

## NATURAL RESOURCES CONSERVATION SERVICE

### CONSERVATION PRACTICE STANDARD

## TREE/SHRUB ESTABLISHMENT

(Ac)

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, etc.
- wildlife habitat
- long-term erosion control and improvement of water quality
- treating waste
- storing carbon in biomass
- reduce energy use
- develop renewable energy systems
- improving or restoring natural diversity
- enhancing aesthetics

#### CONDITIONS WHERE PRACTICE APPLIES

Tree/shrub establishment can be applied on any appropriately prepared site where woody plants can be grown.

Utilize other conservation practice standards for specialized tree/shrub establishment situations, e.g., RIPARIAN FOREST BUFFER (Practice Code – 391), ALLEY CROPPING (Practice Code – 311), WINDBREAK/SHELTERBELT ESTABLISHMENT (Practice Code – 380), CRITICAL AREA PLANTING (Practice Code – 342), HEDGEROW PLANTING (Practice Code – 422).

#### CRITERIA

##### General Criteria Applicable to All Purposes

Composition of species will be adapted to site conditions and suitable for planned purpose(s).

Species on the Federal or State noxious weeds list, or those known to be invasive to the planting, area shall not be planted.

Planting or seeding rates will be adequate to accomplish the planned purpose for the site.

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

Only viable, high-quality and adapted planting stock or seed will be used.

Sufficient site preparation shall be a precondition for tree/shrub establishment. See conservation practice standard TREE/SHRUB SITE PREPARATION (Practice Code – 490).

Adequate seed or advanced reproduction must be present or provided for when using natural regeneration to establish a stand.

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

The acceptability and timing of coppice regeneration shall be based on species, age and tree diameter.

The planting will be protected from adverse impacts from livestock, wildlife, pests and wildfire.

Each site will be evaluated to determine if

mulching, supplemental water or other cultural treatments (root dips, geo-textile mats, tree shelters, tree shades, etc.) will be needed to assure adequate survival and growth.

Comply with applicable federal, state, and local laws and regulations during the installation, operation and maintenance of the practice.

Appropriate cultural resources review will be conducted before beginning any tree/shrub planting practice.

Woody plants will be established without compromising the integrity of property lines, fences, utilities, roads, legal drains, easements or rights of way.

Allow at least a 16-foot maintenance strip from the outside row of trees or shrubs to adjacent property lines or contrasting land use areas. Trees or shrubs will not be planted closer than stated unless all involved landowners agree in writing.

Where functional subsurface drains (tile lines) pass through a tree/shrub planting, sealed conduit will be installed through the planting and extend a minimum for 100 feet from rows of large trees (capable of reaching heights greater than 60 feet) and 75 feet from all other trees and shrubs. Trees and shrubs will not be planted within 50 feet of either side of existing subsurface drains.

#### **Additional Criteria for Wildlife Habitat**

Use multiple native species (minimum of 3 or more) that best meet wildlife needs. See Illinois Biology Technical Note No. 22 for recommended list of woody plant species.

#### **Additional Criteria for Providing Long-Term Erosion Control and Improving Water Quality**

Plants or seed will be evenly distributed over the planting site. Planting rows and equipment operation will be conducted across the slope or along the contour.

Apply mulches, plant residues, non-competitive cover crops or other appropriate erosion control measures on critical erosive slopes (see conservation practice standards MULCHING, (Practice Code – 484), FOREST TRAILS AND

LANDINGS (Practice Code – 655), TREE/SHRUB SITE PREPARATION (Practice Code – 490).

#### **Additional Criteria for Treating Waste**

Use species that have fast growth characteristics, extensive root systems, high nutrient uptake capabilities, tolerance of planned effluent and potential for wood/fiber products in short rotations. When establishing in a riparian area, use species adapted to local flooding.

#### **Additional Criteria for Storing Carbon in Biomass**

The species and plant communities that attain biomass more quickly will sequester carbon faster. The rate of carbon sequestration is enhanced as trees and/or shrubs mature and soil organic matter increases.

Select plant species with higher rates of growth and that are adapted to the site to assure strong health and vigor.

#### **Additional Criteria to Reduce Energy Use**

Orient trees to provide shade to building(s) for reductions in summer energy usage. The first priority is placement on the building's west side where the greatest daily heat gain occurs. The second priority is the east side.

