

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE GENERAL SPECIFICATION**

TREE/SHRUB ESTABLISHMENT

(Ac.)

CODE 612

GENERAL SPECIFICATIONS

Procedures, technical detail, and other information listed below provide additional guidance for carrying out selected components of the named practice. This material is referenced from the conservation practice standard for the named practice and supplements the requirements and considerations listed therein.

GENERAL DESIGN INFORMATION

Planting Stock

Care must be taken so that the planting materials come from a local and appropriate seed source.

For pine, seedlings should originate from an area having an average annual minimum temperature within 5 degrees Fahrenheit of the planting site's average annual minimum temperature (USDA Plant Hardiness Zone Map gives average annual minimum temperatures).

For hardwood, plant material should originate from seed gathered within 150 miles north or south of the planting site. Certain species and periodic seed shortages may make this impossible. Always try to use the plant material whose origin is closest to the planting site. Planting material originating outside the 150 mile limit can make up a minor component of the planting job.

Balled or containerized stock from commercial nurseries must be suited for the "Hardiness Zone" of the site. This information is generally provided on a tag attached to the tree.

Proper transportation from the nursery to the planting site is critical. If the seedlings are picked up at the nursery, provide cool, shaded conditions for transport. If available, use of a refrigerated truck or trailer is best. Arrange to pick up seedlings in the late afternoon and schedule long-distance hauling at night to prevent heat buildup from the sun. If an open truck or trailer is used for shipping, a tarp shall be used to shade the seedlings, but be sure to allow ventilation under the tarp and around the seedlings to prevent heat buildup. Avoid stacking bags of seedlings more than two deep without providing spacers to provide air flow between packages.

Inspect seedlings immediately upon receipt to assure that they are alive and healthy. Seedlings should not:

- Have a fermentation smell
- Have a black color and/or mold on the roots
- Bark that "slips" on the stems or roots
- Have chlorotic, yellow needles
- Have breaks and scrapes
- Be warm to the touch.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#) or visit the [Field Office Technical Guide](#).

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Add water to the packing medium if dry. Apply just enough water to moisten the medium. Excess water shall be drained to avoid mold problems.

Packaged seedlings can be stored for 2 weeks in a cool, dry, shady, or protected location and should be checked every few days for moisture needs. **DO NOT** store packages where they will freeze or where the temperature will exceed 70° F. Ideal storage is at 35 to 40 degrees. Stored packages shall not be stacked more than 2 deep, without spacers, to allow air flow around the bags (packaged seedlings can build heat within the bags).

For large tree plantings, coordinate with the nursery and accept delivery of only enough trees for a one or two week supply at a time. Although not ideal, seedlings can be heeled in when it is necessary to store them longer than 2 weeks. Because of the increased handling and root exposure this entails, it should only be used as a last resort, when no other alternatives are available. To heel in, remove seedlings from the bundle, spread them out in a trench (plow furrow) with a 30 to 40 degree slope from the vertical, and cover the roots with soil. The trees shall be placed in the trench so that the roots and 1-2" of root collar are below ground line. Pack soil firmly around the roots to eliminate air pockets. The trench should be located in a cool, shady place, and the soil around the roots shall be kept moist.

Rooted planting stock should not exceed a 2:1 root-to-shoot ratio.

Seedlings must meet the minimum requirements listed below to be acceptable:

Pine

- A minimum root collar of 1/8" diameter.
- A minimum height of 6 1/2" above the root collar.
- A minimum of 5" in root length.
- At least 5 first order lateral roots.

Hardwoods

- A minimum root collar diameter of 1/4" (5/32" on American Plum and Mulberry and 1/8" on Sand Plum).
- A minimum height of 16" above the root collar; 12" if top-cut at the nursery prior to digging.
- A minimum of 8" in root length.
- At least 5 first order lateral roots.
- Lateral roots will not be pruned unless they exceed 8" in length.
- Pecan seedlings may be smaller. It is acceptable for them to be 10" in height and have a minimum root length of 7".

Site Preparation for Seedling Plantings

Proper site preparation prior to planting trees and shrubs is critical to their survival and growth. Properly prepared sites shall be free of competitive vegetation and plow pans. Mechanical, manual, or chemical methods may be used for site preparation. Follow the guidance in the Oklahoma NRCS Tree/Shrub Site Preparation (490) standard.

