United States Department of Agriculture

Natural Resources

Conservation Service

CONSERVATION PRACTICE

STANDARD TREE-SHRUB

ESTABLISHMENT CODE

612

(ac)

DEFINITION

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

PURPOSE

This practice is used to accomplish one or more of the following purposes:

- Maintain or improve desirable plant diversity, productivity, and health by establishing woody plants.
- Improve water quality by reducing excess nutrients and other pollutants in runoff and ground water.
- Restore or maintain native plant communities.
- Control erosion.
- Create or improve habitat for target wildlife species, beneficial organisms, or pollinator species compatible with ecological characteristics of the site.
- Sequester and store carbon.
- Conserve energy
- Provide livestock shelter

CONDITIONS WHERE PRACTICE APPLIES

Tree-shrub establishment can be applied on any site capable of growing woody plants.

CRITERIA

General Criteria Applicable to All Purposes

Select one or more species that are suited to site conditions, appropriate for the planned purpose(s). Utilize the Kentucky Tree and Shrub Establishment Guide, ecological site

NRCS reviews and periodically updates conservation practice standards. To obtain the current version of this standard, contact your Natural Resources Conservation Service State office or visit the Field Office Technical Guide online by going to the NRCS website at https://www.nrcs.usda.gov/ and type FOTG in the search field.

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descriptions, natural plant communities, conservation tree and shrub guides, or comparable reference sites to guide species selection.

Determine desired stocking levels for trees and/or shrubs based on landowner objectives and ecological characteristics of the site and species. Plant, seed, or naturally regenerate at densities and rates that reflect anticipated seedling mortality to achieve desired stocking levels in the established stand.

Use NRCS Conservation Practice Standard (CPS) Tree-Shrub Site Preparation (Code 490) to prepare sites for planting, seeding, or natural regeneration if conditions are not suitable for establishing the desired plants. Use NRCS CPSs Brush Management (Code 314), Herbaceous Weed Treatment (Code 315), or Prescribed Burning (Code 338) after planting, as needed, to create desirable conditions for establishing the desired plants.

When utilizing natural regeneration to establish trees and/or shrubs, an adequate source of seed, vegetative propagules, or advanced regeneration must be present or planned at a level sufficient to achieve objectives. Where natural regeneration relies on seed sources, apply any needed stand treatments and site preparation at appropriate times to facilitate germination and establishment of seeds from desired species. Modify forest stand conditions prior to initiating natural regeneration to obtain the desired species composition, density, and arrangement of trees and shrubs as needed, using supporting conservation practices.

Implement coppice regeneration (originating from root shoots or stump sprouts) based on suitability of tree species, age, diameter, and site conditions. Determine the correct timing for coppice regeneration based on species characteristics.

Select only viable, high-quality, and adapted plant materials. Do not establish species on the Federal or State Invasive Species or Noxious Weed lists. Refer to the KY Invasive Species Advisory list for those species that will not be included in planting mixtures. The list can be in Section II of the KY Field Office Technical Guide (FOTG) –NEPA – Special Environmental Concerns – Invasive Species Resources. Select planting stock that conforms to established seed transfer protocols within the State and complies with minimum standards accepted by the American National Standards Institute (ANSI). Choose planting dates, techniques, and handling methods appropriate for the site conditions to increase rates of survival. Bare rooted stock may be planted from November 15 to May 1 when the ground is not frozen and prior to bud break in the spring. Select species and adjust timing of establishment to minimize potential effects of known residual herbicides, as needed.

Evaluate the site to determine if mulching, supplemental water, or other cultural treatments (e.g., tree protection devices, shade cards, brush mats, etc.) are needed to ensure adequate survival and establishment, then utilize the appropriate supporting conservation practice. Minimize the need for supplemental water and/or nutrients by choosing site-adapted plant materials, planting methods, and planting seasons.

Protect tree and shrub plantings, seeded areas, and naturally regenerated areas from unacceptable adverse impacts from insects, disease, wildlife, livestock, and fire. Apply supporting practices and treatments as necessary to protect establishing trees and shrubs.

Use tree and shrub planting to supplement natural forest regeneration in locations where additional species or stem densities are desired to meet management objectives. Do not plant trees and shrubs under an overstory scheduled for harvest before seedlings have become established.