Select plants with a potential height growth that exceeds the height of the structure or facility being protected.

Use appropriate plant densities to optimize the shade produced and meet energy reduction needs.

Trees planted within 30 to 50 ft of the building generally provide effective shade to windows and walls, depending on tree height potential.

Plant trees at least 10 ft from the structure or the distance of the trees expected drip line at maturity, to avoid damage to foundations or restrict maintenance access to windows and walls.

### **Additional Criteria for Developing Renewable Energy Systems**

Select plants that can provide adequate kinds and amounts of plant biomass to supply identified bioenergy needs.

Intensity and frequency of energy biomass removals will be managed to prevent long-term negative impacts on the system.

The harvesting of energy biomass shall be accomplished in a manner that will not compromise the other intended purpose(s) and functions.

### **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 desired natural plant community.

#### *Underplanting in Existing Forestland*

Improve stand composition and/or stocking by planting a more desirable species under or within an existing stand of established trees.

Overstory canopy conditions at, or reduced to, a 40-70% stocking level are necessary to allow for adequate light to reach the planted stock. Adjustments within stocking level range will be dependent upon shade tolerance of planted species, site conditions and management objectives.

All underplanted seedlings and container stock will benefit from additional cutting or killing of overstory trees 2 or more years after establishment to maintain or increase the amount of light reaching the ground.

Control of competing herbaceous and woody plants prior to and during establishment will be achieved in accordance to conservation practice standard TREE/SHRUB SITE PREPARATION (Practice Code - 490).

Underplanted seedlings are particularly susceptible to browse damage by deer and rabbits. When heavy seedling damage is

anticipated, protect newly planted trees with fences, tree shelters or repellants.

### **CONSIDERATIONS**

Consideration will be given to plant materials that have been selected and tested in tree/shrub improvement programs.

Use of locally adapted seed, seedlings, or cuttings is recommended. Ideally, seed source of plant materials should be within 200 miles north or south of the planting site.

All plant materials should comply with minimum standards such as those as established by the American Nursery and Landscape Association, Forest Service, or state-approved nursery.

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, and mature plant height.

Consider using diverse species combinations which best meet locally native wildlife and pollinator needs.

Consider the invasive potential when selecting plant species.

Tree/shrub arrangement and spacing should allow for and anticipate the need for future access lanes and stand management.

Residual chemical carryover should be evaluated prior to planting and alter species selection and/or timing or planting/seeding.

Consider using 4-5 foot tube tree shelters to mark rows in row plantings. Install as many well-dispersed tree shelters as feasible, especially if rabbit or deer damage is likely. Place the shelters over the most vigorous seedlings and secure with a decay-resistant stake.

For level planting sites of more than a few acres consider operating planting equipment in a circling pattern, spiraling inward from the outside to the center. An inward spiraling pattern eliminates the need to stop and turn at the ends of rows, saving time and energy. A more natural appearance is

also obtained since row direction is not readily apparent.

Direct seeding sites within 100 feet of tree or grass cover are subject to high seed predation by rodents, reducing chances for success. Consider using other stock types, doubling the seeding rate, reducing rodent populations or a combination of the above. A snap trap survey of rodent populations shortly before seeding the site will allow an opportunity to manage damaging populations before they eat or damage tree seed. See [Illinois Direct Seeding Handbook](#) for information on Wildlife Damage Management.

When direct seeding, consider increasing the seeding rate as much as possible above the minimum specification with low cost or locally available woody seeds, which serve as a woody cover crop or nurse crop. Woody plants are usually less competitive than grasses or forbs and are the best companion crops for trees. Potential nurse crop species include the light seeded tree species (see **Species Selection**). Other potential trees and shrubs include hazelnut, redbud, sumac, dogwood, pawpaw, chokecherry, and plum (see [Direct Seeding of Shrubs](#) in REFERENCES). Test soils and/or consult soil survey report before planting to determine whether soil fertility, pH, or species mix need to be adjusted. Soil tests should indicate a minimum of 15 pounds of phosphorus and 150 pounds of potassium per acre. Some species, such as pin oak (pH < 6.8) and black walnut (high fertility), have very specific requirements.