Do not plant in established improved grass pastures without controlling the grass competition or using weed barrier fabric. No tree planting shall be made in bermudagrass unless steps to destroy or control bermudagrass are applied prior to planting of trees and shrubs, or afterward through herbaceous release herbicides.

Site preparation on medium or heavy cropland soils should include summer fallowing in low rainfall areas. When planting trees in native perennial vegetation or alfalfa, prepare the ground by subsoiling with a ripper or paraplow in the late summer or fall, leaving the surface rough over the winter and disking or harrowing in the spring to provide a clean, firm seedbed for tree planting.

Avoid cropland sites that have had recent heavy applications of herbicides that may be harmful to seedlings.

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Sandy soils which are subject to wind erosion should not be summer fallowed. A cover crop of Sudan or haygrazer should be established the summer before planting the trees. The area may require chemical treatment, if annual winter weeds or grasses present a problem, before tree planting.

Polypropylene woven fabric or organic mulches may be used as a weed barrier instead of cultivation or herbicides.

Pine plantings for wood production. Site preparation will be needed when planting pine in a heavy stand of vegetation, heavy debris, or when soil and site conditions and landowner's objectives justify ripping on the contour to increase survivability.

Critical area plantings. Site preparation is not required. Disturbance of the soil could increase erosion.

Other plantings. Prior to planting, the land should be prepared by breaking or disking to the degree that a clean, cultivable seedbed is provided. Avoid cultivating deeper than 3". A minimum treatment is to destroy competing vegetation in a 3' wide band down the tree row. This may be accomplished with herbicides or by cultivation.

Planting Dates

Bare Root. Plant seedlings after December 1 and prior to bud break of native tree and shrub vegetation (usually March 15 to April 1).

Potted or Containerized. Plant seedlings from October 1 through April 20 as long as adequate moisture is present at the time of planting. Be sure planting stock is alive and was adequately protected in the nursery from freezing.

Spacing for Seedling Plantings

Spacing trees too close will retard their growth and result in mortality before merchantable material can be harvested or the intended purpose is accomplished. Spacing which is too wide may result in development of heavy limbs and delayed natural pruning. Spacing depends on the planting purpose, species being planted, expected survival, and planned maintenance after planting.

Pine. Spacing used for pine species planted to produce pulp wood, saw logs, or other wood products typically ranges from 6' x 8' (907 trees/acre) to 8' x 10' (544 trees/acre), depending upon locally accepted planting practices and specific site conditions. When the site is ripped with a single shank ripper, the spacing is generally 8' x 9' (605 trees/acre); while a double shanked ripper spacing is generally 6' x 10' (726 trees/acre). Any combinations of spacing between 6 and 10 feet are acceptable as long as 500-900 trees per acre are planted.

Hardwoods. Hardwoods which can attain heights of 35 feet and larger should be spaced from 10' x 10' (435 trees/acre) to 12' x 12' (302 trees/acre). Small hardwoods which attain heights of less than 35 feet should be spaced from 6' to 8' apart.

Wildlife Habitat. Shrubs, such as sand plum, which attain heights of <10 feet should be spaced in mottes or thickets between 3' – 6' apart.

Critical Areas. Plantings may be as close as 6' x 6' (1,210 trees/acre) on steep slopes and as wide as 8' x 8' (681 trees/acre) on more stable portions of the area, such as gully bottoms. Black locust trees are recommended on the steep slopes and around the rim of the gullied area. Although not as effective, loblolly pine may be planted instead of black locust in the Eastern 1/4 of Oklahoma. A variety of species should be included on the flatter slopes to benefit wildlife.

Christmas trees. Space a minimum of 6' x 6' (1,210 trees/acre). Rows should be spaced far enough apart to accommodate maintenance equipment.

Wetland areas. Plant to bare root hardwoods that are beneficial to wildlife on a 12' x 12' (302 trees/acre) spacing. Large potted/containerized trees will be planted at a spacing that will accomplish the intended purpose and be economically feasible; spacing of 30 to 100 feet is appropriate.

Orchard Plantings. Walnut and Pecan trees should be spaced 35' x 35' (36 trees/acre). Fruit trees should be spaced 20' x 20' (109 trees/acre).

Planting Seedlings

Machine or hand planting of bare-root trees is acceptable as long as the seedlings are planted properly.

Planting should be done under optimum moisture conditions, when soil is neither too dry nor too wet. Refer to Oklahoma NRCS Job Sheet 612 02 (Checking Soil Moisture Available to Trees).