Various plant materials and planting techniques are commonly used in Kentucky. Evaluate the planting area and determine which plant species, planting technique or combination of

planting techniques, and plant spacing, will achieve the desired results.

Bare-Root

Bare-root seedlings are the most common planting stock available in Kentucky, with many tree and shrub species available from a variety of nurseries. Seedlings should exhibit a large number of first order lateral roots (FOLR) balanced to top growth. Root collar diameters should exceed 3/8 inches. Discard any diseased or damaged seedlings, and those not exhibiting the above qualities.

Cuttings

Use cuttings prepared during the dormant season from wood of the previous season's growth. Do not harvest more than 2/3 of the donor plant. The cuttings should be taken from healthy, moderately vigorous plants growing in full sunlight. At least two nodes should be included in the cutting. Cuttings should be at least ¼ inch and preferably 3/8 to 3/4 inches in diameter. They should be at least 12 inches long and 15 to 20 inches where practical. The top should be horizontal, and the bottom should be beveled at a 45-degree angle.

Containers

Shrub planting stock should be 18 inches or more in height. Tree stock should be 48 inches or more in height. Do not use plants with cracked or broken rootballs. Avoid "pot- bound" plants indicated by root systems that are visible on the rootball surface and that circle the trunk. Containerized stock shall be 3- gallon size (air pruned root stock), with 2 – 6-foot tree height and 3/8 – 5/8" caliper (diameter at ground level at root collar).

Direct Seeding

Use only viable, mature seed. Locally collected seed or that purchased from commercial sources may be seeded by hand or mechanical methods. Successful stands can be established by seeding oaks, yellow poplar, pine, and walnut. Use NRCS CPS Tree/Shrub Site Preparation (code 490) to prepare a bare soil seedbed. Direct seeding should not be considered where the risk of seed predation by birds, rodents, or other mammals is likely.

1. Broadcast: On a well-prepared seedbed, broadcast the seed evenly over the planting area and cover seeds with mineral soil (1/2 to 1 inch).
2. Spot: Plant 1 seed per spot, 2 to 3 inches deep. The spots should be 3 to 4 feet in the row to compensate for low germination rates. Cover with mineral soil.
3. Machine: Plant seeds 2 to 3 inches deep every 3 to 4 feet in the row to compensate for low germination rates. Cover with mineral soil.

Natural Regeneration

When utilizing natural regeneration to establish trees and/or shrubs, an adequate source of seed, vegetative propagules, or advanced regeneration must be present or planned at a level sufficient to achieve objectives. If site conditions include invasive species (e.g., callery pear) or native species (e.g., sweetgum) that could dominate the stand and outcompete the desirable species, natural regeneration should not be used. If undesirable species can be effectively controlled, a specific Operation and Maintenance (O&M) plan must be developed and implemented to control these species.

Where natural regeneration relies on seed sources, apply any needed stand treatments and site preparation at appropriate times to facilitate germination and establishment of seeds from desired species. Modify forest stand conditions prior to initiating natural regeneration to obtain the desired species composition, density, and arrangement of trees and shrubs as needed, using supporting conservation practices.

Implement coppice regeneration (originating from root shoots or stump sprouts) based on

suitability of tree species, age, diameter, and site conditions. Determine the correct timing for coppice regeneration based on species characteristics.

Spacing

Proper tree and shrub spacing is determined by such factors as the objectives of the planting, species, growth rate, expected thinning, mortality rates, natural pruning, maintenance of initial site preparation, and planting costs. The higher the planting density, the faster canopy closure occurs. Higher planting densities also allow for some mortality while still maintaining adequate stocking. Determine the correct spacing to use with reference to the following guidelines:

- Bare Root - Planting rates for bare root tree seedlings should be between 605 seedlings per acre (approximately 6' x 12' spacing) and 800 seedlings per acre (approximately 8' x 7' spacing) to provide sufficient canopy closure after five years post planting. Consider using the 12' row widths to accommodate equipment access during post planting management activities. Use an 8' x 7' spacing when it is anticipated that the planting will receive minimal mechanized post planting treatments.
- Direct Seeding - A minimum rate of 700 seeds per acre is required. A rate up to 1500 seeds per acre is recommended to compensate for predation and seedling mortality.