Consider adding mycorrhizal inoculate either as an amendment at the planting site or incorporated into water absorbing gel dip (synthetic polymer) for bare root seedlings.

To improve plant growth, consider 2 additional years of chemical weed control after plants are established. Weed control should be performed using narrow bands (2-4' wide) on each side of a plant row unless the entire site is treated.

Applications of nutrients may be needed to maintain plant vigor and improve planting survival.

## PLANS AND SPECIFICATIONS

Specifications for applying tree/shrub establishment practices shall be prepared for each site and recorded using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan or other acceptable documentation. Variations in planting methods and species selection when seeding, interplanting, underplanting, and planting in open areas will be documented.

Plans and specifications will include, as a minimum, the following:

- Adapted tree/shrub species
- Planting stock type, source and quantity
- Planting methods
- Site preparation specifications
- Row spacing (between and within)
- Vegetation control and maintenance

The following table may be used as a guide in choosing suitable planting stock or seed:

Site	Planting Stock
Open Fields	1,2,3,5
Understocked Forestland	1,2,5
Landscaping	1,2,3,4,5
Environmental	1,2,3,5

1 = Bare root; 2 = Container grown; 3 = Cutting; 4 = Balled & burlapped; 5 = Direct seeding

All stock types: Discard weak, moldy or damaged material. Plant materials that have been dried, frozen, subjected to mold or high temperature will be assumed to be dead and will not be planted.

All calipers (diameter) are measured at 1 inch above root collar (nursery soil line). Tree/shrub height and root length are measured from the root collar.

Bare root: Plant seedlings with well-branched, fibrous root systems. Minimum height, caliper and root length (RL) will be:

Conifers

Height	Caliper	RL
6"	3/32"	8"

Hardwoods

Height	RBD	RL
12"	7/32"	8"

Determine depth of planting equipment and root prune only if necessary, to a length of no less than 8 inches, using a sharp tool. Never remove more than 25% of the root system.

Container grown: Plant seedlings with dense, fibrous non-curling root system. Minimum height, caliper and root volume (RV) will be:

#### Plug Stock < 1 Gallon

##### Conifers

Height	Caliper	RV
6"	3/32"	7 in <sup>3</sup>

##### Hardwoods

Height	Caliper	RV
12"	7/32"	7 in <sup>3</sup>

#### Air root-pruned potted stock (all species)

Height	Caliper	RV
3'	3/8"	>= 1 gal

Cuttings: Suitable species include cottonwood, hybrid poplar, willow, dogwood and elderberry. Use cuttings prepared during the dormant season from wood of the previous season's growth. At least two healthy buds will be included in the cutting. The minimum size of cuttings will be 3/8 inch in stem diameter and minimum of 8 inches long.

Balled and burlapped: Use stock that is at least 18 inches tall for shrubs. Do not use plants with cracked or broken root-balls, root systems that are visible on the root-ball surface or roots that circle the trunk. Minimum height, caliper and root-ball diameter (RBD) will be:

##### Conifers

Height	RBD	Caliper
18-24"	10"	Not Applicable
2-3'	12"	
3-5'	14"	
5-6'	20"	

##### Hardwoods

Height	RBD	Caliper

4-6'	12"	1/2"
6-8'	14"	3/4"
8-10'	16"	1"

*(Be advised that although ball and burlapped stock is usually the largest type of planting stock available it will probably not outperform other types of planting stock over time. Often other stock types will equal or surpass balled and burlapped stock within 5 to 10 years, at much lower initial cost.)*

Direct seeding: Only undamaged, viable, mature seed will be used. Inspect by species at least 10 randomly selected seed per bushel. Crack or cut open seed and ensure all seed is filled, moist, normal colored and not destroyed by insects. For more information on how to inspect seed, see Seeds of Woody Plants of the United States or Seed Biology and Technology of Quercus (for oaks) or the Illinois Direct Seeding Handbook. Acorns may have up to one insect hole and ¼ of the nut damaged by insects and still be viable. If any non-viable seed is found the seeding rate will be increased by the percentage of non-viable seed.

#### Care of Planting Stock

Protect stock from desiccation during temporary storage and delivery to the planting site. Keep all types of planting stock, except the ones needed immediately for a supply during planting, stored in a cool environment (< 50 degrees F) out of direct sunlight and wind.

