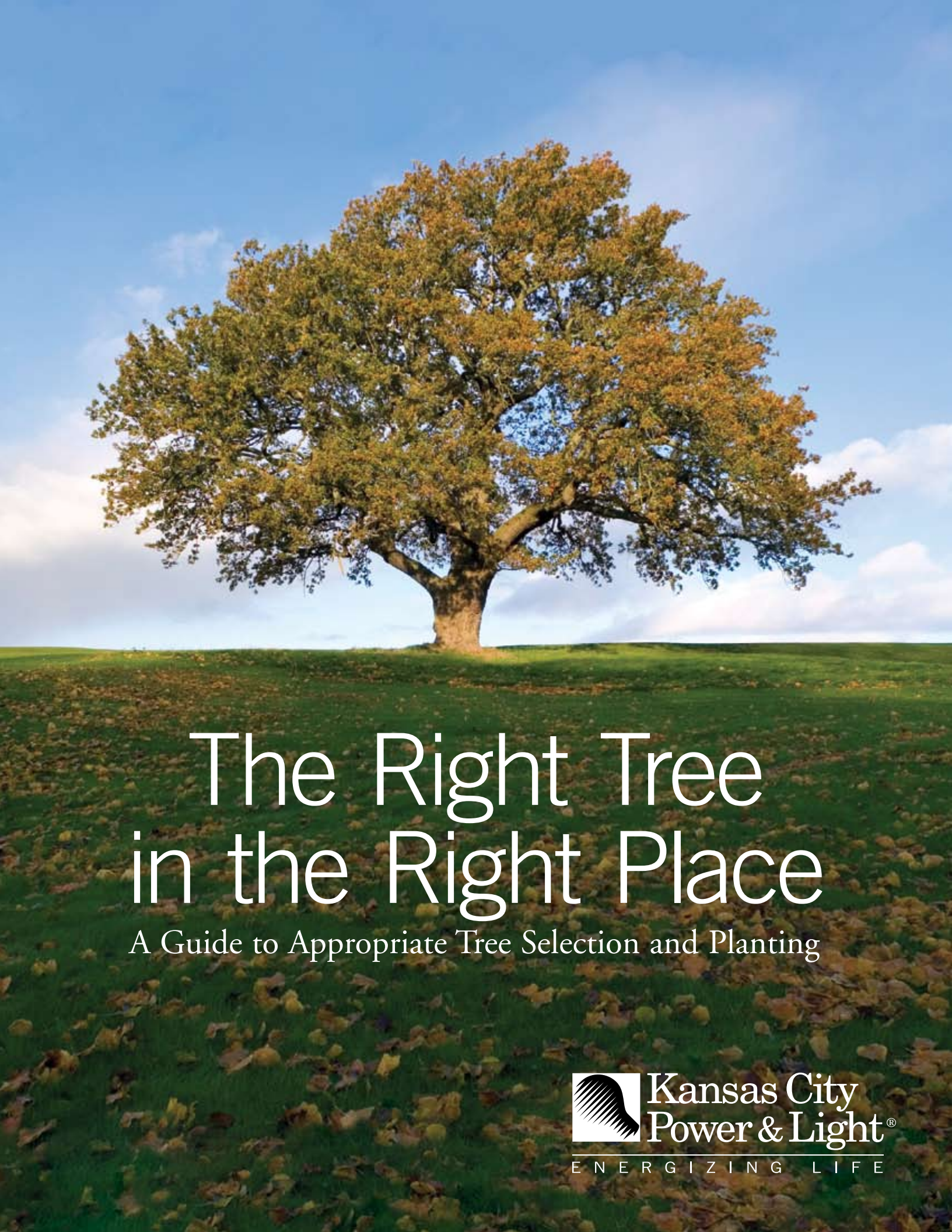

The Right Tree in the Right Place

A Guide to Appropriate Tree Selection and Planting

Kansas City Power & Light®

ENERGIZING LIFE

Planting the right tree in the right place can increase property value and energy efficiency of your home, and minimize property damage and power outages caused when trees come into contact with power lines.

The Right Tree in the Right Place

A Guide to Appropriate Tree Selection and Planting

Contents

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With their dense foliage and majestic height, trees represent the best of what nature has to offer.

Trees can shelter your home from the elements and add beauty to your landscape. With so many different tree variations, it's important to plan before you plant.

Planting the wrong tree in the wrong place can cause property damage, create a nuisance to neighbors or even become a safety hazard.

At Kansas City Power & Light, we are committed to improving the communities we serve and the environment. That's why we are offering this booklet to help you make informed decisions about appropriate tree selection and planting. Proper selection of trees and shrubs will minimize their long-term maintenance, increase property value, enhance the environment and help ensure reliable electric service. With adequate preparation, you will find that you can plant the right tree in the right place.

Versatility of trees

Trees not only make parks and neighborhoods picturesque, but they are also vital to our survival. During photosynthesis, trees clean the air we breathe by absorbing carbon dioxide and turning it into oxygen. For example, it takes an acre of trees to produce enough oxygen for 18 people every day.

