cce.cornell.edu/resources/know-your-trees

Forestry Images website: https://www.forestryimages.org

Missouri Department of Conservation. *Field Guide to Oaks and Hickories*.: http://grownative.org/wp-content/uploads/2017/03/Missouris-Oaks-and-HIckories.pdf

Oregon State University Landscape Plants: http://oregonstate.edu/dept/ldplants

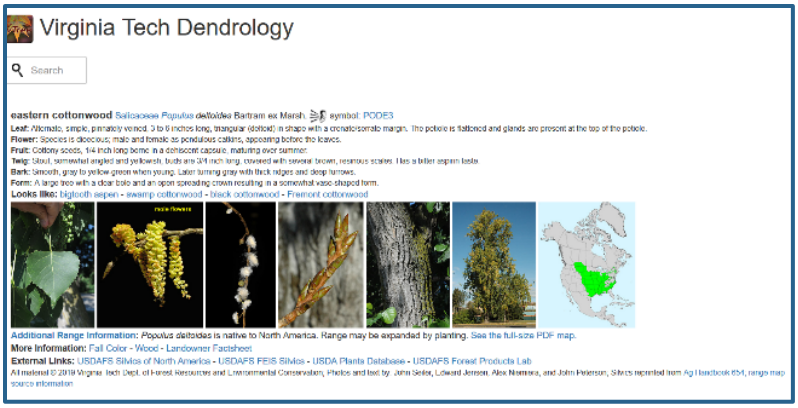
USDA Natural Resources Conservation Service: https://plants.sc.egov.usda.gov/java/factSheet

The Tree Identification Book. George W.D. Symonds. HarperCollins Publishers Inc. ISBN 0-688-05039-5

Trees of Eastern North America. Gil Nelson, Christopher J. Earle, Richard Spellenberg, Amy K. Hughes. Princeton University Press. ISBN 978-0-691-14590-7

Trees of North America, Golden Field Guide. C. Frank Brockman, et. al. St. Martin's Press. ISBN 1-58238-092-9

Trees, Shrubs, and Woody Vines in Kansas. Michael John Haddock and Craig C. Freeman. University Press of Kansas. ISBN 9780700627684



ADDITIONAL EXTENSION OPPORTUNITY

Take pictures of the trees you see outside and have student teams take notes on or sketch the characteristics that helped them identify particular trees. If time allows, create a poster, collage or other visual creation of all the trees identified, their common or scientific name and even the location of each tree.

MAKE A LOCAL CONNECTION!

If your city is currently certified by the Arbor Day Foundation as a Tree City USA Community, your city either has a tree board or a city department (or both!) that oversees the planting and care of the city's trees. Invite your city staff or tree board members to join your classroom on this outdoor excursion. Those local experts often have historical knowledge of your trees and can share information about the tree program in your city. Not sure if your city is a TC USA? View the map at the Kansas Forest Service website - https://tinyurl.com/y4me876s

Step 4. SHOW US WHAT YOU FOUND!

Join the Kansas Forest Service, our poster contest partners and Kansas Tree City USA communities in a closed Facebook Group, Kansas Arbor Day Poster Contest Educators, to share with us and other schools in the state about the trees you found in your community and the experiences your classroom had outdoors. This new social connection may also be used to share ideas with other educators, see how other educators are getting kids outside to learn about trees and nature and find inspiration.

Follow this link to the Kansas Arbor Day Poster Contest Educators group. Once you request to join the group, you will be asked three questions about your involvement in the poster contest, the community or school you work in and why you want to join the group. These steps are being taken to ensure that this is a secure and professional place for participants. A group moderator will review all requests to join and approve legitimate requests.

Be sure to follow your school district's regulations and policies for social media engagement and the sharing of student images.

In **one last step**, think about how different the forests in Kansas are because of the different climates, rainfall amounts, temperature variations and soils that various parts of the state experience. Examine what schools from across the state have shared about the trees they identified in their communities and *ask your students why different trees exist where they do.*

Native Kansas Forest Trees

4-H Forestry Project

This publication constitutes the 4-H Forestry Project Guide for the nomenclature of "Kansas Native Forest Trees." Use this list to determine whether a tree species is in the native forest or ornamental category. The list consists of only those trees that are readily distinguishable from each other. Where separation by species is difficult, for example Hawthorn, only one listing is provided.