Bare root: Promptly examine in the shipping container and moisten packing material, if necessary. Seedling roots may be soaked in water for no more than 2 hours or coated with a water absorbing gel dip (synthetic polymer) immediately before planting to increase survival. If planting will be delayed for more than 5 days, keep seedlings in shipping container and place in cold storage at 34-40 degrees F. If cold storage is not feasible or available, seedlings will be heeled in. Dig a trench a little deeper than the root systems and spread roots against the back of the trench. Cover roots completely with soil, tamped to eliminate air spaces. Water as needed to keep roots moist but not wet.

Container grown: Keep in containers in a shady location and maintain soil moisture. Do not drop or handle by stem. Thoroughly water 2 days before planting to facilitate removal from containers.

Cuttings: If planting will be delayed, place in moist packing material and then in plastic bags and refrigerate at 34-40 degrees F. Warm and soak cuttings for 5-10 days before planting. Make small slits in the bag, leave cuttings in the bag and immerse ¾ of their length in water. Place cuttings in shade at 50-70 degrees F. Cuttings are ready to plant when the buds start elongating, showing some bright green around the bud scales, and just before roots begin to grow. If weather prevents planting when cuttings are ready, cuttings can be held for weeks by placing them in cold storage at 34-40 degrees F.

Balled and burlapped: Keep the rootball moist by watering slowly from the top. Wet the foliage occasionally. Store temporarily (less than 2 weeks) by placing soil or mulch around the entire ball and keeping it moist.

Direct seeding: See [Illinois Direct Seeding Handbook](#) for seed collection, sorting and handling techniques by species. If possible, seed should be planted as soon as it has been cleaned and sorted. If planting is delayed more than a few days, seed will be placed in porous bags, such as onion bags, and in cold storage, no more than 50 degrees F and preferably 34-40 degrees F. All light seeded species (see **Species Selection**) as well as persimmon and Kentucky coffeetree will be kept dry. Heavy seeded species will be kept moist but not wet. Do not allow to mold. Acorns will be rehydrated by soaking in cold water for not less than 4 and not more than 24 hours as soon as possible after collection or delivery and not allowed to dry out. Do not allow seed to heat up. Avoid storing in large quantities unless well ventilated and refrigerated. Never leave tree seed in the sun. For further information by species see [Seeds of Woody Plants of the United States](#) or [Seed Biology and Technology of Quercus](#) (for oaks) or the [Illinois Direct Seeding Handbook](#).

If light seeded species will be stored for more than a few weeks, place in sealed containers at 34-40

degrees F. If heavy seeded species will be stored for more than a few weeks, transfer to sealed plastic bags: 1.75 mil for white, chinkapin and swamp chestnut oak; 4 mil for all other species. Store at 34-40 degrees F. Inspect bags periodically and if no condensation is visible on the inside of bags rehydrate by soaking. Inspect seed, as described in the previous section, when removing from storage before planting. Acorns in the white oak group should be planted as soon as possible in fall, do not try to store more than 6 months. Other species can be stored under carefully controlled temperature and humidity for up to 3 years and planted whenever soil is unfrozen and moisture is adequate. If sprouting of seed begins seed can still be successfully planted but risk of dehydration is increased.

### **Planting Dates**

Bare root seedlings: Do not plant into frozen or dry soil. Begin planting as soon as the ground can be worked and complete by the dates below (see Illinois Field Office Technical Guide, Section I, Maps, for Plant Suitability Zones):

Plant Suitability Zone I: June 1
Plant Suitability Zone II: May 25
Plant Suitability Zone III: May 15

Fall planting of dormant bare-root seedlings may be done after October 1 until the ground freezes as long as soil moisture is adequate. Fall planting of bare-root stock will not be done on soils subject to frost-heave action.

Avoid planting on hot, windy days. A cool, cloudy day is preferred.

Balled and burlapped and container grown stock: Plant at any time of the year that the ground is not frozen, adequate soil moisture is present and normal precipitation is expected. Water if needed.

Cuttings: Plant between mid-April and June when soil temperature reaches 50 degrees F, or when corn is being planted locally. Soil must be moist.