Trees also enhance the environment by helping to moderate climate, conserve water and harbor wildlife. Trees are so versatile that they are used to manufacture everyday products you buy at the grocery store, like shampoo, toilet paper and toothpaste.

The downside of overhead lines

When you experience momentary service interruptions or power outages during storms, trees may be the root of the problem.

Tree limbs that come into contact with power lines have the potential to disrupt service and create a public safety hazard. Keeping power lines clear of limbs and brush provides KCP&L personnel unfettered access so they can quickly restore power to homes during adverse weather conditions, like tornadoes and ice storms.

As the second oldest electric company in the country, we have established a long-standing reputation for providing reliable service. To help prevent the danger and inconvenience of outages, and comply with the National Electric Safety Code, KCP&L's Vegetation Management group is responsible for trimming or removing trees that threaten service reliability. Although the trained and certified tree trimmers at KCP&L try to preserve as much of a tree's beauty as possible, their primary duty is to provide enough clearance between limbs and lines to assure safe and reliable electric service.

In cases when a tree within KCP&L's easement poses a long-term safety or reliability hazard, we may find it necessary to remove a tree on your property. The crew also may trim dead, dying or split trees that are endangering a line.

If a tree has to be removed, you may elect to purchase a replacement tree or shrub. The best way to prevent future problems is to plant trees where they won't interfere with overhead or underground lines. For your convenience, we provide you with

a list of trees you can refer to before making your selection.

On occasion, property owners ask KCP&L to help them remove trees near lines off the company's easements. We evaluate each request for the potential hazard the tree poses to electrical service. As a general rule, our assistance is limited to those actions necessary for the owner to safely remove the tree.

Occasionally they must even remove a treehouse that's too close to a line. This could save a child from being injured or killed.

Keeping trees healthy

A key to fostering the growth and development of a tree is by regularly trimming dead, diseased or insect-infested branches. But removing too much foliage can reduce photosynthesis and stunt a tree's overall growth, so it's important to prune sparingly.

During the life of your tree, pruning will be necessary for various reasons, such as to direct growth away from power lines, remove broken branches or improve visibility of signs and intersections.

You should start pruning trees early in its development and continue throughout the tree's life. For most trees, winter and early spring is the ideal time to prune. Trimming during this time gives the plant time to replace lost branches and foliage before it starts to grow in the spring, allows wounds to close more quickly and reduces likelihood of disease and insect infestation.

There are different kinds of pruning cuts used for tree maintenance. Never prune or trim trees near power lines. Call (816) 471-5275 to report limbs down or limbs contacting lines.

- Side trimming cuts back branches on one side of the tree.
- Crown reduction reduces percentage of overall height of tree. This technique, which is used when a tree has grown too large for its space, is preferred to topping because it results in a more natural appearance, increases the time before pruning is needed again and minimizes stress.
- V-trimming removes entire branches from the center of the tree, while side branches are allowed to grow.
- Collar cuts leave a raised collar of tissue at the branch junction. This method promotes rapid wound covering of tree tissue, reducing external dieback and disease infection.
- 3-cut method shortens branches larger than ¾ inch or 2 cm in diameter before removal and prevents the branch from damaging the trunk as it falls to the ground.
- 3:1 lateral ratio makes a pruning cut back to a lateral branch that is at least 1/3 the diameter of the branch being removed.

Pruning practices that can cause irreparable harm to a tree are topping and tipping.

- Topping — indiscriminate cuts in mature trees, leaving open wounds that are subject to disease and decay. This practice also robs a tree of its food-producing capacity, and causes immediate injury and long-term maintenance requirements to the tree.
- Tipping — involves cutting off the ends of branches. This method causes excessive sprouting, making re-trimming an annual event.

Leave it to the professionals

In the age of do-it-yourself projects, it's always important to know when to leave work to the professionals. Pruning or removing trees, especially large trees, can be dangerous work and has the potential to cause bodily injury or property damage. If your tree is diseased or has pest control problems, consider hiring an arborist, a professional that specializes in tree care, who is trained and equipped to work safely in trees.

There are many factors to consider before selecting an arborist. Remember the following points when hiring or contracting with a tree professional:

- Look for an arborist who has a professional certificate or license.
- Ask for proof of insurance, including proof of liability for personal and property damage.
- Ask for local references.
- If possible, obtain several estimates (should be free of charge).
- Never pay for services up front.

