NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

TREE/SHRUB ESTABLISHMENT

(Acre)

CODE 612

DEFINITION

Establishing woody plants by planting seedlings or cuttings, direct seeding, or natural regeneration.

PURPOSE

Establish woody plants for:

- Forest products such as timber, pulpwood, and energy biomass
- Wildlife habitat
- Long-term erosion control and improvement of water quality
- Treating waste
- Storing carbon in biomass
- Energy conservation
- Enhance aesthetics
- Improving or restoring natural diversity

CONDITIONS WHERE PRACTICE APPLIES

On any appropriately prepared site where woody plants can be grown. Utilize other practice standards for specialized tree/shrub establishment situations such as the following Oklahoma NRCS standards: Riparian Forest Buffer (391); Alley Cropping (311); Windbreak/Shelterbelt Establishment (380); Critical Area Planting (342); Silvopasture Establishment (381); and Hedgerow Planting (422).

CRITERIA

General Criteria Applicable To All Purposes

Species will be adapted to site conditions and suitable for the planned purpose(s). Refer to **Tables 1 and 2**.

Species considered locally invasive or noxious shall not be used.

Observing planting dates, taking care in handling and planting seed, cuttings, or seedlings, will ensure that planted materials have an acceptable rate of survival.

Use only viable, high-quality, and adapted planting stock or seed. Use locally adapted seed, seedlings, or cuttings when possible. Priority should be given to plant materials that have been selected and tested in plant improvement programs. All plant materials should comply with a minimum standard, such as the American Nursery and Landscape Association, Forest Service, or state-approved nursery.

Selection of planting technique and timing will be appropriate for the site and soil conditions.

The planting will be protected from unacceptable adverse impacts from pests, wildlife, livestock damage, or fire. Tree guards or repellent sprays may be needed to avoid damage by wildlife.

Each site will be evaluated to determine if mulching, supplemental water, or other cultural treatments will be needed to assure adequate survival and growth. For guidance on designing drip irrigation systems, refer to the Oklahoma NRCS Irrigation System, Microirrigation (441) standard.

Replanting or reseeding will be required when survival is inadequate to meet the planned purposes.

Care of Planting Stock

Inspect seedlings immediately upon receipt. Add water to the packing medium if dry. Apply enough water to moisten the medium.

Packaged seedlings can be stored for 1 week in a cool, damp location. **DO NOT** store packages where they will freeze or where the temperature will exceed 70° F.

Heel in the seedlings when it is necessary to store them longer than 1 week. Heel trees in a

trench (plow furrow) with a 30 to 40 degree slope from the vertical on the back wall. Place trees in the trench so that the roots and 1" to 2" of root collar are below ground line. Pack soil firmly around the roots to eliminate air pockets. If the soil is not sufficiently moist add water but avoid over watering, especially in clay soils.

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.
- 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

Site preparation shall be sufficient for establishment and growth of selected species. Follow the guidance in the Oklahoma NRCS Tree/Shrub Site Preparation (490) standard.

Pine plantings for wood production. Site preparation will be needed when planting pine in a heavy stand of vegetation, heavy debris, or when heavy clay soil requires 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.

Polypropylene woven fabric or organic mulches may be used as a weed barrier instead of cultivation or herbicides. The fabric should weight of at least 3 oz. per square yard.

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. Use the following spacing for pine species planted to produce pulp wood, saw logs, or other wood products: 6' x 8' (908 trees/acre) to 8' x 10' (544 trees/acre).

Hardwoods. Hardwoods which can attain heights of 35 feet and larger should be spaced from 10' x 12' (436 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.

Critical Areas. Plantings may be as close as 6' x 6' (1210 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. Pine may be planted instead of Black Locust in the Eastern 1/4 of Oklahoma. A variety of species should be used on the flatter slopes to benefit wildlife.

Christmas trees. Space a minimum of 6' x 6' (1210 trees/acre). Rows should be spaced far enough apart to accommodate maintenance equipment.

Wetland areas. Plant to hardwoods that are beneficial to wildlife on a 12' x 12' (302 trees/acre) spacing.

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 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.

- Do not plant during freezing weather or in frozen ground.
- Do not plant in established improved grass pastures without chemically controlling the grass competition or using weed barrier fabric.

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 after December 1 and prior to April 20. Be sure planting stock was adequately protected in the nursery from freezing and are alive. Where moisture conditions allow or supplemental water is supplied, fall plantings are recommended from September 1 through October 15.

Be sure to limit root exposure during planting. Carry seedlings in suitable container under cover of moist burlap, moist sphagnum moss, moist straw, or in water. Withdraw only one seedling at a time when planting. When removing trees from shipping bundle, be sure to restore moisture to trees that remain. Heel in any remaining unplanted seedlings. Prolonged root exposure will kill seedlings. Keep containerized seedlings watered.