Direct seeding: Tree/shrub seed may be planted from October through June anytime the ground is not frozen and soil moisture is adequate. For

shrubs, the time of the year seeds are produced is generally the best time to establish that species from seed. Spring seeding can reduce rodent and insect damage. Fall seeding (prior to January 1) can eliminate the need for stratification.

### Site Preparation

Follow guidelines in conservation practice standard TREE/SHRUB SITE PREPARATION (Practice Code – 490).

### Planting Methods

All stock types: Assure that tree/shrub planting is performed by trained and closely supervised personnel. Hand planting is well suited to small areas, plantings on steep terrain, or sites that are rough, rocky, or have scattered slash and logging debris. Machine planting is well suited to gentle terrain and well-prepared sites.

Bare root and plug container stock: Plant seedlings upright (within 20 degrees of vertical for hardwoods, 10 degrees for conifers) at same depth or slightly deeper (1 inch) than the stock was growing in the nursery. Properly planted seedlings should resist gentle lifting pressure. Do not allow roots to be twisted or bent into a J or L shape. Inspect by digging up and replanting a sample of planted trees. Check for proper depth, root position and adequate packing of soil around roots.

Container  $\geq$  1 gallon: Plant by hand or using an auger that is larger in diameter than the container. Handle plants by moving the container, not by grasping the stem. Remove plants from containers before placing in the ground. Straighten or cut all encircling roots to avoid future girdling problems. If plants are in paper pots, slit along each side or remove before placing in the ground. Place plants at the same depth as in the nursery and firmly pack soil around roots to eliminate air pockets. On wetland and floodplain sites the best results have been obtained when ridges or raised beds at least 12 inches high have been created and seedlings planted into these slightly raised sites.

Cuttings: Keep cuttings wet while planting. Plant in a vertical position with buds pointing up. Leave

1 or 2 good buds above ground, about 1 inch of the cutting exposed. If soil is loose, cuttings may be pushed into soil by hand, otherwise make a hole with a dibble. Firm but do not pack the soil. Assure that bottom of cuttings will be deep enough to reach moist soil.

Balled and burlapped: Dig holes  $1\frac{1}{2}$  times as big as the rootball. Handle plants by moving the rootball, not by grasping the stem. Remove any rope, wire, or plastic twine from the tree. Pull back burlap around trunk and fold once in the hole. Straighten or cut all encircling roots to avoid future girdling problems. Place plants at the same depth as in the nursery and firmly pack soil around roots to eliminate air pockets. Water if needed.

Direct seeding: Seed may be planted mechanically or by hand, in rows or broadcast. Depth of planting for heavy seeded species will be approximately 2 times the seed diameter, or 1 to 4 inches deep, depending upon species. Plant all species at 2 inches or more if seed predation and/or low soil moisture are anticipated. Light seeded species will be sown on the surface of the soil and firmed by rolling or cultipacking. Heavy seed that is broadcast will be disked in or covered with mineral soil and firmed by rolling or cultipacking.

Natural regeneration: In some instances it is not feasible or practical to attempt to establish a stand of trees by either planting or direct seeding in either spring or fall. Natural regeneration may be used under any of the following conditions:

- Local reports or a site inspection indicate that the site is flooded, subject to swift currents, or too wet for planting equipment in both spring and fall of the typical year.
- The site is inaccessible to planting equipment (islands or other remote sites).
- The site is on the unprotected side of levees along major rivers (fourth order stream or greater)
- There are existing mature trees suitable to the planting area, preferably including at least 2

hard mast tree species, within 200 feet of the entire planting site.

**Planting Rates and Spacing**

*General*

All stock types: Plantation success is highly correlated with high numbers of seedlings or seed planted. The rates listed below are minimums and cost effective ranges. Exceeding the minimums will likely reduce the need for weed control, speed the establishment of forest cover and improve the ultimate timber value and form of the stand.

Bare root or cuttings: The following planting rates will be used for woody species. Adjust rates within listed ranges for desired objectives, site conditions, maintenance requirements, planting combinations and species needs.