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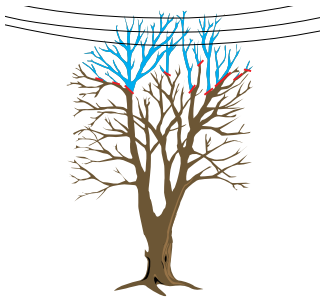
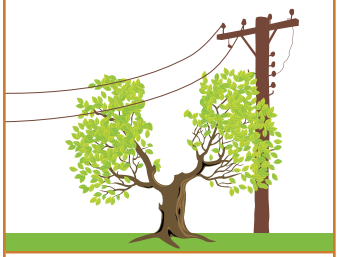
Types of pruning cuts

Side Trimming

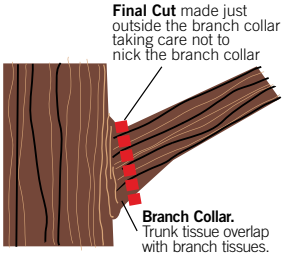
Crown Reduction



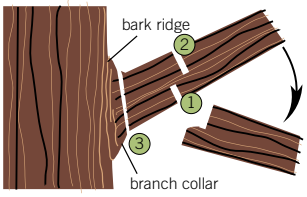
V-Trimming



Collar Cuts



3-cut Method



Types of utility poles

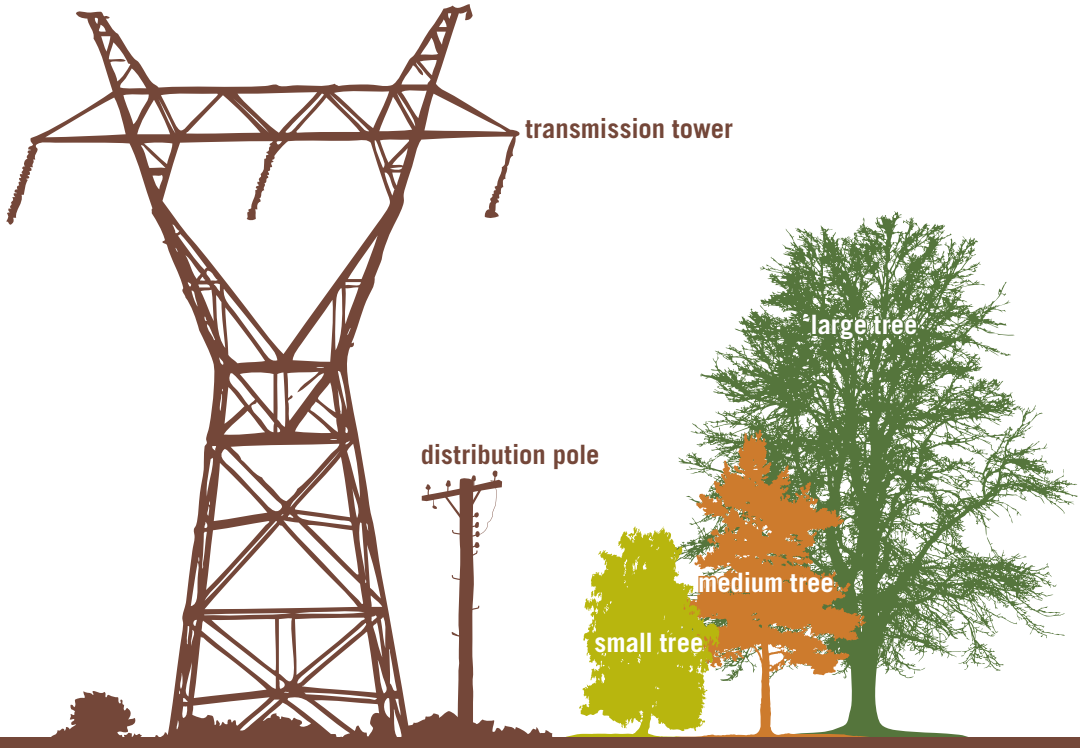
Wood distribution poles

Steel distribution pole

H-frame transmission tower

Steel transmission tower

Steel lattice transmission tower



Tree Siting Guidelines

Small trees & shrubs: Plant at least 20 ft. from powerlines

Medium trees: Plant at least 35 ft. from powerlines

Large trees: Plant at least 45 ft. from powerlines

Small trees & shrubs (Mature height under 30 ft.)		Medium trees (Mature height 30 – 70 ft.)	Large trees (Mature height over 70 ft.)
Amur Maple	Freedom Honeysuckle	American Holly	Black Walnut
Arborvitae	Goldenraintree	American Hophornbeam	Ginkgo
Burning bush	Japenese Maple	Chanticleer Pear	Imperial Honey Locust
Cherry	Lilac	Chinese Pistache	Kentucky Coffeetree
Chinese Juniper	Serviceberry	Common Hackberry	Norway Maple
Crabapple	Staghorn Sumac	Japanese Black Pine	Oak
Dogwood	Star Magnolia	Lacebark Elm	Pine, other
Eastern Red Bud	Viburnum	Laurel Willow	Red Maple
Eastern Red Cedar	Washington Hawthorn	Persimmon	River Birch
Forsythia	Winterberry	Sassafras	Southern Magnolia
		Swiss Stone Pine	Spruce
		Western Soapberry	Tuliptree

You may have seen transmission and distribution lines around your neighborhood. But do you know the difference?

Transmission lines carry extra high voltage from a power plant to a KCP&L substation. These lines, totaling 1,700 miles, are connected to a grid creating a pool of power that can be "wheeled" across the nation during periods of high demand. Because of their high voltage, these lines are typically on taller poles and require greater tree clearances than distribution lines.