Do not plant when the ground is frozen or during periods of freezing weather.

Avoid planting under dry, windy or very warm conditions.

On sloping land, planting by machine shall be done on the contour whenever possible. Do not machine plant through ephemeral stream channels. Machine planters should be raised out of the ground when crossing ephemeral stream channels.

When transporting the seedlings to the field; do not stack the packages more than two deep, without spacers, and protect from the heat of the sun as much as possible. Store the seedling bags in a cool, shady location and protect them from temperature extremes.

Exercise extreme caution while planting bare root seedlings, to keep the roots from being exposed to open air. Only open one bag at a time and close it immediately after taking only one handful of seedlings or the amount that will be planted in a short period of time. Transfer seedlings from shipping bags to planting containers quickly. Do not tap tree roots to remove excess moisture holding material or soil. Carry seedlings in a suitable container under cover of moist burlap, moist sphagnum moss, moist straw, polyacrylamide slurry or mud. Withdraw only one seedling at a time when planting. When removing trees from shipping bundle, be sure to restore moisture to trees that remain.

Seedlings shall be planted at the same depth or slightly deeper (1 – 2 inches) than they grew in the nursery. Roots must be planted straight down, not twisted, balled, 'J' or 'L' shaped. Do not force roots into too shallow a hole or furrow.

Soil around the planted roots must be gently, but firmly, packed to remove air pockets. When hand planting, use your shoe to pack the soil firmly around the roots. If planting with a machine, make sure the packer wheels have the proper tension and are in the proper alignment in relation to the tree. Properly planted seedlings should resist gentle tugging pressure.

Planting holes or furrows must be deep enough so that the roots are not curled or crowded (planting into a narrow trench will accumulate extra moisture for establishment). When planting in holes that have been augured, the edges of the hole should be gouged to roughen or break up the compacted layer caused by the auger along the edge of the hole.

Planting Seed

Good quality seed of desired species may be sown on suitable soils as an alternative to using seedlings. The initial cost of direct seeding is one-half to one-third that of planting seedlings but stand establishment is usually less predictable, less uniform, and sometimes much slower when unfavorable climatic conditions follow planting.

Seeds can be collected by hand or purchased from seed dealers. Acorns can be collected between the months of October and December. Check viability by floating acorns in water for 16-24 hours. Unsound acorns will float and can be discarded (The exception is that a good overcup acorn can float). Both red and white oak acorns can germinate without storage and should be planted as soon as possible after October 31. Red oak acorns planted in the spring require a pre-treatment consisting of 30-90 days in a refrigerator or cold storage unit. Pecan and Hickory nuts can be stored for several years if needed at 40° F. **Do not freeze.** Loblolly and Shortleaf pine seed should be stored for 60 to 90 days between 37° and 41° F. The germination desired for this seed is 80%.

Site Preparation for seed. Exposed soil is needed for good seed germination. It will also control competing vegetation and eliminate cover for rodents. Prepare the seedbed by disking, prescribed

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burning, or applying herbicide as site conditions dictate. Follow the recommendations in the Oklahoma NRCS Forest Site Preparation (490) standard.

Hardwood Seed. Acorns should be machine or hand planted at a depth of 2" to 6". They should be planted 2.5' to 3' apart within each row and the rows should be spaced 10' to 12' apart.

The above spacing requires approximately the following lbs. of seed/ac:

- White and Shumard oak (12-15 lbs.)
- Southern red oak (3-4 lbs.)
- Pecan (10-12 lbs.)
- Water oak (4-5 lbs.)
- Willow oak (3-4 lbs.)
- Pin oak (4-5 lbs.)

Pine Seed. Stratified seeds may be aerially sown or spread by hand between the dates of February 15 to April 15. Hand sowing can be done using a cyclone type seeder. Seed Loblolly Pine at a rate of 18,500 seeds per acre (1 lb.) and Shortleaf Pine at a rate of 45,000 seeds per acre (1/2 lb.). Pine seed for direct seeding is generally treated to reduce loss to birds and rodents.

Natural Regeneration by Seed

Stands of trees may be obtained from a natural seed source under the following conditions:

- When sufficient seed trees of the desired species are available to provide the desired seeding rate.
- When the area to be seeded is within 200 feet of the seed trees.
- When sites are generally too wet during the planting season to facilitate the normal planting method.
- When sites are likely to be invaded by soft mast hardwood species that will out-compete the desired species.