Trees not included in this list are considered nonnative and should be placed in the "Ornamental Trees" category. Forest trees collected outside of Kansas and not used as ornamentals, for example redwood, may be placed in a separate group entitled, "Forest Trees not Native to Kansas."

"Horticultural Fruit and Nut Trees" is considered a separate category and should be labeled as such in the collection. Check species against this list to prevent duplication.

List of Kansas Native Forest Trees

Ash, blue
Fraxinus quadrangulata Michx.

Ash, green
Fraxinus pennsylvanica Marsh.

Ash, wafer — see Hop tree

Ash, white
Fraxinus americana L.

Basswood, American
Tilia americana L.

Birch, river
Betula nigra L.

Boxelder
Acer negundo L.

Buckeye, western
Aesculus glabra Willd.
var. *arguta* (Buckl.) Robinson

Buckthorn, woolly
Bumelia languinosa (Michx.) Pers.

*Catalpa, spp. — northern and southern Catalpa not readily distinguishable
Catalpa spp.

Cherry, black
Prunus serotina Ehrh.

Chinaberry — see Soapberry

Coffeetree, Kentucky
Gymnocladus dioica (L.) K. Koch

Cottonwood, eastern
Popular deltoides Marsh.

Cottonwood, western — not readily distinguishable, list as Cottonwood, eastern.

Crabapple — see Wild crabapple

Dogwood, flowering
Cornus florida (L.) Raf.

Elm, American
Ulmus americana L.

Elm, red
Ulmus rubra Muhl.

*Elm, Siberian
Ulmus pumila L.

Elm, slippery — see Elm, red

Elm, white — see Elm, American

Hackberry
Celtis occidentalis L.

Hackberry, dwarf
Celtis tenuifolia Nutt.

Haw, southern black — see Hawthorn spp.

Haw, red — see Hawthorn spp.

Hawthorn spp.
Crataegus spp. (Several species, not readily distinguishable.)

*Hedge — see Osage-orange

Hickory, bitternut
Carya cordiformis (Wang.) K. Koch

Hickory, black
Carya texana Buckl.

Hickory, kingnut — see Hickory, shellbark

Hickory, mockernut
Carya tomentosa Nutt.

Hickory, shagbark
Carya ovata (Mill.) K. Koch

Hickory, shellbark
Carya laciniosa (Michx.) Loud.

Honeylocust
Gleditsia triacanthos L.

Holly, deciduous
Ilex decidua Walt.

Hophornbeam — see Ironwood

Hop tree
Ptelea trifoliata L.

Ironwood
Ostrya virginiana (Mill.) K. Koch

June berry — see Serviceberry, downy

**Introduced and naturalized.*

Kansas State University Cooperative Extension Service and Agricultural Experiment Station

Linden — see Basswood, American

*Locust, black
Robinia pseudoacacia L.

Locust, honey — see Honeylocust

Maple, black — not readily distinguishable; list as Maple, sugar.

Maple, hard — see Maple, sugar

Maple, silver
Acer saccharinum L.

Maple, soft — see Maple, silver

Maple, sugar
Acer saccharum Marsh

Mulberry, red
Morus rubra L.

*Mulberry, white — not readily distinguishable; list as Mulberry, red

Oak, black
Quercus velutina Lam.

Oak, blackjack
Quercus marilandica Muenchh.

Oak, bur
Quercus macrocarpa Michx.

Oak, chestnut — see Oak, chinkapin

Oak, chinkapin
Quercus muehlenbergii Engelm.

Oak, pin
Quercus palustris Muenchh.

Oak, post
Quercus stellata Wang.

Oak, northern red
Quercus rubra L.

Oak, shingle
Quercus imbricaria Michx.

Oak, Shumard
Quercus shumardii Buckl.

Oak, white
Quercus alba L.

*Olive, Russian
Elaeagnus angustifolia L.

*Osage-orange
Maclura pomifera (Raf.) Schneid.

Pawpaw
Asimina triloba (L.) Dunal.

Pecan
Carya illinoensis (Wang.) K. Koch

Persimmon
Diospyros virginiana L.

Poplar, silver — see Poplar, white

*Poplar, white
Populus alba L.

Possumhaw — See Holly, deciduous

Redbud, eastern
Cercis canadensis L.

Redcedar, eastern
Juniperus virginiana L.

Sassafras
Sassafras albidum (Nutt.) Nees.

Serviceberry, downy
Amelanchier arborea (Michx. f.) Fern.

