

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION GUIDE SHEET
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, etc.
- wildlife habitat
- long-term erosion control and improvement of water quality
- treating waste
- storing carbon in biomass
- energy conservation
- improving or restoring natural diversity
- enhancing aesthetics

Documentation

All categories require the following design information:

1. Landowner and Design Preparer name and address.
2. Property Location, including town and county, and NRCS Field Office.
3. Practice name, code, justification, extent, estimated cost, and time schedule.
4. Description of specific work to be performed and its location and size, as well as written instructions for contractor and /or owner.
5. Description of layout and planting method to be used.

6. Maps of property and practice locations, including a lat/long for boundary corners and practices. (GIS data preferred).
7. Specifications for the protection of other natural resources including but not limited to water, soil, and wildlife and non-target plants.
8. The design shall also identify where and if recommended treatments necessitate application for permits or variances from local, state or federal regulations.
9. Detailed specifications, modifications and as-builts include type of erosion control and/ or drainage work, stream crossings and maintenance requirements.

General Specifications - Applicable to all Purposes

Use the Tree/Shrub Table in Section IV of the FOTG to choose the appropriate species for the site conditions and purpose.

http://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/nypmspu11417.pdf

Where a portion of a planting site has variable on-site conditions (such as pockets of high pH soils, high water table soils, an area subject to inundation, depressional areas, wetlands or other unique environmental conditions) tree and shrub species should be selected to compensate for the unique site characteristic(s).

NOTE: Planting Ashes (*Fraxinus spp.*)

Planting ashes of the genus *Fraxinus*, including green (*Fraxinus pennsylvanica*), white (*Fraxinus americana*), black (*Fraxinus nigra*) and all other *Fraxinus* species should be carefully considered. If populations of ash trees are within ½ mile of the planting site, it is not recommended to plant ashes of the *Fraxinus* genus due to insufficient methods to manage or control outbreaks of the emerald ash borer.

Place *Fraxinus* species in the middle of a multiple row design where there are no populations of ashes within ½ mile of the establishment site. Avoid single-row ash windbreaks completely.

Make sure landowners understand the risk of planting ashes of this genus. Warn landowners that they may be responsible for replanting lost ash trees.

Ashes not of the *Fraxinus* genus such as Mountain ashes (*Sorbus spp.*) and prickly ash (*Zanthoxylum spp.*) are not affected by the emerald ash borer.

Measures to prevent browsing of trees/shrubs will be identified in the practice design and implemented.

Transportation and Installation of planted seedlings must be done to maximize survival, e.g. with proper vertical placement of roots and soil contact with the roots.

Protect stock from desiccation during temporary storage. On-site while transplanting place in a cool, shaded spot, protected from the wind.

Avoid temperature extremes; do not allow seedlings to freeze or heat up.

Protect seedlings during delivery to the planting site by sheltering them from sun and wind or use a refrigerated truck.

Fall planting is discouraged because of frost heaving and limited time for new root development.

Containerized seedlings work well on a wide variety of sites and conditions. They are preferable when planting on harsh sites, restoration projects (land reclamation) or

when planting outside of the dormant season, such as in the fall.

If seeds will be stored more than 2 weeks, treat the seeds with 5% bleach solution for 5 minutes, rinse with clean water, pat dry or air dry, then place in 4 mil plastic bags and store in a cold environment with the air temperature between 33 and 40 degrees.

Maintain seed moisture content between 30 to 50 percent.

Specifications — Planting Stock

Stock types include bare-root, plugs, containers, potted, whips, cuttings, balled and burlap (B&B) and seeds (for direct seeding).

Bare-root or plugs are used for either hand planting or machine planting. Plant only healthy seedlings with well-branched, fibrous root systems. For under planting hardwoods, use stock at least 3/8 inch in stem caliper (diameter). Bare-root plants should be planted only in the spring and must be dormant (no white tip on roots). Handle container stock seedlings by the plug, not by the stem.

Container or potted plants should be used when their size is necessary to overcome adverse site and soil conditions or for fall plantings for some hardwoods.