Some site preparation may be necessary to promote natural regeneration.

Pine. Pine can be naturally regenerated using the following three harvest methods: seed tree, shelterwood, and clearcut. Refer to the Oklahoma NRCS Forest Stand Improvement (666) standard for guidance.

Seed Tree method requires leaving a basal area of at least 15 sq. ft. of good quality seed trees per acre that are well disbursed over the area (at least 12 trees that are 10"-16" DBH).

Shelterwood requires leaving a basal area of 20 to 30 sq. ft. per acre of well distributed, good quality seed trees that will also provide some protective canopy (40 to 75 trees would be needed with a minimum 12" DBH).

Clearcut areas should be no wider than 400 feet and be perpendicular to the prevailing winds. This will also bring in the light-seeded hardwoods such as ash, maple, sycamore, elm, cottonwood, and willow if present in the area.

Planting Tree Cuttings

Several species of bottomland hardwoods can be readily propagated with cuttings, or short lengths of young shoots. Cuttings from limbs on black willow, sycamore, green ash or cottonwood can be successfully planted to provide shoreline or streamside stabilization. Ideal planting sites are moist but not flooded for long periods of time.

Limbs cut from these species should be 16" to 20" long and no less than ¼" in diameter at the top and no more than 1.5" in diameter at the base.

The cuttings should be collected during dormancy from one year old growth. The cuttings can be temporarily stored, if necessary, by placing them in cool water or covering them with wet burlap or similar

material. Long-term storage can be achieved by bundling cuttings and refrigerating them in moist sand or plastic bags. They should be soaked in water 2 to 3 days before planting.

Cuttings are usually planted vertically in approximately 16" deep rips, with the buds pointing upwards and the tops of the cuttings protruding 2-4" above the soil surface. Cuttings can also be planted horizontally, in slits approximately 2" deep. Soil should be packed firmly around the cutting to eliminate air pockets.

Transplanting Trees

Transplanting desirable tree species available near the site of the designed planting can be done when it is economically feasible. Some species such as walnut and pecan do not respond well to transplanting. Trees should be moved when they are dormant but not during a time when the ground is dry or frozen. Avoid rocky soils and soils that are too sandy to hold the root ball together.

Transplanted trees should be no larger than 4" DBH. Smaller trees will survive better and grow faster after planting. The planting hole should be slightly larger than the root ball so it will be recessed slightly after planting. Water should be applied to eliminate air pockets. The trees should be oriented the same direction as they were before to reduce the effect of sunscald.

Care of Plantings

Pine. Plantations in Eastern Oklahoma normally do not require cultivation, but should be protected from grazing damage. Livestock should be excluded until trees are at least 6' tall.

Hardwoods. Grazing should be excluded from plantations until trees are tall enough that the lowest limbs are above grazing height. Control competitive vegetation until the trees are well established. This may be done mechanically or chemically

Cottonwood and sycamore trees will need cultivation until the trees have reached a height of 3' to 6'.

Christmas Trees. Control competing vegetation by using herbicides or mowing for the life of the planting. Livestock must be excluded from the plantation.

Protect all seedlings from fire. Construct firebreaks as needed. Refer to the Oklahoma NRCS Firebreak (394) and Fuel break (383) standards.

Renovating Existing Stands

Underplanting. This practice is for thin, poor quality hardwood stands which are suitable for pine. Normally, all sites that have hickory will also grow pine. Effective conversion can be accomplished by planting from 300 to 700 trees per acre. The over story hardwoods should be deadened with herbicides within 1 year following planting. Refer to the Oklahoma NRCS Forest Stand Improvement (666) standard.

Interplanting. This is done on existing stands of pine where there are not enough of the desired species to make a stand (plant in openings only). If the DBH of the existing desirable tree is 6" or less, plant nearest seedling 10' to 12' away. Where existing desirable trees have a 6" DBH or larger, space planted seedlings equal to the tree DBH plus 10'. Example: DBH = 10 inches, convert inches to feet, (1 inch = 1 foot) $10 + 10 = 20$ (plant seedling 20' away).

Replanting

Newly planted pine plantations with openings larger than 50 feet across due to mortality, should be replanted or interplanted within 2 years. In general, a uniform distribution of the greater of 350 surviving trees per acre or 50% of the original planting rate will not require replanting. Losses caused by fire or drought should be replanted as soon as possible, preferably the next planting season.

