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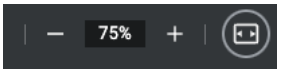
- USE THIS 

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CLIMATE-SMART GROWN IN SC FOREST PRODUCTS CPS DOCUMENTS

Practice by Commodity	Standard Practice	Description	Page
Forestry (Afforestation)			
Prescribed Burning Overview	CPS 338	Applying a planned fire to a predetermined area of land	3
Prescribed Burning	CPS 338	Using planned fire as a supporting practice for forestry restoration	4
Site Preparation Overview	CPS 490	Treatment of sites to enhance the success of natural or artificial regeneration of desired trees and/or shrubs	8
Site Preparation	CPS 490	Supporting practice for Forestry Restoration practices. Treatment of sites to enhance the success of natural or artificial regeneration of desired trees and/or shrubs.	9
Tree/Shrub Establishment Overview	CPS 612	Planting seedlings or cuttings, seeding, or creating conditions that promote natural regeneration	13
Tree/Shrub Establishment	CPS 612 CPS E612A CPS E612B CPS E612C	Establishing woody plants by planting seedlings or cuttings, by direct seeding, and/or through natural regeneration (CPS 612) to improve water quality (CPS E612A), increase carbon sequestration (CPS E612B), and restore native plant communities (CPS E612C)	14
Forestry (Improvement)			
Herbaceous Weed Treatment Overview	CPS 315	Removal or control of herbaceous weeds including noxious. Prohibited, or undesirable plants	34
Herbaceous Weed Treatment	CPS 315	Using herbaceous weed treatment as a supporting practice for forestry improvement	35
Prescribed Burning Overview	CPS 338	Applying a planned fire to a predetermined area of land	41
Prescribed Burning	CPS 338	Supporting practice for Forestry Improvement practices	42
Tree/Shrub Establishment Overview	CPS 612	Planting seedlings or cuttings, seeding, or creating conditions that promote natural regeneration	46
Tree/Shrub Establishment	CPS 612 CPS E612C	Establishing woody plants by planting seedlings or cuttings, by direct seeding, and/or through natural regeneration (CPS 612) to restore native plant communities (CPS E612C)	47
Forest Stand Improvement Overview	CPS 666	Manipulating species composition, structure, or density of a stand of trees to achieve desired forest conditions	58
Forest Stand Improvement	CPS 666 CPS E666H CPS E666S	Manipulating species composition, structure, or density of a stand of trees (CPS 666) to Increase on-site carbon storage (CPS E666H) and to facilitate longleaf pine regeneration and establishment (CPS E666S)	59
Forestry (Maintenance)			
Prescribed Burning Overview	CPS 338	Applying a planned fire to a predetermined area of land	73
Prescribed burning	CPS 338	Supporting practice for Forestry Maintenance practices	74
Tree/Shrub Establishment Overview	CPS 612	Planting seedlings or cuttings, seeding, or creating conditions that promote natural regeneration	78
Tree/Shrub Establishment	CPS 612	Establishing woody plants by planting seedlings or cuttings, by direct seeding, and/or through natural regeneration	79
Forest Stand Improvement Overview	CPS 666	Manipulating species composition, structure, or density of a stand of trees to achieve desired forest conditions	84
Forest Stand Improvement	CPS 666 CPS E666H CPS E666K CPS E666S	Manipulating species composition, structure, or density of a stand of trees (CPS 666) to Increase on-site carbon storage (CPS E666H), create structural diversity with patch openings (CPS E666K), and to facilitate longleaf pine regeneration and establishment (CPS E666S)	85
Forestry (Mobilization)			
Forest Stand Improvement Overview	CPS 666	Manipulating species composition, structure, or density of a stand of trees to achieve desired forest conditions	106
Smaller Parcel Cutting in Clusters	CPS 666 CPS E666H CPS E666S	incentive *for loggers* for adapting operations to small parcels paid per cluster of 4 or more individual stand with a goal of 7 clusters per year (CPS 666) to increase on-site carbon storage (CPS E666H) and facilitate longleaf pine regeneration and establishment (CPS E666S)	107
Forestry (Cluster Coordination)			
Forest Stand Improvement Overview	CPS 666	Manipulating species composition, structure, or density of a stand of trees to achieve desired forest conditions	121