Woody Species	Plant Rate / Acre
Hardwood Trees <sup>1</sup>	436 - 907
Shrubs	1089 - 1742
Conifer Trees	538 - 1210
Biofuels/Biomass	605 - 1210

<sup>1</sup>Can include up to 50% conifers

Spacing	Plants /	70% Survival
5 x 5	1742	1219
5 x 8	1089	762
6 x 6	1210	847
6 x 8	907	634
6 x 10	726	508
6 x 12	605	423
7 x 7	889	622
7 x 10	622	435
8 x 8	681	476
8 x 10	544	380
9 x 9	538	376
9 x 10	484	338
10 x 10	436	305
20 x 20	109	76
30 x 30	48	34
40 x 40	28	20

Direct seeding: Use the same rates for all intended products and purposes. Plant a minimum of 3,000 seeds per acre of heavy seeded species (see **Species Selection**) if row planting; 4,800 if broadcast seeding. If there is

not a source of light seeded woody plants within 500 feet of the planting site, add another 1000 seeds per acre of either light or heavy seeded species. See Illinois Direct Seeding Handbook, Appendix A-10 for seed per pound by species. To overcome predation by wildlife, double the seeding rate for the first 100 feet beyond a forest or grassland edge.

The following chart shows row spacing and seed spacing combinations that will result in approximately **3000** seeds per acre:

Row Spacing (feet)	Seed Spacing (feet)
6	2.4
7	2.0
8	1.8
9	1.6
10	1.5
11	1.3
12	1.2
13	1.1
14	1.0
15	1.0
16	0.9
17	0.9
18	0.8

Container: Smaller container stock (>= 7 in<sup>3</sup> and <1 gallon) can be planted at the rates listed above for bare root and cuttings. Large (>= 1 gallon) container stock is best suited to sites that have a history of being wet or flooded in spring since they can be effectively planted in fall when bare root seedlings are less available and subject to frost heaving. Large container stock is capable of rapid height growth, allowing it to keep up with fast-growing, light seeded bottomland tree species. Rapid early height growth is important for establishing windbreaks. If natural regeneration is expected to fill in between container trees, plant at 28 trees per acre (approximately 40' X 40'). Adequate fill in natural regeneration is likely to occur on frequently flooded sites with an upstream floodplain dominated by woody vegetation or where a mature forest stand is within 200 feet of the planting site. If the above conditions do not exist,

plant at least 48 trees per acre (approximately 30' X 30').

Balled and Burlapped: See *Energy Conservation, Snow Control and Beautification* below.

#### *Agroforestry*

See specific conservation practice standard, ALLEY CROPPING (Practice Code – 311), WINDBREAK/SHELTERBELT ESTABLISHMENT (Practice Code – 380), RIPARIAN FOREST BUFFER (Practice Code – 391).

#### *Christmas Trees*

For Christmas tree production a minimum of 1210 plants/acre is recommended. Landowner equipment and objectives must be considered in the planting design and layout.

#### *Wildlife Habitat*

For tree species, use any of the minimum planting rates under **Planting Rates and Spacing, General**.

For shrub plantings, use one of the following guidelines:

- Conservation practice standard UPLAND WILDLIFE HABITAT MANAGEMENT (Practice Code – 645)
- Plant a minimum of 1089 plants per acre

*Solid shrub plantings are best suited to small well positioned locations within tree plantations and/or along perimeters of tree plantations, property boundaries, or adjacent to agricultural crops and power lines.*

For more information regarding direct seeding of shrubs, see Direct Seeding of Shrubs in REFERENCES.

For specialized wildlife planting areas refer to the appropriate conservation practice standard(s) for guidance.

#### *Energy Conservation, Snow Control and Beautification*

For energy conservation and snow control, see conservation practice standard WINDBREAK/SHELTERBELT ESTABLISHMENT (Practice Code – 380). For beautification

planting, rates will vary according to the extent of the planting and individual site plans.

#### *Underplanting in Existing Forestland*

Establishment of container trees and/or bare root seedlings in a forestland condition often will not require the same planting rate specifications as those for open fields or reforestation plantings. Individual trees or groups of trees may be planted under canopy of existing trees or planted in naturally or artificially created openings within a forest stand.

Planting rates will vary dependent upon existing stand conditions. Suitable species, stock type, location and planting density will be specified in Illinois Job Sheet 612TS, Forest Management Plan or Tree Planting Plan. Plant up to 400 bare root seedlings or up to 28 container trees (>= 1 gallon) per acre. Spacing between two bare root trees will be no closer than 6 feet in any direction. Container trees will be spaced no closer than 30 feet in any direction.