Use only healthy, well-developed plants.

Do not plant conifers in the fall, the roots will not be developed enough to prevent winter desiccation.

Whips or cuttings of willow, cottonwood, or other species that take root when branches touch the ground, are suited to wetter sites such as riparian forest buffers, stream bank or shoreline protection or forested wetlands. Cuttings should be taken during the dormant season (leaf off) from wood of the previous season's growth. The cuttings should be taken from healthy trees growing in full sunlight. At least two buds should be included in the cutting. The minimum size

of cuttings should be 1/3 inch in diameter and 8 inches in length; use the same diameter for whips but they should be a minimum 2 feet in length. Cuttings shall be planted deep enough to leave 1-2 buds above the soil surface. Cuttings must be long enough to reach the capillary fringe of the water table.

Balled and burlap (B&B) should only be used where their size can overcome adverse site or soil conditions. The plants should be at least 18 inches in height for shrubs and a minimum of 48 inches for trees. Do not use B&Bs with cracked or broken root balls and do not use plants with root systems that are visible on the root ball surface or that have roots that circle the stem.

Seeds collected for direct seeding should not be allowed to dry out and should be planted in the fall season of the year they are collected.

Specifications - Plant Spacing and Density

Use Table 1 to determine plant spacing for linear and wildlife block plantings.

For specific forest products, Table 2 provides a general guide to minimum recommended spacing for common forest products.

***Table 1.** Spacing guidelines for linear or block tree/shrub plantings.

Between Row Types/Heights	Recommended Row-to-Row Spacing
Between shrubs less than 10' in height	10 ft.
Between shrubs and small trees from 10' to 25' in height	12 ft.
Between small trees less than 25' in height	12 ft.
Between small and tall trees greater than 25' in height	16 ft.

Between tall trees greater than 25' in height	16 ft.
Between any wide crowned species and conifers	20 ft.
Between faster growing species and conifers	20 ft.
Within Row Types/Heights	Recommended Row-to-Row Spacing
Shrubs	3 – 8 ft.
Small Trees	8 – 16 ft.
Tall Trees	8 – 20 ft.
Conifers - Cedars	6 – 10 ft.
Conifers – All Others	8 – 16 ft.

***Table 2.** Recommended tree spacing for planting of common wood products.

Purpose	Spacing (ft.)	Trees/Acre
Sawlogs (hardwood)	9 X 9	538
Sawlogs (conifers)	8 X 8	680
Posts (hardwoods)	8 X 8	680
Poles (conifers)	8 X 8	680
Short rotation woody crops	8 X 8	680
Biofuels	6 X 6	1210

*Plant spacing may vary to accommodate the need for weed control measures and equipment as well as other objectives of the planting.

Specifications - Planting Dates

Conifers are not recommended for late summer plantings. Conifers include pines, spruces, firs, cedars, larches, tamaracks and hemlocks.

The following tree species are specifically not recommended for late summer planting regardless of the planting stock or soil types: conifers, fruit trees, mountain ash, birch, willow, oak, poplar, honeylocust, maple, and hawthorn.

Specifications – Plant Establishment

All plantings will be done in a manner to promote maximum survival and seedling growth.

Pack soil around newly planted seedlings to eliminate air pockets.

Plant the seedling in a vertical position with the root collar at or no deeper than 1 inch below the soil surface.

Hand Planting

- Hand planting is suitable for small areas and on plantings on steep terrain, or sites that are rough, rocky, or have scattered slash and logging debris.

Machine Planting

- Machine planting (including direct seeding) is suitable on gentle terrain in open landscapes and on any well prepared sites with few obstacles.
- Machine planters usually use bare-root stock and is used for large numbers of plants >400 seedlings.

Direct Seeding

- Hardwood species suitable for direct seeding (seeding with agricultural equipment) include maples, oaks, hickories, black cherry, basswood, and other appropriate species. Varieties of shrubs are suitable for direct seeding including dogwoods, American cranberrybush, cherries (*Prunus* spp) and wild plum.
- Seeds collected for direct seeding should be from as near the planting site as possible.
- Collect only mature, viable seed from quality seed bearing trees, either from the ground or directly off the tree.
- Plant seed anytime between October and December when the ground is not frozen or wet.