Develop Cluster Sales of Smaller Parcels	CPS 666 CPS E666H CPS E666S	Incentive *for timber buyers* for adapting operations to small parcels. Compensate for coordination cost incurred by consulting foresters; incentive paid per cluster of 4 or more individual stands; goal of 7 clusters per year (CPS 666) to support the increase of on-site carbon storage (CPS E666H) and facilitate longleaf pine regeneration and establishment (CPS E666S)	122
Forestry – SC State CPS Standards			
Herbaceous Weed Treatment	CPS 315	The removal or control of herbaceous weeds including invasive, noxious, prohibited, or undesirable plants	136
Herbaceous Weed Treatment Statement of Work (SOW)	CPS 315	Design, installation, and check out deliverables applied to herbaceous weed treatment	142
Prescribed Burning	CPS 338	Planned fire applied to a predetermined area	144
Prescribed Burning Implementation Requirements	CPS 338	Detailed considerations for a prescribed burning plan	148
Tree/Shrub Site Preparation	CPS 490	Treatment of sites to enhance the success of natural or artificial regeneration of desired trees and/or shrubs	153
Tree/Shrub Site Preparation Implementation Requirements	CPS 490	Detailed considerations for site establishment of trees/shrubs	157
Tree/Shrub Site Preparation Statement of Work (SOW)	CPS 490	Design, installation, and check out deliverables applied to tree/shrub site preparation	162
Tree/Shrub Establishment	CPS 612	Establishing woody plants by planting seedlings or cuttings, by direct seeding, and/or through natural regeneration	164
Tree/Shrub Establishment – Keys to Successfully Planting Longleaf Pine	CPS 612	Longleaf Alliance guidelines for successfully planting longleaf pine trees	169
Tree/Shrub Establishment Implementation Requirements	CPS 612	Detailed considerations for establishing woody plants	172
Tree/Shrub Establishment for Wildlife Implementation Requirements	CPS 612	Detailed considerations for establishing woody plants to attract and benefit wildlife while providing other ecosystem services	175
Tree/Shrub Establishment for Wildlife Planting Guide	CPS 612	Establishing adapted and compatible native trees and shrubs for forest products, wildlife habitat, and other ecosystem services	178
Tree/Shrub Establishment for Wildlife Technical Guide	CPS 612	Specific guidelines for establishing native woody vegetation to improve wildlife habitat	190
Tree/Shrub Establishment for Wildlife Native Plant List	CPS 612	List of SC native plants that can be used to improve wildlife habitat	193
Tree/Shrub Establishment Statement of Work (SOW)	CPS 612	Design, installation, and check out deliverables applied to tree/shrub establishment	198
Forest Stand Improvement	CPS 666	The manipulation of species composition, stand structure, or stand density by cutting or killing selected trees or understory vegetation to achieve desired forest conditions or obtain ecosystem services	200
Forest Stand Improvement Commercial Thinning	CPS 666	The manipulation of species composition, stand structure and stocking by cutting/harvesting selected trees	205
Forest Stand Improvement Mechanical Treatment of Understory	CPS 666	The manipulation of dense understory woody and select tree composition on forest land to improve wildlife habitat	209
Forest Stand Improvement Practice Job Sheet	CPS 666	Detailed criteria, methods, and guidelines for implementing forest stand improvements	211
Forest Stand Improvement Thinning for Wildlife and Forest Health	CPS 666	Guidelines for forest stand improvement on forested lands where the objective is to improve the health of the stand or increase the wildlife habitat in the stand	215
Forest Stand Improvement Statement of Work (SOW)	CPS 666	Design, installation, and check out deliverables applied to forest stand improvement	217

Conservation Practice Overview

October 2020

Prescribed Burninig (Code 338)

Prescribed burning is applying a planned fire to a predetermined area of land.

Practice Information

Prescribed burning can be applied for several purposes. For the plant community, prescribed burning is used to manage undesirable vegetation and reduce plant pressure caused by pests, pathogens, and diseases. For safety and protection of property, prescribed burning is used to reduce the various risks associated with wildfire. For wildlife, prescribed burning is used to improve terrestrial habitat for wildlife and invertebrates (pollinators), and it improves plant and seed production, quantity, and/or quality. For livestock, prescribed burning is used to improve the livestock-forage balance by enhancing plant productivity and the distribution of grazing and browsing animals. Prescribed burning also improves habitat for soil organisms, thereby enhancing soil health.