Distribution lines carry lower, but still deadly, voltages from the substation to the electric meter on your property. These lines, totaling 13,400 miles, can either be overhead on wood poles or buried underground and are commonly seen in residential neighborhoods.

For more detailed information, visit the International Society of Arboriculture at www.isa-arbor.com.

Plan before you plant

Haphazardly planting trees and shrubs will increase the time you spend working in the yard and could directly endanger your home and its utilities in the future.

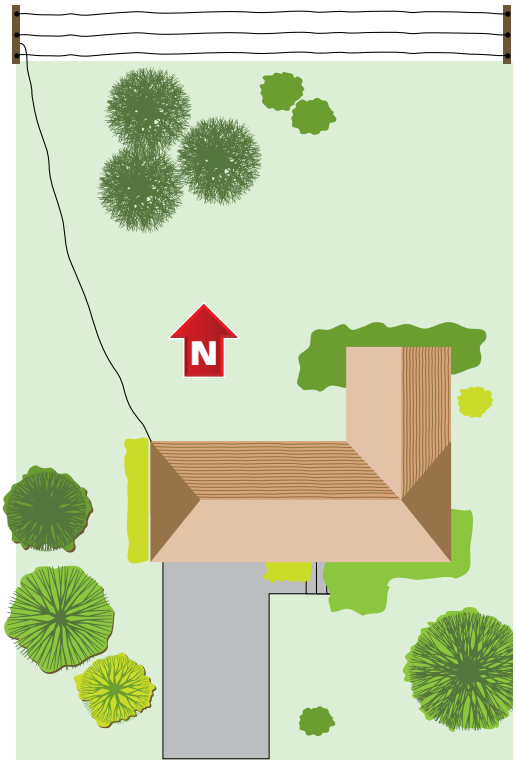
Remember that you are planting for tomorrow, so take the time to plan before you plant. To the prospective buyer, all trees look alike at six or eight feet tall. But fast-forward 20 to 30 years, and that beautiful "shrub-like" blue spruce that complements the front of your house today, will dominate much of your yard, overpower your house and clog your sewers. Buy trees to fit the site at maturity.

Don't be impatient. It may seem ideal to plant trees that grow faster and provide instant shade. These fast-growing trees, however, also have undesirable features, like shallow root systems or weak wood that breaks easily. In the long run, it's better to buy genetically improved tree varieties that require less maintenance for property owners, less attention from municipalities and easier to protect from disease and insects.

Think of your yard as your outdoor living room. Use the grid on the inside back cover of this booklet to draw a plan of your property and indicate where you want sun, shade, work and recreation areas, flowers and gardens. Then visit a nursery and pick your trees accordingly.

Before buying a tree, evaluate the following questions and discuss them with a professional at your local nursery.

- What are your reasons for planting a tree? To screen an undesirable view? For its fruit? To accent or frame your house? To attract birds or other wildlife? To add more greenery to your yard? For spring flowers? (Remember that as beautiful as spring blossoms or fall colors are, they last only a short time. Pick trees that look good the other 50 weeks of the year, as well.)
- How large will the tree ultimately become? Once it grows to its full height and width, will it still fit into your landscape scheme?
- What shape will mature trees have – upright, round or spreading? How will this fit into your landscape scheme?
- What maintenance will the tree require? Will you need to clean up messy fruit or seeds? Will it need to be sprayed often?
- Will the tree be able to survive in the local climate and soil? Is it suitable for a sunny or shady, wet or dry spot?
- Is the wood of the tree strong enough to bear snow accumulation and strong winds without breaking? Does the tree have a deep or shallow root system?
- Is the tree susceptible to insects and disease?
- Will the tree add to the value of your property now and at maturity?
- Consider your neighbors — will the tree shade their roses or vegetable garden, or overhang their property?
- Are there any local ordinances controlling what you can plant in the parking strip or forbidding the planting of certain trees?



Location, location, location

As in real estate, location is everything when it comes to planting a tree. Here are some important tips to consider before selecting your tree's location.

Don't plant:

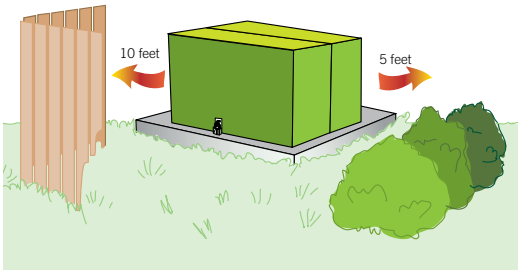
- A large tree too close to a house; limbs can loosen roofing and mar paint, leaves can clog gutters, roots can heave foundations and sidewalks. If shallow rooted and weak, the tree could fall onto the house, causing major damage.
- A tree with low branches too close to the driveway can scratch cars.
- A large tree that can interfere with overhead lines.
- A large shade tree with overhanging limbs can obscure street signs and traffic lights, creating hazards for motorists and pedestrians. It's also dangerous to screen your own driveway so that you cannot see approaching traffic.

Plant for energy efficiency

Another important factor to consider when planning is planting for energy efficiency. Carefully positioned trees can save up to 25 percent of a typical household's energy consumption for heating and cooling.