Soapberry
Sapindus drummondii Hook. & Arn.

Sugarberry
Celtis laevigata Willd.

Sycamore, American
Platanus occidentalis L.

*Tree-of-heaven
Ailanthus altissima (Mill.) Swingle

Walnut, black
Juglans nigra L.

Wild crabapple
Pyrus ioensis (Wood) Bailey

Willow, black
Salix nigra Marsh.

Willow, Carolina
Salix caroliniana Michx.

Willow, dwarf prairie
Salix humilis Marsh.

Willow, peachleaf
Salix amygdaloides Anderss.

Willow, sandbar
Salix interior Rowlee

**Introduced and naturalized.*

References:

Little, E.L. *National Audubon Society Field Guide to North American Trees: Eastern Region*. Knopf. 1980.

Stephens, H.A. *Trees, Shrubs and Woody Vines in Kansas*. University Press of Kansas. Lawrence. 1969.

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service

4H 334 rev. April 2006

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Identify Trees in Your Community Handout

Many Kansas native trees found in rural area are also found in Kansas communities. Pretend that you are a tree board member conducting an inventory to learn how many different species are in your community. Note differences between species, such as leaf color, shape or fruiting structure.

Green ash

White ash

Eastern cottonwood

American elm

Siberian elm

Hackberry

Honeylocust

Kentucky coffeetree

American linden

Silver maple

Sugar maple

White mulberry

Bur oak

Northern red oak

Pin oak

Osage-orange

Eastern redbud

Eastern redcedar

American sycamore

Black walnut

Resources and Acknowledgments

Content:

Arbor Day Foundation - http://www.arborday.org.

Emerald Ash Borer Information Network. Found online at http://www.emeraldashborer.info

i-Tree: Tools for Assessing and Managing Forests and Community Trees. Found online at http://www.itreetools.org.

Kansas Forest Service:
- Conservation Trees, Product Information: https://www.kansasforests.org/conservation_trees/products/index.html
- Right Tree for Your Soil Map: http://www.kansasforests.org

K-State Research and Extension. *Native Kansas Forest Trees.* Found online at https://www.bookstore.ksre.ksu.edu/pubs/4H334.pdf

University of Florida. IFAS Center for Aquatic and Invasive Plants. Found online at https://plants.ifas.ufl.edu/manage/research-and-outreach/educators/scientific-and-common-plant-names

University of Illinois at Urbana-Champaign. Landscape and Human Health Laboratory. Found online at http://lhhl.illinois.edu

University of Washington School of Environmental and Forest Sciences. Human Dimensions of Urban Forestry and Urban Greening. Found online at http://naturewithin.info

USDA Forest Service. Northern Research Station
- *Assessing Urban Forest Effects and Values: Douglas County, Kansas.* Found online at http://www.fs.fed.us/nrs/pubs/rb/rb_nrs91.pdf
- Dutch Elm Disease. Found online at https://www.nrs.fs.fed.us/disturbance/invasive_species/ded

USDA Forest Service. Pacific Southwest Research Station. *Midwest Community Tree Guide: Benefits, Costs and Strategic Planting.* Found online at http://www.fs.fed.us/psw/publications/documents/psw_gtr199/psw_gtr199.pdf

USDA Plant Materials Program Fact Sheets. Found online at https://plants.usda.gov/java/factSheet

US Environmental Protection Agency. Found online at www.epa.gov

Content Contribution and Review by Laura Downey, Executive Director
Kansas Association for Conservation and Environmental Education - www.kacee.org

Images:

Arbor Day Foundation. Pages 5, 6, 7, 11, 14, 17, 20, 21, 24, 25, 28, 31

Bob Saathoff. Page 10. Pawpaw fruit

Jason Crum, City of Lansing, Kansas. Page 5. Larvae by quarter

Kim Bomberger, Kansas Forest Service

Kansas Governor's Office. Page 33

Ken O'Dell, Kansas Native Plant Society. Page 10. Black cherry fruit

USDA Forest Service, APHIS. Page 5. Adult EAB on leaf. See more images at https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/emerald-ash-borer

Step 2

Create a Poster

We All Need Kansas Trees for Resilient Ecosystems!

Contest Deadline: February 7, 2020

Send local-winning posters to a Kansas Forest Service Community Forester on page 37.