Application of this highly specialized practice requires intensive training and sufficient support personnel and equipment. A safe, successful burn must be timed for proper humidity, wind conditions, air temperature, and fuel conditions (ignitable vegetation). Safety precautions are planned before the burn and monitored during the burn. Be aware of your state's smoke management program and use the specific tools your state has implemented to address smoke. Be mindful of the potential air quality impacts that burning might have on downwind communities.

All burn plans must address the following: location and description of the burn area, resource management objectives, preburn vegetation cover, preburn preparation required, weather conditions, equipment checklist, personnel needs and assignments, safety requirements, firing sequence and ignition method, smoke management plans, notification checklist, approval signatures, and postburn evaluation criteria.

Common Associated Practices

NRCS Conservation Practice Standard (CPS) Prescribed Burning (Code 338) is commonly applied with other practices such as NRCS CPSs Fire Break (Code 394), Prescribed Grazing (Code 528), Forest Stand Improvement (Code 666), Forest Trails and Landings (Code 655), Range Planting (Code 550), Forage and Biomass Planting (Code 512), Pest Management Conservation System (Code 595), and other associated harvesting, planting, and seeding practices.

For further information, contact your local NRCS field office.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

PRESCRIBED BURNING

CODE 338

(ac)

DEFINITION

Planned fire applied to a predetermined area.

PURPOSE

Use this practice to accomplish one or more of the following purposes:

- Manage undesirable vegetation to improve plant community structure and composition
- Manage pests, pathogens, and diseases to reduce plant pressure
- Reduce wildfire hazards from biomass accumulation
- Improve terrestrial habitat for wildlife and invertebrates
- Improve plant and seed production, quantity, and/or quality
- Facilitate distribution of grazing and browsing animals to improve forage-animal balance
- Improve and maintain habitat for soil organisms and enhance soil health

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on all lands as appropriate.

CRITERIA

General Criteria Applicable to All Purposes

All prescribed burn plans and applications shall address the following items:

- Location and description of the burn area
- Preburn vegetation cover
- Resource management objectives
- Required weather conditions for prescribed burn
- Notification checklist
- Preburn preparation
- Equipment checklist, personnel assignments, and needs/safety requirements
- Firing sequence
- Ignition method
- Basic smoke management practices to minimize smoke impacts
- Approval signatures
- Postburn evaluation criteria

Additional Criteria for Prescribed Burn Planning

- The procedure, equipment, weather conditions, and the number of trained personnel shall be adequate to accomplish the intended purposes.
- Inventory the location of utilities, such as electric power lines and natural gas pipelines, to prevent damage to the utility and to avoid personal injury and human and vehicular traffic that may be impeded by heat or smoke.
- Monitor weather parameters, smoke dispersion, and other conditions that will affect fire behavior during the burn.
- Use information in “Basic Smoke Management Practices” (O’Neill et al., 2011) for planning and mitigating smoke impacts. Be aware of your state’s smoke management program and utilize the specific tools your state has implemented to address smoke. Be mindful of the potential air quality impacts that burning might have on downwind communities.
- Timing of burning will correspond with desired soil and site conditions to maintain site productivity and minimize effects on soil health.
- Control points; existing barriers such as lakes, streams, wetlands, roads, and constructed firebreaks; and areas devoid of fuel are important to the design and layout of this practice.
- Notify adjoining landowners, local fire departments, and public health and safety officials as appropriate within the airshed prior to burning.

CONSIDERATIONS

Consider integration of NRCS Conservation Practice Standards (CPSs) Firebreak (Code 394) or Fuel Break (Code 383) into land preparation prior to the prescribed burn. Utilize NRCS CPS Prescribed Grazing (Code 528) to manage fuel loads prior to the burn and grazing use of vegetation postburn.

Consider using prescribed burning as a pathway for restoring ecological sites to reference or other states referred to in the ecological site description(s) and state and transition models for the area. Consider wildlife and pollinator needs such as nesting, brood rearing, feeding, and cover when applying prescribed burns.

Consider cultural resources and inventory any sites found within the burn unit and design the burn to avoid any possible damage.

Consider minimizing carbon release by the timing and intensity of the burn.

Consider utilizing prescribed burning to prepare sites for planting or enhancing seed and seedling production.

Consider using prescribed burning to remove slash and debris.