- Refer to the Woody Plant Seed Manual for more information.
http://www.nsl.fs.fed.us/nsl_wpsm.html
- Seeding mixtures will use a minimum of four different species.
- The minimum rate for direct seeding is 3000 seeds per ac. Use Table 3 below as a guide for seeding rates to meet the 3000 seeds/acre criteria.

Table 3. Recommended rates for direct seeding*

Species	Seeds/lb	Lbs/Ac
Bur Oak	60	218 (3 bu/ac)
White Oak	90	204 (3 bu/ac)
Swamp White Oak	85	193 (3 bu/ac)
Northern Red Oak	125	190 (3 bu/ac)
Shagbark Hickory	120	0.25 – 0.5
Maples (silver, sugar)	1,750	0.25 – 0.5
Black Cherry	4,240	0.25 – 0.5
Basswood	5,000	4.0 – 10
Green Ash**	17,000	0.25 – 1.0
White Ash**	13,000	0.25 – 1.0
Choke Cherry		0.25
Wild Plum		0.25

*Rate to achieve a minimum of 3000 seeds/ac

** Refer to Note on page 1 of the Specifications Sheet about planting ashes.

Natural Regeneration

- Adequate seed sources or trees that produce advanced reproduction (suckering and stump sprouts) need to be present when using natural regeneration to re-establish a stand. The proposed site will be inventoried to measure if suitable seed bearing trees are present in adequate numbers or adequate trees that

produce advanced regeneration is present.

- Many hardwood species will naturally regenerate through root suckering, stump sprouting and seed dispersal if the parent trees are healthy and the canopy is sufficiently opened. Conifers naturally regenerate only through seed dispersal.
- For hardwoods or conifers using seed source dispersal, a site inventory will be completed on the proposed seed source site to determine if suitable seed bearing trees are present in adequate numbers or adequate advanced regeneration from root sprouts or suckers are present.

1. Afforestation (Land use changes from Cropland, Marginal Pasture, and Open Field Sites)

- Natural regeneration of hardwood stands is suitable on floodplain soils (such as in riparian areas) which originally were in forest cover and when an adequate source of seed is located within 200 feet of the site.
- On non-floodplain soils, natural regeneration of hardwoods will be an option when the site has suitable seed bearing trees located within 300 feet on at least 2 sides of the site.
- Suitable seed bearing trees include but are not limited to eastern cottonwood, maples, boxelder, hackberry, native elms, oaks, ashes and basswood.
- Seed Dispersal Dates

Fall

Black ash (September - October)

Green ash (September - October)

Basswood (after first frost in the fall)

Boxelder (September - over winter)

Spring

Cottonwood (May – June)

Elm (May – June)

Maple (May – June)

2. Reforestation (following forest stand improvement, harvest or clearcut)

- Natural regeneration for hardwood sites can be accomplished by timing and conducting timber-harvesting operations to promote root suckering, stump sprouting and dispersal of natural seed. For suitable species, refer to the list of hardwood species in the suitable seed bearing paragraph under the Afforestation section earlier in this section.
- White, red and jack pines are suitable for shelterwood or seed tree regeneration; other conifers suitable for reforestation are tamarack and black spruce. These methods of regeneration require the planning and implementation expertise of a NRCS forester or TSP.

Specifications – Survival Rates and Establishment

- Survival will be determined in the spring after “leaf out” which is when new leaves or needles erupt and elongate after bud break.
- Use Table 5 to determine 1st year minimum survival rates by practice.
- Establishment is measured on surviving plants, 1-3 years after planting, following bud break.
- After the 3rd growing season plants should be “free-to-grow” which means the plants are above immediate competition from adjacent vegetation, are vigorous and likely to survive.
- Natural regeneration will result in a minimum of 300 stems/acre of woody plants (including any stock seeded and planted) by the 3rd growing season to be considered successful. If natural regeneration has not produced the above criterion, additional planting will be

required to establish a minimum rate of 300 stems/acre of woody plants.