Students Who Demonstrate Understanding Can:

SL.5.5 – Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Crosscutting Concepts:

- Systems and System Models

Contest Administration and Selection

The Kansas Arbor Day Poster Contest is administered by the Kansas Forest Service. Local-winning posters are to be submitted to Kansas Forest Service Community Foresters for competition at the district level. A state winner is selected from the six district-winning entries. District winners and their teachers will receive robust gift packages sponsored by contest partners. The Kansas winner will be recognized at the Tree City USA Recognition in the spring. A request is made each year for the state winner to meet with the governor and plant a tree on the Capitol grounds.

Kansas Arbor Day
POSTER CONTEST

Create a Poster

Ask each student to create a poster that reflects his or her understanding of how trees differ from each other and why biodiversity is important to them, local ecosystems and to Kansas. Encourage students to think about how to properly select and plant trees for long term health of the tree and for the health of the community and rural landscape.

Have students begin their process by listing ways that trees are different from each other and how growing different types of trees benefits them and where they live or go to school. Students should use their lists to help determine which elements they wish to represent in their poster. After students have created their posters, have them present their posters to the class or to a contest selection committee and discuss the process they used to decide which design elements to include in their poster.

Students should make sure that their poster follows the contest rules by closely following the numbered list on page 34. You may select the winner or have a judging panel for the classroom and/or school contest. Judges could include other students, garden club members, tree board members, nursery personnel, arborists, the city forester, teachers, PTA/PTO members or individuals with an interest in trees who are willing to volunteer some time.

Poster Contest Rules

Follow the contest rules below to make certain all entries are eligible for judging. Entries not meeting these guidelines will be disqualified.

1. All entries must be original artwork created by a student who is currently in the **5th grade**. A student may enter the contest only once.

2. **<u>The student's first and last name must be written or signed in the lower right-hand corner on the front of the poster.</u>**

3. a) Entries may be done in marker, crayon, paint pens, watercolor, ink, acrylic, colored pencil and/or tempera paint. Bright colors that reproduce well are desirable.
   b) Collages are not acceptable. (Do not glue anything to your poster).
   c) Computer or photo-generated art and/or printing is not acceptable. The use of light tables or other professional equipment is prohibited.

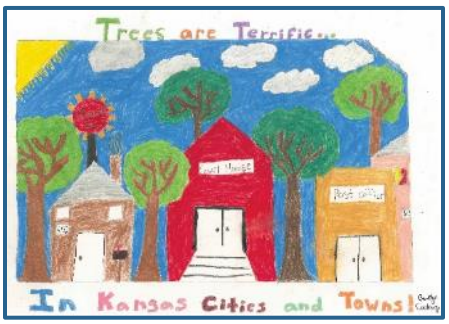
4. Entries must be no smaller than 8 ½" x 11" and no larger than 14" x 18".

5. Entries must be done on paper that will allow for duplication, display and framing.

6. The poster must be related to the contest theme and content in some way. The theme **We All Need Kansas Trees for Resilient Ecosystems!** must be on the poster. All words must be spelled and punctuated correctly.

7. Entries should not be matted, mounted, laminated, framed or folded!

8. **Submit local-winning entries to a Kansas Forest Service Community Forester by February 7, 2020 (page 37).**
   Deadlines for local contests should be earlier than February 7, 2020, to ensure a timely arrival to a KFS forester office.



School Winner Report Form

After selecting a school or local winner, copy and complete this form, attach it to the back of the poster, and send to a Kansas Forest Service Community Forester (page 37) by February 7, 2020.

2020 School Winner Report Form

Send this form with the winning school or community poster to your KFS Community Forester. All information should be complete to expedite contact of winners.

Winner's Name _____

Winner's Home Address _____

City _____ Kansas Zip _____

Winner's parent or guardian name_____

Teacher's name _____

Teacher's email address _____

School name _____

School Address _____

City_____ Kansas Zip _____

School Phone (_____) _____

Important

☐ Please indicate the number of posters entered or drawn in the school contest in the box to the left.

☐ Number of teachers in school who participated.

*** All artwork becomes the property of contest sponsors.

Celebrate Arbor Day

Step 3

Kansas Arbor Day is April 24, 2020

Since 1872, Arbor Day has been celebrated throughout the United States and Arbor Day celebrations in schools have always played an important role.