Integrate safety and health precautions into the timing, location, and expected intensity of the burn.

PLANS AND SPECIFICATIONS

Qualified individuals will complete a written prescribed burn plan with specifications for each site using approved burn plan templates, specification sheets, implementation requirements, and technical notes, in support of the conservation plan. Ensure landowner or operating manager has obtained all necessary State, local, and Tribal permits prior to implementation of the burn plan.

OPERATION AND MAINTENANCE

Operation

During the implementation of this practice, the variability of inherent site factors (e.g., topography, fuels, and weather conditions) on fire behavior, as well as heat and smoke impacts on people, vehicles, and property, must be accounted for and monitored, as appropriate.

Prescribed burning activities shall follow the direction of the burn boss (ultimate decision-maker) and designated personnel in accordance with the approved burn plan and NRCS policy. The prescribed burn plan, and the actions contained in the burn plan as carried out at the direction of the burn boss and designated personnel, will reduce risk to life and public safety and provide protection of values at risk for prescribed fire participants as well as adjacent and local values at risk.

Appropriate levels of trained and equipped personnel are essential for the successful and safe implementation of prescribed fires in all scenarios and land uses.

Requirements for burn weather, necessary resource staffing, and equipment availability correspond to expected fire behavior. The burn boss can override these requirements—in writing at the time of burn—if conditions warrant such action.

A test fire should be ignited prior to all burns to monitor fire behavior, fire effects, consumption, and smoke dispersal.

To effectively minimize postfire escapes, suppression and mop-up must be completed that ensures no fire, embers, or other ignition sources will escape beyond the designated burn area.

Maintenance

All fires will be monitored and evaluated postfire to determine that predetermined burn objectives and metrics were met based on the identified resource concern. This may include but is not limited to targeted—

- Density, structure, and composition of native plant communities.
- Plant productivity and health.
- Reduction of plant pest populations and nonnative plants.
- Reduction in hazardous fuels.
- Improvements in wildlife habitat elements.

All postfire monitoring will be used to inform prescriptions for future burn plans to ensure safe, efficient, and effective application of prescribed fire to achieve resource concern objectives across all scenarios and land uses. Employ NRCS CPS Prescribed Grazing (Code 528) to maintain overall objectives of the burn and manage vegetation for livestock. Consider maintaining firebreaks using NRCS CPS Firebreak (Code 394) for followup burns and wildfire protection.

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Conservation Practice Overview

October 2020

Tree Shrub Site Preparation (Code 490)

Treatment of sites to enhance the success of natural or artificial regeneration of desired trees and/or shrubs.

Practice Information

Apply the tree/shrub site preparation conservation practice to control undesirable vegetation, remove slash and debris, or alter site conditions in order to provide optimum site conditions for planting or seeding of woody species, or to encourage natural regeneration of desirable trees and shrubs.

This practice applies to understocked areas, areas planned for tree planting following harvest, areas where a land cover change to woody plants is desired, or areas having undesirable vegetation that inhibits or competes with the establishment of preferred woody species.

Application of this practice requires consideration of—

- Protecting existing desirable vegetation;
- Treating remaining slash and debris so it does not harbor harmful levels of pests, hinder needed equipment operation, or create undue fire hazard;
- Controlling erosion and/or runoff;
- Cost-effectivess of the chosen method;
- Protecting cultural resources, springs, seeps, wetlands, and other unique areas; and
- Impacts on wildlife habitat.

Common Associated Practices

NRCS Conservation Practice Standard (CPS) Tree/Shrub Site Preparation (Code 490) commonly precedes NRCS CPS Tree/Shrub Establishment (Code 612); and is applied with other conservation practices such as NRCS CPSs Woody Residue Treatment (Code 384), Upland Wildlife Habitat Management (Code 645), and Windbreak/Shelterbelt Establishment (Code 380).

For further information, contact your local NRCS field office.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

TREE/SHRUB SITE PREPARATION

CODE 490

(ac)

DEFINITION

Treatment of sites to enhance the success of natural or artificial regeneration of desired trees and/or shrubs.

PURPOSE

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

- Manage soil conditions, naturally available water, and seasonally high water to favor tree and shrub establishment, survival, and growth
- Modify the habitat of weeds, pests, and diseases to reduce pressure on naturally or artificially regenerated trees and shrubs
- Facilitate the establishment, survival, and growth of tree and shrub species

CONDITIONS WHERE PRACTICE APPLIES

On all lands suited to growing woody plants where current site conditions are not suitable for the natural or artificial establishment of desired trees and shrubs.