Hardwood trees should be replanted when there are less than 125 trees per acre surviving. Decisions to determine the need to replant hardwood trees should be delayed 2-3 growing seasons, after planting, to allow for possible re-sprouting.

Moisture

Available water in the soil must be adequate at the time of planting. This can often be accomplished by cultivation and fallowing one year prior to planting. If soil moisture is inadequate or the soil is dry, delay the planting until after precipitation.

Moisture conservation or supplemental watering shall be provided for plant establishment and growth where natural precipitation is too low for the selected species. Seedlings with a drip irrigation system typically need the equivalent of at least 1 gallon of water per day, per plant, during the dry months. One time watering applications shall provide at least 15 gallons per week. This is recommended for the first 3 years of establishment. Use Job Sheet WOOD-OK-09 (Operating Your Drip Watering System) for design. Supplemental watering is not feasible for large-scale plantings of either pine or hardwoods.

Superabsorbent polymers (polyacrylamide or hydrogels) are widely used in tree planting applications as a means of conserving water. When mixed with water the polymers swell like sponges to several times their original size. After planting, the water is then slowly released to the surrounding soil, reducing the need for irrigation. Mix the hydrogel product with water according to manufacturer's instructions. Let the mixture stand until it forms a slurry the consistency of gravy (30 minutes to 1 hour). Adjust the slurry to the thickness that permits the maximum amount of gel to adhere to the roots. Dip the roots of the seedlings immediately prior to field planting, and do not shake.

Mulch materials such as wood chips or fabricated plastic mulches (polypropylene geotextile) may be used for moisture conservation. The most common dimensions of fabricated mulch rolls are 6 ft. by 300 ft. and 6 ft. by 500 ft. The six-foot-wide rolls are mechanically installed over the top of seedlings immediately after planting. A slit or X is cut at each tree location no larger than necessary to pull seedlings through. The fabric should weigh at least 3 oz. per square yard. If weed barrier is to be used on sandy soils, disk and clean only the row area which the material will cover.

When fabricated mulches are used in conjunction with irrigation systems or in areas of 20 inches or greater annual precipitation, 4 ft. wide fabricated mulch rolls are sufficient. Supplemental watering may be provided by hand watering, flood irrigation, or drip systems.

Table 1
Tree and Shrub Area of Adaptation

<u>*Area of Adaptation</u>	<u>Species</u>	<u>Wildlife Food Value</u>	<u>Average Height at Age 20</u>	<u>Comments</u>
Cimarron County	Mt. Mahogany	Good	9'	Plant above 3500' elevations in coarse textured soils.
Cimarron County	Pinyon Pine	Good	8'	Edible seed. Plant at high elevations. Slow growth.
Cimarron County	Gambel Oak	Good	12'	Plant in coarse soils. Drip irrigation recommended.
Cimarron County	Golden Current	Good	7'	Will grow in gravelly soils at high elevations.
Statewide	Lacebark Elm	Poor	25'	Insect and disease resistant. Adapted on all soils. Good for windbreaks.
Statewide	Hackberry	Good	30'	Drought resistant. Needs deep well drained soils. Good for windbreaks and riparian forest buffers.
Statewide	Oriental Arborvitae	Good	18'	Drought tolerant. Ok on clay soils. Good for windbreaks. Bagworms possible problem.
Statewide	Cottonwood	Poor	70'	Prefers deep, moist, bottomland soils. Cuttings can be used. Fast growth.
Statewide	Rocky Mt. Juniper	Good	18'	Okay on all soils. Good for windbreaks (replacement for redcedar). Can have insect and disease problems.
Statewide	Virginia Pine	Poor	32'	Avoid alkaline or wet soils. Used for Christmas trees.
Statewide	Common Lilac	Poor	7'	Drought tolerant. Showy flowers. Will sucker from roots.
Statewide	American Plum	Good	12'	Tolerates dry or clay soils. Avoid deep sand. Edible Fruit.
Statewide	Sand Plum	Good	7'	Drought tolerant. Good on sandy soils. Edible fruit.