Table 5: Survival criteria by practice.

1st Year Survival Criteria for Tree/Shrub Plantings (1 st year following the planting year)	
Practice	Survival Percent or Number
<ul style="list-style-type: none"> • Windbreak/Shelterbelt Establishment (380) • Tree/Shrub Establishment (612) linear plantings for practices in this section only 	90% of all trees and shrubs planted with no two adjacent within-row or between-row plants missing or dead.
<ul style="list-style-type: none"> • Riparian Forest Buffer (390) • Tree/Shrub Establishment (612) nonlinear plantings* and linear plantings not for windbreaks • Streambank/Shoreline Protection (580) 	A minimum of 200 plants/ac for basic cover requirements or 75% of the original planting rate if specific plant densities were recommended. Surviving plants should be evenly distributed over the planting area.
<ul style="list-style-type: none"> • Wetland Wildlife Habitat Management (644) • Upland Wildlife Habitat Management (645) 	A minimum of 150 plants/ac for basic cover requirements or 50% of the original planting rate if specific plant densities are needed*. Surviving plants should be evenly spaced over the planting area.
*If natural regeneration is used, refer to the survival rates and establishment criteria in that Section of this standard.	

Specifications – Conservation Cover Crops

Temporary Cover

- Temporary cover crops may be required for erosion control and weed suppression when seedlings are not available, the normal planting period has passed, chemical residues are likely to carry-over in the soil, steep slopes, erosive soils or other site conditions exist. Temporary cover crops are an interim ground cover and proper site preparation is required prior to planting.

Alternative Temporary Cover Crops

Crop	Rate/acre
Small grains (Oats, Wheat, Barley, Rye)	1 ½ to 2 ½ bu.
Perennial rye	8 lbs.
Timothy	2 to 3 lbs.

Permanent Cover

- Permanent grass cover is important for erosion control, weed suppression, wildlife and other

environmental benefits. Between-row seeding of herbaceous cover should be done prior to, at the same time, or very shortly after planting of the shrubs or trees.

- Please refer to the following for native cool season grasses and sedges for planning conservation plantings – appendix 2d. (http://efotg.sc.egov.usda.gov/references/public/ME/NBH_ME_01.pdf)

Specifications for Storing Carbon in Biomass

The species and plant communities that attain biomass more quickly will sequester carbon faster but are generally short-lived species; while slower growing but long-lived species will sequester more carbon over extensive periods. Pay particular attention to the landowner’s objectives when recommending plants for this purpose.

The rate of carbon sequestration is enhanced as trees and/or shrubs mature and soil organic matter increases.

Specifications for Operation and Maintenance

Refer to the Operation and Maintenance Plan on the job sheet for site-specific activities.

Perform the following actions to insure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation) and repair and upkeep of the practice (maintenance):

Inspect plantings periodically to ensure protection and restoration from adverse impacts. Examples of adverse impacts include excessive equipment traffic, pest infestations (herbaceous and woody weeds and insects), pesticide drift from adjacent lands, hail and wind damage, and fire.

Fencing, gates and other exclusion devices will be maintained so that people, livestock and wildlife shall be controlled or excluded as necessary to achieve and maintain the intended purpose.

Wildlife damage will be monitored and controlled. Repellents, poisons, tubing, netting and cages of various kinds may need to be applied or replaced as needed to control rodents and wildlife damage.

Replacement of dead trees or shrubs will be continued until the windbreak is functional throughout its length. Branches should be touching or intercrossing blocking the wind at the planned density or porosity.

If using chemicals, follow the guidelines in practice Integrated Pest Management (595).

Periodic applications of nutrients may be needed to maintain plant vigor (mainly for carbon sequestration).

As applicable, control of wind or concentrated flow erosion shall be continued in the area up-wind or up-gradient of the planting site to maintain its function. Following severe storms check for evidence of sediment deposit, erosion or concentrated flow channels.

The trees or shrubs will be thinned or pruned to maintain optimal health and function.