CRITERIA

General Criteria

- Use mechanical, chemical, or prescribed burning methods either alone or in combination to alter woody residue, vegetation, ground cover, soil, or microsite conditions to prepare the site for planting, seeding, or natural regeneration of desired tree and shrub species. Where herbicides will be used, evaluate and interpret risks using the Windows Pesticide Screening Tool (WIN-PST) or other approved tools or guides, or use NRCS Conservation Practice Standard (CPS) Pest Management Conservation System (Code 595).
- Expose mineral soil as needed to achieve the desired distribution of plants to be established by seed for tree and shrub species that require mineral soil for germination and establishment.
- Determine method(s), intensity, and timing of site preparation activities depending on topography, and on soil and site conditions. Schedule silviculture and site preparation activities so they are completed at the optimal time prior to the commencement of planting or seeding activities, or to the initiation of natural regeneration.
- Leave woody residue in place to provide soil protection and wildlife habitat, retain soil moisture and organic matter, and protect the soil surface from temperature extremes—except where it will pose a fire hazard, increase the risk of pest damage, or interfere with management activities.
- Use NRCS CPS Prescribed Burning (Code 338) when using fire to prepare a site.
- On soils prone to compaction or rut formation, use low ground-pressure equipment or nonmechanized site preparation methods. When preparing compacted cropland or pasture sites

for tree planting, chisel, rip, and/or subsoil to mitigate compacted soil layers, as needed. Use criteria in NRCS CPS Deep Tillage (Code 324).

- Retain desirable surface and canopy cover to protect soil and site conditions. Alternatively use NRCS CPS Cover Crop (Code 340) or Critical Area Planting (Code 342) and/or other measures as needed to control erosion, runoff, and displacement from typical rainfall events.
- Do not use wheeled and tracked equipment on slopes where operability causes safety concerns or adverse impacts on soil conditions. Perform ground-disturbing site preparation activities on the contour where feasible. Restrict the use of wheeled and tracked equipment to periods when the soil is either frozen or unsaturated. Use designated trails or establish a trail system as appropriate and feasible. Use NRCS CPS Forest Trails and Landings (Code 655).
- Mitigate site preparation activities near wetlands, water bodies, and in or near riparian areas to reduce negative water quality impacts.
- Follow State's best management practices for water quality.

Additional Criteria for Reducing Habitat for Harmful Pests and Diseases of Woody Plants

- Remove vegetation infected with transmittable disease (e.g., mistletoe and certain root rots). Consult a professional forester to aid in identifying sanitation measures.
- Treat slash and woody debris so that it does not create habitat for, or harbor, harmful levels of pests. Refer to criteria in NRCS CPS Woody Residue Treatment (Code 384).
- Clean equipment and gear before and after site preparation activities where risk of spread and potential impact from invasive species or harmful pathogens is likely.

Additional Criteria for Ponding, Flooding, and Seasonally High Water

- On sites where a seasonal excess of surface water restricts the establishment or regeneration of desired and adapted trees or shrubs, use temporary water management techniques as allowable by regulation, laws, and policy as needed.
- Where temporary water management is used, limit the depth, spacing, and number of channels to the minimum amount needed to remove excess surface water for tree/shrub establishment or regeneration.
- Temporary water management channels must empty into areas where runoff will be diffused and filtered by vegetation and soils before reaching a natural water body.
- Apply water management activities, including spoil placement, in compliance with the Clean Water Act, Food Security Act, and NRCS Wetland Compliance.

CONSIDERATIONS

To reduce problems associated with insects in logging debris and the reestablishment of undesirable species, consider doing site preparation within one year after logging, followed promptly by planting or natural regeneration.

To reduce negative impacts on wildlife species and their habitat, consider the timing of site preparation to minimize actions that disturb seasonal wildlife activities.

Particulates, smoke, dust, and other air pollutants generated by site preparation may have negative effects on air quality. Consider proximity to populated areas, roads, and visually sensitive areas when planning method and timing of site preparation activities.