Planting deciduous trees (those that lose their leaves in fall) on the west and southwest side of your home can shade roof and wall surfaces in summer, serving as a natural aid to your air conditioning.

A wind break of evergreens planted to the north and west of your home can help save energy during the winter. Correct foundation plantings around the base of your home can create a dead air space that will help insulate against cold.



Tips for landscaping around transformers

If your home is located in a newer subdivision or development, chances are your electric service is underground. You'll know it's underground if there are no overhead lines to be found, and if you have a green transformer box like that pictured above along your front or rear lot line.

Although the initial instinct is to cover it with shrubs or fences, KCP&L must have safe, easy access to perform regular maintenance or to restore power. When our choice is between protecting your service or your plantings, your service comes first. We may have to remove or damage shrubs or fencing.

Before you plant any shrub, consider its size at maturity. Make sure it won't grow within five feet of the transformer's sides or within 10 feet of the front. Do the same with fencing. You'll ensure your landscape's security and beauty for years to come.

- Shallow rooted trees can clog sewer lines, cause property damage and require costly repairs. They also can entangle underground power lines, creating a safety hazard and a potential for outages.

Do plant:

- Well-proportioned trees that are not too close to the house will provide shade and privacy without harming the roof and paint. The proper selection of shape and color will add to the appearance of the home.
- "Clean" trees near the patio that will not litter the area with fruits, limbs or leaves. Fruit and seed trees are often beautiful, but their droppings can be messy and slippery, attract insects, create strong odors, and clog screens, gutters and air conditioners.
- Trees to frame the house and add beauty to the overall landscape.
- Shrubs and certain evergreens that make the property line look neat, add privacy and are small enough to manage. Keep in mind that future electric or other utility construction, if required, is likely to be done along property lines.
- Small trees or shrubs near power lines that will reach a mature height of 15 feet or less because they won't pose a future line clearance problem or threaten your electric service.
- Deciduous trees on the west and southwest sides of the house to provide cooling shade in the summer. In the winter, the bare branches will let most of the sunshine through to warm the house.
- Evergreen trees and shrubs along the north and west sides of the home and foundation to block the harsh winter winds.

Search high and low for right tree size

Trees grow in all shapes and sizes. Any tree or shrub requires adequate space to grow and develop into a mature, attractive plant. So how do you decide which tree is best for planting? First determine available growing space, factoring in adequate clearance around overhead and underground lines and, lastly, reflect on the additional benefits you would like the tree to provide.

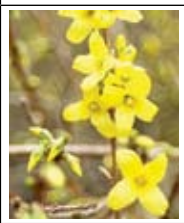
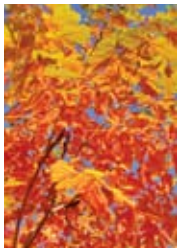
- Large shrubs seldom exceed 15 feet at maturity. You can plant them under utility lines; ideal for visual screen and privacy barriers, windbreak, noise abatement and wildlife benefits.
- Small trees that reach less than 30 feet at maturity can be planted 15 feet or more from lines if adequate space is allowed for future growth. Ideal for visual screen, windbreak, wildlife benefits, and street side, park and district locations.
- Medium trees that reach 30 to 70 feet at maturity, avoid locations under or within 35 feet of overhead lines. Provide same benefits as small trees.
- Large trees that typically grow 70 feet to maturity, don't plant within 45 feet of overhead lines. Ideal for shading large areas, park and open space settings, background and framing of multi-story buildings.

Recommended tree species

Whenever possible, choose a tree that's native or naturalized to this area. A native tree will be naturally adapted to the climate, and will probably thrive in locations where an exotic tree might die. Native trees are highlighted in yellow and other features are also indicated.

If you want to know what the tree will look like in the future, find a mature tree of the same species and then visualize how a tree of that size and shape would fit into your yard. A city park, arboretum or the Internet are good places to check. Since there are thousands of tree variations, it's not possible to list every species available. We want to provide you with some practical guidance in making your choices, so we are providing a comprehensive list of recommended trees and shrubs.

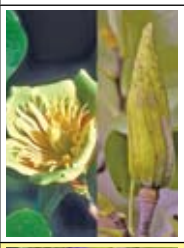
Common Name Scientific Name	Planting distance from powerlines	Growth Rate	Type of Light	Image	Bark	Foilage	Flower/Fruit	Fall Foilage
Arborvitae *Thuja occidentalis* Adaptable to poor soil: no	20 feet	Medium						
Birch, River *Betula nigra L.* Adaptable to poor soil: yes	45 feet	Medium						
Burning bush *Euonymus alatus* Adaptable to poor soil: yes	20 feet	Medium						
Cedar, Eastern Red *Juniperus virginiana* Adaptable to poor soil: yes	20 feet	Slow						
Cherry ornamental *Prunus serotina* Adaptable to poor soil: no	20 feet	Slow						
Crabapple species *Malus spp* Adaptable to poor soil: yes	20 feet	Medium						