- Containers - Large container stock is capable of rapid height growth, allowing it to keep up with fast growing, light seeded native tree species that will naturally regenerate. If natural regeneration is expected to fill in between container trees plant at 28 trees per acre minimum (approximately 40' x 40').

Mixtures

Single species plantings are easier and more economical to establish, manage, and maintain. Mixed plantings can produce higher yields and are preferred for wildlife plantings where species diversity is a goal. Hardwoods are more suitable for mixed plantings than conifers. Seedling mixtures and planting rates of each species should be determined by local site conditions and ecological goals.

Additional Criteria for Reducing Nutrients and Pollutants

When plantings are used to remove excess nutrients from runoff or ground water, select species that have fast-growth characteristics, extensive root systems, and a high-nutrient uptake capacity. Use tree and shrub species that are tolerant of the types of pollutants contained in effluent or soils at the site.

Additional Criteria for Restoring or Maintaining Native Plant Communities

Species selected for planting, seeding, or those favored in natural regeneration that are native to the site and will create a successional state that progresses toward the identified target plant community. A minimum planting density of 300 trees per acre is required. Refer to Section IV of the KY FOTG – Tools – KY Tree and shrub Establishment Guide, for selection of species that are considered native.

Additional Criteria to Control Erosion

On bare or critically eroding areas, trees alone will not effectively control erosion for a period of 5 to 10 years. Use NRCS CPS Critical Area Planting (Code 342) to establish herbaceous vegetation for immediate ground cover. Trees and shrubs need time to attain adequate size to produce sufficient ground litter and root systems to hold the soil in place and provide long term erosion control protection.

Refer to Section IV of the KY FOTG – Tools - Tree and Shrub Establishment Tool - KY Tree and Shrub Establishment Guide for selection of species that have greatest growth at 20 years.

Additional Criteria for Wildlife Habitat

Select tree and shrub species that provide food, cover, or connectivity to target wildlife species, including pollinators and beneficial organisms, as supported by a State approved wildlife habitat assessment, a specialist's (e.g., biologist) report, or wildlife habitat management plan. Refer to Section IV of the KY FOTG – Tools - Tree and Shrub Establishment Tools - KY Tree and Shrub Establishment Guide, for selection of species that are best suited to wildlife plantings.

For pollinator and beneficial organisms refer to Section IV of the KY FOTG – Tools - Tree and Shrub Establishment Tool - KY Tree and Shrub Establishment Guide for selection of species that are beneficial to pollinators. Additionally, the KY Pollinator Handbook provides species and other information regarding trees and shrubs that are beneficial for pollinators.

Additional Criteria for Sequestering and Storing Carbon

Maximize carbon storage by selecting tree and shrub species that have longer life spans, the ability to reach a large size, high wood density, and the potential for use in long-lived wood products. To meet both short and long-term objectives of a site, establish fully stocked stands for the selected rotation to sustain growth and vigor potential. Build forest resilience by favoring community composition and structural diversity of a site.

Additional Criteria to Conserve Energy

Increase energy efficiency by planting trees to provide shade for buildings. Use proper plant densities to optimize the shade produced. Select plants with a potential height growth that will be taller than the structure or facility being protected. Design tree and shrub plantings to avoid damage to structures and to allow adequate space for maintenance access to walls and windows. Plant at a distance that is greater than mature crown spread, and select species that develop deep root systems. To protect structures from heat loss due to wind, use NRCS CPS Windbreak/Shelterbelt Establishment and Renovation (Code 380).

Additional Criteria for Livestock Shelter

Select trees with growth rates and crown characteristics to provide livestock adequate shade. Protect trees from livestock. Manage livestock with NRCS CPS Prescribed Grazing Plan (Code 528).

CONSIDERATIONS

Utilize plant materials that have been selected and tested in the NRCS Plant Materials Program or in similar tree and shrub improvement programs when specific performance elements are necessary. Plant materials used for planting treatments can include bare-root stock, containerized stock, seed, stem or root cuttings, or layered bows. Consider the potential impacts of extreme weather events (e.g., drought, flooding, wind, late spring frosts) when selecting plant species and sites for planting. Select trees and shrubs adapted to the site's natural disturbance regime. If planting in existing forestland, select tree species based on the existing forest's species traits, successional status, structure, and composition.