Plant seedlings at the same depth or slightly deeper than they grew in the nursery. Roots should be planted straight down, not twisted, balled, or 'J' shaped. Pack soil firmly around the planted seedlings with no air pockets left in machine furrows or tool holes. Seedlings should be tight enough to resist withdrawal.

Planting Seed

Good quality seed of desired species may be planted 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 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). White Oak acorns can germinate without storage and should be planted as soon as possible after October 31. Red Oak acorns will germinate the following spring after fall sowing. They require a pre-treatment consisting of 30-90 days in a freezer at temperatures between 33° and 41° F. 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 60 days between 0° and 32° 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 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.)

Pine Seed. 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.).

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 (25 to 28 trees would be needed with a 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 like Ash, Maple, Sycamore, Elm, Cottonwood, and Willow.

Planting Tree Cuttings

Cuttings from limbs on species like Willow, Sycamore, or Cottonwood can be planted to provide shoreline or streamside stabilization.

Limbs cut from these species should be 18" to 20" long and be at least 3/8" in diameter. The cuttings should be collected during dormancy from one year old growth. They should be soaked in water 2 to 3 days before planting. They should be kept cool and moist prior to planting. Plant the cuttings on a 12' x 12' spacing in rips that are about 16" deep. They need to be planted with 2" to 4" of the terminal buds protruding vertically from the ground. 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. Trees should be moved when they are dormant but not during a time when the ground is very 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.

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.

Control competitive vegetation in all other types of tree plantings until the trees are well established. This may be done mechanically or chemically.

Protect all seedlings from fire. Construct firebreaks as needed. Refer to the Oklahoma NRCS Firebreak (394) standard.

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 within 2 years. A uniform distribution of about 300 surviving trees per acre will not require replanting. Losses caused by fire or drought should be replanted as soon as possible, preferably the next planting season.

Hardwoods should be replanted when there are less than 125 trees per acre surviving.

Additional Criteria for Treating Waste

Species used to treat waste should have fast growth characteristics, extensive root systems, capable of high nutrient uptake, and tolerant of the planned effluent.

Additional Criteria For Improving Or Restoring Natural Diversity

Composition of species selected for planting or those favored for natural regeneration will be native to the site and create a successional stage or state that can progress to the potential natural plant community.

Additional Criteria for Storing Carbon in Biomass

The species that attain biomass more quickly will sequester carbon faster. The rate of carbon sequestration is enhanced as plants mature and soil organic matter increases. Select plants that have higher rates of growth and potential for carbon sequestration in biomass and are adapted to the site. Plant species at the appropriate stocking rate for the site.

CONSIDERATIONS

Dipping the roots of bare root seedlings in a polyacrylamide solution will improve their chance for survival especially under dryer conditions in western Oklahoma.

When underplanting, trees should be planted sufficiently in advance of overstory removal to ensure full establishment.

Plans for landscape and beautification plantings should consider foliage color, season and color of flowering, adaptability, and mature plant size.

Select multiple species when available to accomplish the planned objective. Consideration should be given to selecting species which best meet wildlife needs.

Plant arrangement and spacing should allow for future access lanes, if needed, for stand management and fire control.

Residual chemical carryover should be evaluated prior to planting. Adjust the species selected and/or timing of planting as necessary.

Prescribed burning may be required for natural regeneration of serotinous cone species and for site preparation for other species.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, job sheets, and narrative statements in the conservation plan, or other acceptable documentation.

Plans and specifications will include the following: adapted tree species for the purposes outlined, spacing, planting methods, cultural practices, maintenance requirements, and variations in methods and species between interplanting, underplanting, and planting in open areas. Separate specifications can be prepared for each of these planting methods.

OPERATION AND MAINTENANCE

Access by vehicles or equipment during or after plant establishment shall be controlled to protect new plants and minimize erosion and compaction. Refer to the Oklahoma NRCS Use Exclusion (472) standard.

If needed, competing vegetation will be controlled until the woody plants are established. Noxious weeds will be controlled. If pesticides are used, refer to the Oklahoma NRCS Pest Management (595) standard.

Replanting will be required when survival is inadequate.

Trees and shrubs will be inspected periodically and protected from adverse impacts including insects, diseases, competing vegetation, fire, and damage from livestock or wildlife.

Supplemental watering may be desirable to ensure adequate survival.

Periodic applications of nutrients may be needed to maintain plant vigor and establish the planting.

When trees and/or shrubs are established, refer to the Oklahoma NRCS Forest Stand Improvement (666) and Tree/Shrub Pruning (660) standards for subsequent management.

REFERENCES

NRCS Field Office Technical Guide, Section II - “Forestland Interpretations.”

NRCS Field Office Book of Herbicide Labels.