#### **Adapted Species and Selection**

Base species selection on soil type, site limitations, landowner objectives, landscape characteristics and geographic location. Refer to conservation practice standards.

For guidance on species selection, refer to Illinois FOTG Section II, CTSG Forestland Interpretations and Windbreak Interpretations; Section IV conservation practice standards UPLAND WILDLIFE HABITAT MANAGEMENT (Practice Code – 645), RIPARIAN FOREST BUFFER (Practice Code – 391), WINDBREAK/SHELTERBELT ESTABLISHMENT (Practice Code – 380) and/or the standard for the conservation practice being planned.

All stock types: Plantation success is highly correlated with increased species diversity. Plant as many different suitable species as possible. For shrub plantations, see conservation practice standard HEDGEROW PLANTING (Practice Code – 422) for recommended species.

Direct seeding: The following species have been successfully established using direct seeding:

Heavy Seeded Species	Light Seeded Species
Black Walnut	Maple
Oak	Basswood
Hickory	Sycamore
Pecan	Sweetgum
Persimmon	Hackberry/Sugarberr
Kentucky Coffeetree	Black Cherry
	Tulip Poplar
	Bald Cypress
	Blackgum

### Weed Control

Provide a 2-4 feet diameter competition-free zone around all woody plantings.

If non-living mulches (including weed mats) are used, follow conservation practice standard MULCHING (Practice Code – 484).

If mechanical means are used, care should be taken to avoid physical damage to plantings. Keep tillage depths shallow to avoid root damage.

If herbicides are used, read and follow all label directions and manufacturers recommendations.

Use of living mulches and weed mats may cause an increase in rodent or deer damage to the woody planting.

If living mulches are used, utilize Table 1 of conservation practice standard TREE/SHRUB SITE PREPARATION (Practice Code – 490) to control weed competition.

### OPERATION AND MAINTENANCE

Access by vehicles or equipment during or after tree/shrub establishment shall be controlled to protect new plants and minimize erosion, compaction and other site impacts. Refer to conservation practice standard ACCESS CONTROL (Practice Code – 472).

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

A weed-free area at least 2 feet in all directions from planted or seeded trees and/or shrubs will be

maintained for at least the first 2 full growing seasons after planting.

Competing grass species will continue to be controlled in a 2-foot radius until woody plants are  $\geq$  the mature height of competing grasses.

Noxious weeds will be controlled in accordance with conservation practice standard INTEGRATED PEST MANAGEMENT (Practice Code – 595). If mulches are to be used, refer to conservation practice standard MULCHING (Practice Code – 484). If herbicides are to be applied read and follow all label directions and manufacturers recommendations.

Replanting will be required when survival after one growing season is less than 70% of planted materials other than seed.

Natural regeneration sites will be replanted if recruitment and survival after 3 growing seasons is less than 500 evenly distributed seedlings per acre.

Direct seeded sites will be replanted if survival after 2 growing seasons is less than 500 evenly distributed seedlings per acre.

Desirable natural regeneration may be substituted for planted material when equivalent to desired species and planned purpose.

Replant to achieve at least the minimum requirements of the intended purpose or woody species class listed under “Planting Rates and Spacing.”

300 trees/acre for basic cover requirements or 70% of the original planting rate when specific plant densities are needed will be maintained for the practice life of all tree/shrub establishment practices unless otherwise stated in specific conservation practice standards. Surviving plants should be evenly distributed over the planting area.

Apply appropriate minerals according to a soil test to a minimum of 15 pounds per acre of phosphorus and 150 pounds per acre of potassium. Adjust pH only when human action has resulted in an unnatural pH. Periodic applications of nutrients may be needed to

maintain plant vigor. If nutrients are applied, refer to conservation practice standard NUTRIENT MANAGEMENT (Practice Code – 590).

Following full establishment of trees/shrubs, refer to conservation practice standards FOREST STAND IMPROVEMENT (Practice Code – 666) and TREE/SHRUB PRUNING (Practice Code – 660) for subsequent management.

## REFERENCES

McPherson, E. Gregory; Simpson, James R.; Perper, Paula J.; Maco, Scott E.; Gardner, Shelley L.; Cozad, Shauna K.; Xiao, Qingfu 2006.

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