Use diverse tree and shrub species combinations which best meet the needs of target wildlife and pollinator species. Enhance wildlife habitat structure in existing forest stands by establishing additional trees and shrubs in the understory. Select tree and shrub species that produce hard or soft mast utilized by targeted wildlife species.

When using trees and shrubs for carbon sequestration and storage, consider using modeling

tools to predict carbon sequestration rates and amounts of stored carbon.

Design tree-shrub arrangement and spacing to allow for and anticipate the need for future access lanes for purposes of stand management and fire control. Establish species with growth rates and at densities that make them competitive with weeds and undesirable plants. Consider incorporating culturally significant species into establishment design.

Consider designing plantings to enhance visual quality in farmsteads, recreation areas, and along public rights-of-way, by incorporating foliage color, season and color of flowering, mature plant height, edge- feathering, and other landscaping techniques to meet client's management objectives and concerns.

Consider acquiring planting stock from suppliers located in or adjacent to the state of Kentucky. Use species compatible with the plant hardiness zone of the planting site.

Considerations for Organic Systems During Vegetation Establishment

For USDA certified-organic and transitioning-to-organic operations, all materials and methods must comply with the USDA National Organic Program Standards, including all seeds, planting stock, and fertilizers. Use NRCS CPS Mulching (Code 484) to support tree and shrub establishment by controlling competing vegetation with natural mulches, such as wood products or hay, as a viable alternative to using herbicides. Certified weed-free mulches are preferred.

Invasive plant species may be controlled through mulching with fully biodegradable materials; mowing; livestock grazing with protection for plantings; manual pulling and cutting; mechanical cultivation; pre- irrigation; flame, and heat or electrical means. NRCS CPS Prescribed Burning (Code 338) may be used to control diseases and stimulate seed germination.

Pests may be managed through augmentation or introduction of predators or parasites and development of habitat for natural enemies of pests; non-synthetic controls such as lures, traps, and repellents may be used.

Considerations for Reducing Energy Use

When trees and shrubs are planted to reduce summer energy use in buildings, consider prioritizing their placement based on the greatest daily solar heat gain (typically the west side). Trees or shrubs planted within 30 to 50 feet of a building generally provide effective shade to windows and walls, depending on tree height potential. Evaluate tree and shrub crown and root spread characteristics before establishing near structures. Deciduous tree or shrub species planted adjacent to the south side of buildings in cool climates can provide shade in the summer yet allow sun to reach the building in winter.

PLANS AND SPECIFICATIONS

Prepare plans and specifications that describe requirements for applying the practice to achieve its intended purpose and obtain any required permits.

Use Implementation Requirements or other acceptable documentation. At a minimum, provide—

- Objective(s) for establishment.
- Drawings and details when appropriate.
- Map showing the location of tree and shrub establishment areas.
- Soils map and description of soils and ecological sites (if available).
- Establishment method by species or vegetation type.

- Number of trees and shrubs per acre to be established, by species.
- Timing of establishment treatments relative to seasonal factors, plant physiology, disease, insects, and wildlife impacts.
- Mitigation measures, if needed, to reduce damage from wildfire hazard or potential pests.

OPERATION AND MAINTENANCE

Prepare an Operation and Maintenance Plan for the site. As a minimum, include the following activities:

- Manage competing vegetation (including Federal or State Invasive Species and Noxious Weeds), as needed, until the desired trees and shrubs are established without competing for sunlight, water, or nutrients.
- Maintain the health of the established plant community with appropriate management techniques including periodic mowing, herbicide treatments, or prescribed burning, as needed. Do not conduct maintenance practices and activities during the primary reproductive period of wildlife. Exceptions can be considered to maintain the health of the vegetation if such exceptions do not conflict with agency requirements.
- Control access by vehicles and equipment during or after tree-shrub establishment to protect new plants and minimize erosion, compaction, and other site impacts.
- Inspect the site at appropriate time intervals following planting, seeding, or natural regeneration to determine whether the survival rate for trees and shrubs meets the intended practice purposes and client objectives. When survival is not adequate to meet the intended objective, replant or supplement the planting as needed to meet the management goals.
- Periodically inspect established trees and shrubs and protect them from adverse impacts of insects, diseases, competing vegetation, fire, livestock, wildlife, nonfunctioning tree shelters, weed barriers, etc.
- Apply nutrients to maintain vigor of desirable trees-shrubs, as needed.

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