<u>*Area of Adaptation</u>	<u>Species</u>	<u>Wildlife Food Value</u>	<u>Average Height at Age 20</u>	<u>Comments</u>
Statewide	Fragrant Sumac	Good	6'	Good on all soils.
Statewide	Sand Cherry	Good	4'	Short lived. Do not plant on clay soils.
Statewide	Chokecherry	Good	12'	Good on all soils. Root sprouts. Leaves and seed are poisonous to livestock and humans.
Statewide	Ponderosa Pine	Poor	32'	Needs well drained soil. Drought tolerant. Good for windbreaks.
> 21" rainfall	Black Locust	Good	50'	Legume, excellent for gully or streambank erosion control. Any soil except too shallow or wet. Good for fence posts. Have short, paired thorns and showy white flowers.
>21" rainfall	Bur Oak	Good	30'	Suited to any soil except wet. Good for windbreaks or riparian forest buffers.
>21" rainfall	Shumard Oak	Good	36'	Tolerates alkaline soil. Timber production. Good for riparian forest buffers.
>21" rainfall	Austrian Pine	Poor	40'	Excellent for windbreaks. Okay on all soils but needs soil 3' - 4' deep. Needs irrigation in Western Oklahoma. Very susceptible to needle blight and nematodes. Planting is discouraged.
>21" rainfall	Loblolly Pine	Poor	50'	Needs deep soil. Good for windbreaks and timber production. Needs irrigation in Western Oklahoma.
>21" rainfall	Chaste-tree Vitex	Good	7'	Tolerates dry soils but not course sands.
>23" rainfall	Chittamwood	Good	32'	Tolerates poor soils. Has short thorns.
>23" rainfall	Red Mulberry	Good	35'	Good for windbreaks. Needs moist fertile soil. Has edible fruit. Yellow fall color.

<u>*Area of Adaptation</u>	<u>Species</u>	<u>Wildlife Food Value</u>	<u>Average Height at Age 20</u>	<u>Comments</u>
>23" rainfall	Bois-d'arc (Osage Orange)	Good	30'	Good for fence posts and making hunting bows. Has short thorns. Good for windbreaks.
>23" rainfall	Nanking Cherry	Good	7'	Not native. Needs well drained soils. Will survive on drier sites with irrigation.
>25" rainfall	Sugar Maple	Good	40'	Prefers bottomland soils.
>25" rainfall	Persimmon	Good	30'	Edible fruit. Sprouts from roots so it can be invasive.
>27" rainfall	Pecan	Good	45'	Needs deep soil. May have insect problems. Wood and nut production. Good for riparian forest buffer.
>27" rainfall	Redbud	Good	20'	Tolerates poor soils. Showy flowers in early April.
>27" rainfall	Black Walnut	Good	45'	Needs well drained, deep soil. Nut and wood production.
>27" rainfall	Hawthorne	Good	10'	Tolerates poor soil. Has short thorns.
>29" rainfall	Green Ash	Poor	40'	Drought tolerant. Good for wet and mined soils. Borers can be a problem. Cuttings can be used. Highly susceptible to Emerald Ash Borer, a pest not yet found in Oklahoma, but currently as close as Missouri. Long term viability questionable.
>29" rainfall	Sawtooth Oak	Good	40'	Tolerates poor soils. Good for windbreaks and riparian forest buffers. Timber production. Bears acorns quickly. Not native.
>30" rainfall	Roughleaf Dogwood	Good	10'	White blossoms in April. Good fall color.
30"- 42" rain	Soapberry	Good	22'	Tolerates dry, poor soils. Fruit poisonous to humans.
>33" rainfall	Sycamore	Poor	45'	Tolerates wet or clay soil. Bottomland species. Timber production. Has white bark. Cuttings can be used.

<u>*Area of Adaptation</u>	<u>Species</u>	<u>Wildlife Food Value</u>	<u>Average Height at Age 20</u>	<u>Comments</u>
>33" rainfall	Hickory	Good	40'	Tolerates poor, rocky soil. Timber production.
<34" rainfall	Four-wing Saltbush	Good	5'	Good on alkaline soils. Don't plant on sandy soil or wet sites. Plant 4# PLS of de-winged or 10# PLS winged seed per acre.
>37" rainfall	Black Cherry	Good	40'	Prefers bottomland soils. Timber production.
>37" rainfall	Pin Oak	Good	35'	Prefers bottomland soils. Timber production. Susceptible to Iron chlorosis in high pH soils.
>39" rainfall	Shortleaf Pine	Poor	42'	Tolerates droughty and rocky soils. Timber production.
>39" rainfall	Water Oak	Good	36'	Wetland Species. Timber production.
<40" rainfall	Winterberry Euonymous	Good	5'	All soils except wet or sandy.
>41" rainfall	Northern Red Oak	Good	35'	Prefers deep loamy soils. Timber production.
>41" rainfall	White Oak	Good	38'	Prefers bottomland soils. Large acorns.
>41" rainfall	Red Maple	Poor	35'	Tolerates poor and moist soils. Beautiful fall color.
>43" rainfall	Southern Red Oak	Good	35'	Prefers upland soils. Timber production.
>45" rainfall	Overcup Oak (Swamp White Oak)	Good	40'	Wetland Species. Timber production. Tolerates clay soil.
>45" rainfall	Willow Oak	Good	45'	Wetland species. Timber production. Avoid alkaline soils.
>45" rainfall	Holly	Good	24'	Prefers deep bottomland soils. Evergreen with showy red berries.