Common Name Scientific Name	Planting distance from powerlines	Growth Rate	Type of Light	Image	Bark	Foilage	Flower/Fruit	Fall Foilage
Dogwood species *Cornus spp* Adaptable to poor soil: no	20 feet	Slow	☀					
Elm, Lacebark *Ulmus parvifolia* Adaptable to poor soil: yes	35 feet	Medium	☀ to ◐					
Forsythia *Forsythia* Adaptable to poor soil: yes	20 feet	Fast	☀ to ◐					
Ginkgo (male) *Ginkgo biloba* Adaptable to poor soil: yes	45 feet	Medium	☀					
Golden rain tree *Koelreuteria paniculata* Adaptable to poor soil: yes	20 feet	Medium	☀					
Hackberry, Common *Celtis occidentalis* Adaptable to poor soil: yes	35 feet	Medium	☀ to ◐					
Hawthorn, Washington *Crataegus phaenopyrum* Adaptable to poor soil: yes	20 feet	Medium	☀ to ◐					
Holly, American *Ilex opaca* Adaptable to poor soil: yes	35 feet	Medium	☀ to ◐					

Common Name Scientific Name	Planting distance from powerlines	Growth Rate	Type of Light	Image	Bark	Foilage	Flower/Fruit	Fall Foilage
Honeylocust, Imperial *Gleditsia triacanthos var. inermis 'Imperial'*	45 feet	Medium						
Honeylocust, Thornless *Gleditsia triacanthos v. inermis* Adaptable to poor soil: yes	45 feet	Medium						
Honeysuckle, Freedom *Lonicera Freedom* Adaptable to poor soil: yes	20 feet	Fast						no photo available
Hophornbeam, American *Ostrya virginiana* Adaptable to poor soil: yes	35 feet	Slow	to					
Juniper, Chinese *Juniperus chinensis* Adaptable to poor soil: yes	20 feet	Medium						
Kentucky Coffee Tree *Gymnocladus dioicus* Adaptable to poor soil: yes	45 feet	Slow						
Lilac species *Syringa spp* Adaptable to poor soil: no	20 feet	Medium						

Common Name Scientific Name	Planting distance from powerlines	Growth Rate	Type of Light	Image	Bark	Foilage	Flower/Fruit	Fall Foilage
Magnolia, Southern *Magnolia grandiflora* Adaptable to poor soil: yes	45 feet	Slow	to					
Magnolia, Star *Magnolia stellata* Adaptable to poor soil: yes	20 feet	Medium	to					
Maple, Amur *Acer ginnala* Adaptable to poor soil: yes	20 feet	Medium	to					
Maple, Japenese *Acer palmatum* Adaptable to poor soil: no	20 feet	Slow	to					
Maple, Norway *Acer platanoides* Adaptable to poor soil: no	45 feet	Slow	to					
Maple, Red *Acer rubrum* Adaptable to poor soil: no	45 feet	Slow	to					
Oak species *Quercus spp* Adaptable to poor soil: yes	45 feet	Slow	to					

Common Name Scientific Name	Planting distance from powerlines	Growth Rate	Type of Light	Image	Bark	Foilage	Flower/Fruit	Fall Foilage
Pear, Chanticleer *Pyrus calleryana var. 'chanticleer'* Adaptable to poor soil: yes	35 feet	Medium	☀					
Persimmon *Diospyros virginiana* Adaptable to poor soil: yes	35 feet	Slow	☀ to ◐					
Pine, Swiss Stone *Pinus cembra* Adaptable to poor soil: no	35 feet	Slow	☀					
Pine, other *Pinus spp* Adaptable to poor soil: yes	45 feet	Slow/ Medium	☀ to ◐					
Pistache, Chinese *Pistacia chinensis* Adaptable to poor soil: yes	35 feet	Fast	☀					
Red Bud, Eastern *Cercis canadensis* Adaptable to poor soil: yes	20 feet	Slow	☀ to ◐					
Sassafras *Sassafras albidum* Adaptable to poor soil: yes	35 feet	Medium	☀					
Serviceberry *Amelanchier* Adaptable to poor soil: no	20 feet	Slow	☀ to ◐					

Common Name Scientific Name	Planting distance from powerlines	Growth Rate	Type of Light	Image	Bark	Foilage	Flower/Fruit	Fall Foilage
Soapberry, Western *Sapindus drummondii* Adaptable to poor soil: yes	35 feet	Medium						
Spruce species *Picea spp* Adaptable to poor soil: no	45 feet	Slow						
Sumac, Staghorn *Rhus typhina* Adaptable to poor soil: yes	20 feet	Slow						
Tuliptree *Liriodendron tulipifera* Adaptable to poor soil: no	45 feet	Fast						
Walnut, Black *Juglans nigra* Adaptable to poor soil: no	45 feet	Slow						
Willow, Laurel *Salix pentandra* Adaptable to poor soil: yes	35 feet	Fast						
Winterberry *Ilex verticillata* Adaptable to poor soil: yes	20 feet	Medium						

Tree species to avoid

If you are tempted to select a fast-growing tree, think about the damage to overhead lines or constant maintenance problems they may cause. Below are trees that are problematic to homeowners and communities.