OSU Extension Agents' Handbook of Insect, Plant Disease and Weed Control.

OSU Extension Facts No. F-5020, "Introduction to Growing Christmas Trees".

OSU Extension Facts No. F-5023, "Tree Planting Objectives and the Seedling Selection".

OSU Extension Facts No. F-5024, "Tree Seedling Availability, Planting and Initial Care".

OSU Extension Facts No. F-5025, "Early Protection and Care for Planted Seedlings".

OSU Extension Facts No. F-5031, "Growing Oak Trees from Seed".
OSU Extension Facts No. F-5036, "Deciduous Trees for Oklahoma".

OSU Extension Facts No. F-6201, "Pecan Varieties for Oklahoma".

OSU Extension Facts No. F-6207, "Starting Pecan Trees".

OSU Extension Facts No. F-6210, "Apple and Peach Varieties for Oklahoma".

OSU Extension Facts No. F-6211, "Propagation of Fruit and Nuts by Seed".

OSU Extension Facts No. F-6222, "Home Fruit Planting Guide".

OSU Extension Facts No. F-6247, "Establishing a Pecan Orchard".

OSU Extension Facts No. F-6414, "Planting Shade Trees and Shrubs".

OSU Extension Circular No. E-889, "Landscape Plants for Oklahoma-4: “Deciduous Shrubs, Vines and Ground Covers".

OSU Extension Circular No. E-897, Landscape Plants for Oklahoma-2: “Shade and Ornamental Trees".

OSU Extension Video Tape No. 208, "Growing Christmas Trees in Oklahoma".

OSU Extension Video Tape No. 429, "Oklahoma Gardening and Urban Forestry".

OSU Extension Video Tape No. 222, "Ornamental Trees and Shrubs for Oklahoma".

NRCS – Oklahoma Woodland Job Sheet No. JS 612 01 Tree/Shrub Establishment – “Tree/Shrub Planting”.

NRCS – Woodland Job Sheet No. JS 612 02 Tree/Shrub Establishment – “Checking Soil Moisture Available to Trees”.

NRCS – Woodland Job Sheet No. JS 666 01 Forest Stand Improvement.

NRCS – Woodland Job Sheet No. JS 342 01 Critical Area Planting – “Planting Trees and Shrubs”.

Table 1
Tree and Shrub Area of Adaptation

*Area of Adaptation	Species	Wildlife Food Value	Average Height at Age 20	Comments
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 Aborvitae	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'	Ok on all soils. Good for windbreaks (replacement for red cedar). Can have insect and disease problems.
Statewide	Virginia Pine	Poor	32'	Avoid alkaline or wet soils. Used for Christmas trees.
Statewide	Amur Honeysuckle	Good	10'	Tolerates dry or clay soil. Avoid deep sand. Bush variety. Showy flowers.
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.

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*Area of Adaptation	Species	Wildlife Food Value	Average Height at Age 20	Comments
Statewide	Fragrant Sumac	Good	6'	Good on all soils.
Statewide	Sand Cherry	Good	4'	Short lived. Don't plant on clay soils.
Statewide	Choke Cherry	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. Has 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. Ok on all soils but needs soil 3' – 4' deep. Needs irrigation in Western Oklahoma.
>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.
>23" rainfall	Bois D' Arc (Osage Orange)	Good	30'	Good for fence posts and making hunting bows. Has short thorns. Good for windbreaks.

*Area of Adaptation	Species	Wildlife Food Value	Average Height at Age 20	Comments
>23” rainfall	Nanking Cherry	Good	7’	Not native. Needs well drained soils. Will survive on dryer 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 deep soil. Nut and wood production.
>27” rainfall	Hawthorne	Good	10’	Tolerates poor soil. Has short thorns.
>29” rainfall	Green Ash	Poor	40’	Avoid clay soils. Drought tolerant. Good for wet and mined soils. Borers can be a problem. Wood production.
>29” rainfall	Sawtooth Oak	Good	40’	Tolerates poor soils. Good for windbreaks and riparian forest buffers. Timber production. Bears acorns quickly.
>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. White bark.
>33" rainfall	Autumn Olive	Good	16'	Tolerates dry soil. Avoid wet or shallow soils.
>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 dewinged or 10# PLS winged seed per acre.

*Area of Adaptation	Species	Wildlife Food Value	Average Height at Age 20	Comments
>37" rainfall	Black Cherry	Good	40'	Prefers bottomland soils. Timber Production.
>37" rainfall	Pin Oak	Good	35'	Prefers bottomland soils. Timber production.
>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 soil. Beautiful fall color.
>43" rainfall	Southern Red Oak	Good	35'	Prefers bottomland 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 1st 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	L
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	L-M
Persimmon	M	M	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

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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.

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 Merit. 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.

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.

CTSG – Conservation Tree/Shrub Group