An Arbor Day celebration can be:

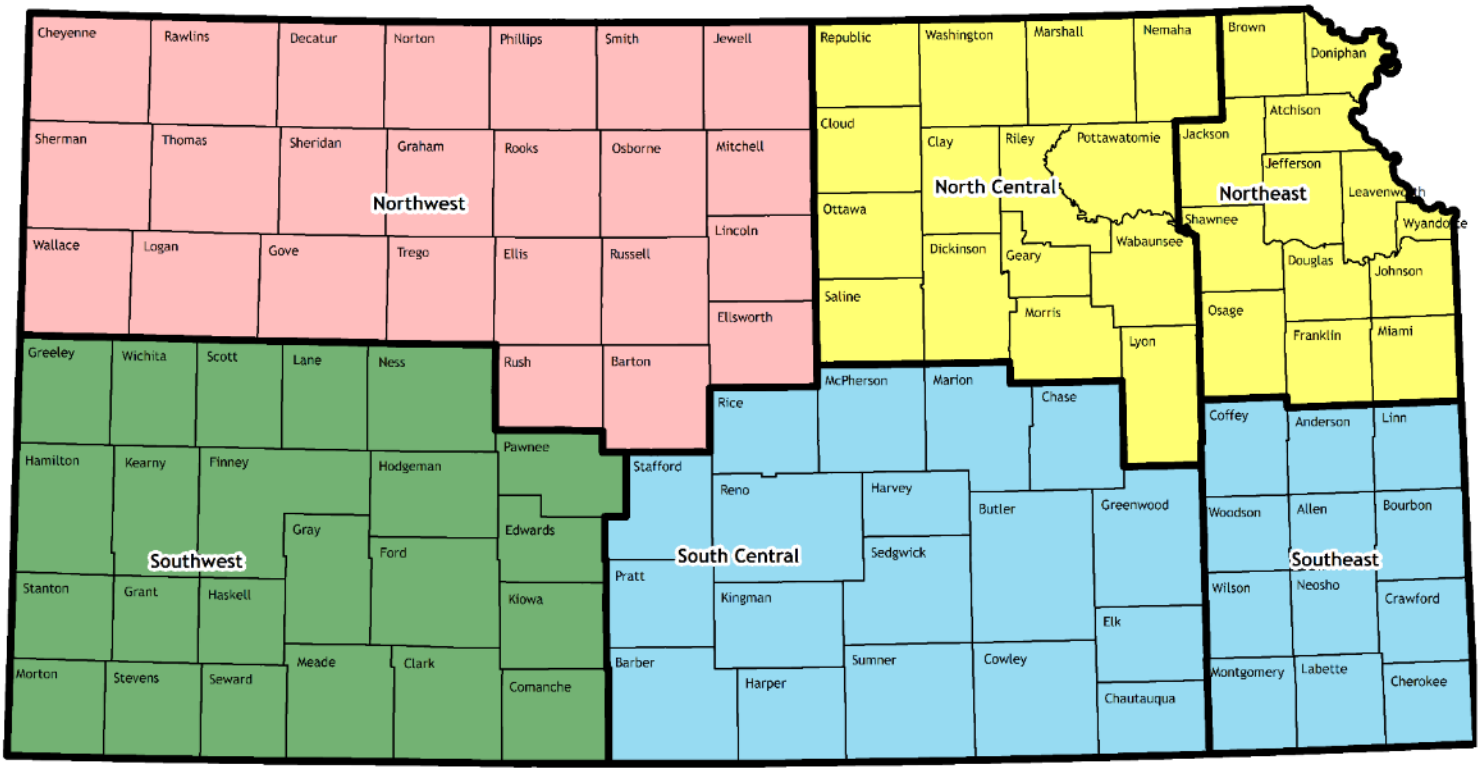
Simple: Plant a tree in honor of your school poster contest winner or to recognize an outstanding volunteer. Check to see if your city is a Tree City USA community and team up with a local tree board or your forestry department!

Inspiring: Have your graduating class plant a tree with younger students. This is a tradition that honors the students leaving and gives new students something to enjoy throughout their years!

Entertaining: Students could compose poems about trees or perform an Arbor Day play (https://www.arborday.org/celebrate/celebration-materials.cfm). Ask your music teacher if he or she knows songs about trees or Arbor Day and have a musical program dedicated to trees!

Whatever you choose for your celebration – go outside and enjoy the trees and environment that surround you!

Community Forestry Districts
Arbor Day Poster Contest



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KANSAS FOREST SERVICE
KANSAS STATE UNIVERSITY

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