Common Name	Image	Bark	Foilage	Problems
Silver maple *Acer saccharinum* This fast growing tree quickly engulfs overhead lines and requires frequent trimming. It is prone to damage by wind and ice storms, causing damage to homes and utility lines alike. Insect infestation and surface roots are common.				
Lombardy poplar and hybrid poplars *Populus nigra 'Italica'* This fast growing, short-lived poplar is prone to early death by disease. There are many species that will make a better visual screen and sound barrier than this tree.				
Weeping willows *Salix babylonica* One of the most damaging trees to plant in the vicinity of overhead lines.The rapid growth and weak, brittle wood will require constant homeowner maintenance.				
Cottonwood *Populus freemontii* This tree grows quickly into overhead lines. Cottonwoods can mature to 75 feet. Some local ordinances prohibit planting them because their seeds are a nuisance.				
Boxelder *Acer negundo L.* The fast growth and weak wood of this tree commonly endanger utility service. Large quantities of seeds can be a problem. Boxelder bugs are a common nuisance.				
Sycamore *Platanus L.* This messy, shallow-rooted tree litters the area with abundant seed balls and peeling bark. It's susceptible to stem and leaf disease, and insect infestations.				
Osage Orange *Maclura pomifera (Raf.) Schneid.* A thorny tree, it produces an abundance of troublesome, softball-sized fruit and re-sprouts prolifically.				

Common Name	Image	Bark	Foilage	Problems
Siberian (Chinese) Elm *Ulmus pumila* It tends to split and drop limbs when loaded down with ice. Abundant sucker growth would require planting away from overhead lines.				
Tree of Heaven *Ailanthus* This fast-growing tree is a poor selection for landscaping. It will quickly take over a yard with multiple trees from root "suckering." It is short-lived with very soft, weak wood that splits when exposed to ice or high winds.				
Black Locust *Robinia pseudoacacia* A fast growing tree with clusters of needle-like toxic thorns that quickly repopulate open areas though seed production.				

How to plant your tree

Now that you know what qualities to look for in a tree, it's time to learn how to properly plant it.

Before you excavate or dig, first call these statewide one-call services: Kansas 1-800-DIG-SAFE or Missouri 1-800-DIG-RITE. Contact with underground electrical lines can be deadly and interrupt service to your home and others. KCP&L can help you locate underground service lines before starting your project. Location services are absolutely free, but can take up to two working days to complete.

Planting your tree

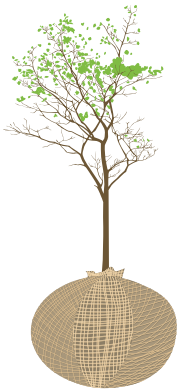
- To determine ideal dimensions of the planting hole, dig a hole twice as large and slightly shallower than the root ball. Loosen the sides and bottom of the planting hole with a pick or shovel, so root tips can penetrate the native soil.
- Don't add soil amendments directly to planting hole. Some planting sites might require modification if existing soil is compacted.

- Plant trees at the level of the exposed buttress roots or the root flare.
- Place tree in root hole by lifting underneath the root ball, not the trunk. Balance the tree and make sure it is at the appropriate height.

- Backfill evenly around root ball using the soil from the planting hole.

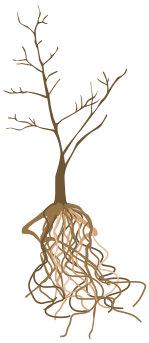
- Research shows that most trees perform better with no staking at all. In some instances, such as open exposure to high winds or a tall slender tree with a small root ball, staking is preferred. Stakes should be removed after one full growing season.

Typical tree stock types:



A ball and burlap tree, referred to as a B&B, comes wrapped in burlap around its root ball. Until you are ready to plant, keep tree in a cool place, cover the burlap ball with mulch and keep roots moist. The burlap and wire basket should be removed after tree is in planting hole.

If your tree comes in a container, remove it and gently cut the young fibrous roots before planting.



If you are planting a bare-root tree, plant the sapling quickly to keep roots from drying out. If weather or soil conditions don't allow immediate planting, store in a cool place and keep soil moist.

- The root systems of container-grown trees sometimes grow into a circular pattern. Before planting, slice the young fibrous roots with a sharp knife to allow them to spread and grow out once planted.

- Layer two to four inches of mulch around the base of the tree. The mulch acts like a blanket to hold moisture and moderate temperature extremes. We provide free wood chips to homeowners in our service territory. Simply call (816) 471-KCP&L to find out how to receive a load of these chips.
- Trees require certain nutrients to live and thrive. Fertilizing your tree can increase growth, reduce susceptibility to diseases and reverse declining health.

Something to grow on

Fertilizer provides additional nutrients that can enhance a plant's foliage color, prevent nutrient deficiencies or increase shoot growth. It's important to realize the limitations of fertilizer; it cannot overcome problems caused by non-native varieties, improper planting techniques, poor soil drainage and compaction or improper watering practices.