*Refer to the current Oklahoma NRCS Annual Precipitation Map

Table 2
Woody Species for Riparian Forest Buffers and Windbreaks

SPECIES (Common Name)	FLOODING TOLERANCE	LARGE DEBRIS	SHADE VALUE	WILDLIFE VALUE	CTSG Group	GROWTH RATE
Ash, green	M	M	H	M	1,2	H
Bald cypress	VH	M	M	M	1,2	M
Birch, river	M	H	M	M	1,2	M
Blackgum	L	M	M	M	1,2	L
Buttonbush	VH	L	L	L	2	M-H
Cherry, black	L	L	M	M	1,2	M
Cottonwood	H (after 1 st year)	H	M	H	1,2	H
Dogwood, flowering	L	L	M	M	1,2	M
Elderberry	L	L	L	M	2	M
Hackberry	M-L	M	M	M	1	M
Hawthorn, green	M-L	L	L	M	1,2	L
Hickories	M-L	M	H	H	1	M
Maple, boxelder	M	H	M	M	1	H
Maple, silver	M-H	H	H	M	1,2	H
Maple, red	M	M	H	M	1	M
Mulberry, red	M-L	M	H	H	1,2	M
Oak, bur	H	M	H	H	1,2	M
Oak, cherrybark	M	M	H	H	1	M
Oak, Northern red	L	M	H	H	1,2	M
Oak, Shumard	M	M	H	H	1,2	M
Oak, Nuttall	VH	M	H	H	2	M
Oak, overcup	VH	M	H	H	2	M
Oak, pin	M-L	H	M	H	1,2	M-H
Oak, swamp chestnut	M	M	H	H	1,2	M
Oak, water	M	M	H	H	1	M
Oak, white	M	M	H	H	1,2	M
Oak, willow	M	M	H	H	1	M
Pecan	M	M	H	H	1,2	M
Persimmon	M-H	L	M	H	1	M
Plum, American	L	L	L	M	1	L
Plum, Chickasaw	L	L	L	M	1	L
Redbud	L	L	L	L	1,2	L
Sassafras	L	M	M	L	1	M
Serviceberry	L	L	L	M	1,2	L
Sugarberry	M	H	M	M	1	M
Sumac, smooth or winged	L	L	L	M	1	L
Walnut, black	M-L	M	M	H	1,2	M

VH = very high; H = high; M = medium; L = low

Flooding Tolerance. General capacity of the plant to withstand standing water. VH = able to survive deep, prolonged flooding for more than one year; H = able to survive deep flooding for one growing season, with mortality occurring if flooding is repeated the following year; M = able to survive flooding or saturated soils for 30 consecutive days during the growing season; L = unable to survive more than a few days of flooding during the growing season without mortality.

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Large Debris. Potential for the plant to produce debris larger than ten inches in diameter. H = large debris likely within life span of the plant; M = large debris possible within life span of the plant; L = large debris unlikely within life span of the plant.

Shade Value. The density or fullness of shade provided by an individual plant's crown in full leaf. H = large crown providing full shade; M = partially open or medium sized crown that provides patchy or incomplete shade; L = very open or small crown that provides minimal shade.

Wildlife Value. The potential for the plant to provide useful cavity sites and/or quality fruit production for wildlife. H = excellent large cavity potential and/or high quality fleshy fruit or nut production; M = moderate cavity potential or fruit production; L = low cavity potential and dry, non-nut fruit production.

CTSG – Conservation Tree/Shrub Group.

Growth Rate. The rate at which the plant grows in height during its development period (after seedling stage and before final maturity stage). H = Rapid growth of 3 or more feet per year; M = Medium growth of 1 to 3 feet per year; L = Low growth rates of generally less than 1 foot per year.