Nutrients found in fertilizer are divided into macronutrients and micronutrients. Macronutrients — required by plants in larger quantities — include nitrogen, phosphorus, potassium, calcium, magnesium and sulfur. Micronutrients that are required in small amounts include iron, manganese, zinc, copper, boron, chlorine and molybdenum.

Iron is the most commonly deficient micronutrient in soils, especially in alkaline soil regions. When iron becomes insoluble, the plant cannot extract sufficient amounts from the soil for good growth. A sign of iron deficiency is pale green to yellow leaves with darker green veins. Iron deficiency is common in certain plant species, such as some red oaks, maples and hollies.

A way to determine fertilizer recommendations is through a leaf and soil nutrient analysis, a tool that provides valuable information on fertilizer amounts and ratios that minimize nutrient waste and pollution. Contact your local county extension office to get instructions on taking a nutrient analysis. Proper timing of fertilizer applications has a marked effect on the growth of woody plants. The best time to apply fertilizer is in the spring before growth begins. A factor that can affect timing is soil type. For sandy or loam soils, apply fertilizer as soil temperatures begin to rise and before growth occurs. However, with heavy clay soils, apply during late fall after leaves have fallen or plant is completely dormant.

The maximum growth response to fertilizer is achieved if it is available in the root zone at or slightly before the start of spring growth. With sandy soils, fertilizer moves rapidly into the root zone, but takes longer to penetrate with heavy clay soils.

Do not apply fertilizers from August 1 until late fall, usually around the time of the first killing frost. Late summer fertilizing can stimulate an excessive amount of new growth, making plants more susceptible to winter injury

Picking the right fertilizer

A nitrogen deficiency limits tree growth more often than by a lack of phosphorus or potassium. For this reason, it is recommended that you use a fertilizer grade with a 2-1-1 or 3-1-1 ratio. The ratios correlate to the percentage of nitrogen, phosphorous and potassium, respectively, contained in the fertilizer. These three nutrients are needed in the largest amount for optimum growth. Fertilizers with these ratios are readily available, including 10-8-6 and 12-6-6. If the desired ratio is unavailable, a 3-1-1 fertilizer can be approximated by mixing 12 ounces

of ammonium nitrate (33-0-0) to each pound of a 12-12-12 fertilizer. The same type of fertilizer can be used on shrubs and vines.

Whether you use organic or synthetic fertilizers try to find one with a high percentage of water-insoluble nitrogen — a slow-release form that becomes available as the plant can use it — that doesn't wash off or leach through the soil into groundwater.

Fertilization rates

When rapid growth is desired on young landscape trees and shrubs use the high application rate listed in the *Table* below. The nitrogen rate should be 0.2 to 0.4 pounds for every 100 square feet per year. The low application rate listed should be used in situations that restrict growth, such as slow growing and dwarf species, dry or compacted soils or where plant has a restricted root zone.

	Maintenance level	
	Low	High
Soil organic matter level	**Pounds of nitrogen (N) to apply per 100 sq. feet**	
Low	0.1	0.2
Medium to high	0.07	0.05
Organic soils	0.1	0.15

Soil organic matter level is obtained though a soil analysis

Because the growth rate is slowed as trees and shrubs mature, the need for nitrogen decreases. The low application rate should be used for established trees and shrubs. This low maintenance level keeps landscape plants in a healthy condition without excessive vegetative growth.

When it comes to fertilizer, more is not necessarily better. Fertilizer applied in excess of a plant's needs or with improper timing often goes to waste. Excess nitrogen can quickly leach into the subsoil and runoffs can lead to pollution of underground water supplies.

Watering frequency depends on the type of soil and amount of rainfall in your particular area. The best time to water trees is in the morning. Don't let water accumulate and runoff because it can be detrimental to root growth.

Conclusion

To fully develop our outdoor surroundings requires proper tree selection and planting. Planting the right tree in the right place can increase property value and energy efficiency of your home, and minimize property damage and power outages caused when trees come into contact with power lines. We hope this brochure helped you make informed decisions about tree purchases and plantings that will benefit everyone in the long run.

Acknowledgements

The authors of *The Right Tree in the Right Place* booklet used several sources for background material.

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Heartland Tree Alliance..... **www.heartlandtreealliance.org**

International Society of Arboriculture..... **www.treesaregood.com/**

Kansas Forest Service..... **www.kansasforests.org/**

Missouri Department of Conservation ..... **http://www.mdc.mo.gov/**

National Arbor Day Foundation ..... **www.arborday.org/index.cfm**

Tree Care Industry Association..... **www.treecareindustry.org/index.aspx**

United States Forest Service ..... **www.na.fs.fed.us/spfo/pubs/howtos/ht_prune/prun001.htm**

Photo credits

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Paul Wray, Iowa State University, **www.forestryimages.org**

Notes

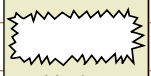
Common landscaping symbols

Evergreen tree

Deciduous tree

Deciduous shrub

Evergreen shrub



Hedge

Fence

Property line

Arbor

Land contours

Bench

Light source

Hazard

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