Where site preparation requires treatment of competing vegetation, consider alternatives to chemical treatments such as thermal applications, mulching, or solarization. Use other emerging technologies when applicable.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for site preparation in accordance with this standard. Clearly describe the requirements for applying the practice to achieve its intended purpose. As a minimum, include the following in the implementation requirements document:

- Maps, drawings, and narratives, showing areas to be treated, and showing details of the layout of site preparation activities relative to streams, wetlands, or water bodies, underground or overhead utilities, existing access or other infrastructure, etc., as applicable.
- Description of existing land use and vegetative cover.
- Description of site preparation methods to be used and application dates.
- Description of mitigations for compaction, erosion, soil organic matter removal, and any other anticipated site impacts.
- State whether site preparation is for natural or artificial regeneration. If artificial, provide the planned date for tree planting, timed appropriately relative to site preparation.
- Details on undesirable plant species to be treated and control methods to be used.
- Description of contingency plans in case of flooding or other disturbances that impact implementation schedules or mitigations.
- References to other conservation practice specifications, if applicable.

OPERATION AND MAINTENANCE

Operation

Site preparation operations will comply with all local, State, and Federal laws and ordinances, and with State's forestry best management practices for water quality.

For site preparation using herbicides, the operator will develop a safety plan for individuals exposed to chemicals, including telephone numbers and addresses of emergency treatment centers and the telephone number for the nearest poison control center. The National Pesticide Information Center (NPIC) telephone number in Corvallis, Oregon, may also be given for nonemergency information: 1-800-858-7384, Monday to Friday, 6:30 a.m. to 4:30 p.m. Pacific Time. The national Chemical Transportation Emergency Center (CHEMTRAC) telephone number is 1-800-424-9300.

- Follow label requirements for mixing/loading setbacks from wells, intermittent streams, and rivers, natural or impounded ponds and lakes, and reservoirs.
- Post signs, according to label directions and/or Federal, State, Tribal, and local laws, around fields that have been treated. Follow restricted entry intervals.
- Dispose of herbicides and herbicide containers in accordance with label directions and adhere to Federal, State, Tribal, and local regulations.
- Read and follow label directions and maintain appropriate material safety data sheets.
- Calibrate application equipment according to recommendations before each seasonal use and with each major chemical and site change.
- Replace worn nozzle tips, cracked hoses, and faulty gauges on spray equipment.
- Herbicide application records shall be kept in accordance with USDA Agricultural Marketing Service's Pesticide Recordkeeping Program and State-specific requirements.

Determine the success of the practice by evaluating post-treatment conditions and verifying that they are suitable for the establishment of desired trees and shrubs.

Maintenance

Following initial application, some regrowth, sprouting, or reoccurrence of undesirable plants may be expected. Spot treatment of individual plants or areas needing retreatment should be completed as needed while woody vegetation is small and can be most successfully treated, during the lifespan of this

practice. This includes maintaining erosion control measures as necessary and controlling access by vehicles, wildlife, or livestock, to support successful establishment of this practice.

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Conservation Practice Standard Overview

Tree/Shrub Establishment (Code 612)

Tree/shrub establishment involves planting seedlings or cuttings, seeding, or creating conditions that promote natural regeneration.

Practice Information

Trees and shrubs can be established for a variety of purposes. Conservation benefits may include, but are not limited to—

- establishing forest cover
- enhancing wildlife habitat
- controlling erosion
- improving water quality
- capturing and storing carbon
- conserving energy

Species selection, site preparation, planting date and method, and tree spacing will vary depending on the planned purpose and site conditions. Once planted, trees and shrubs need to be inspected periodically and protected from insects, diseases, competing vegetation, fire, and damage from livestock or wildlife.

Depending on the site, supplemental water may be required to ensure survival during the establishment period, typically 1 to 3 years. Periodic applications of nutrients may be needed to maintain plant vigor.

Common Associated Practices

Tree/Shrub Establishment (Code 612) is commonly associated with conservation practices such as Tree/Shrub Site Preparation (Code 490), Mulching (Code 484), Forest Trails and Landings (Code 655), Upland Wildlife Habitat Management (Code 645), Critical Area Planting (Code 342), Brush Management (Code 314), Herbaceous Weed Control (Code 315), Integrated Pest Management (Code 595), and Access Control (Code 472).

For further information, contact your local NRCS field office.

United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

TREE-SHRUB ESTABLISHMENT

CODE 612

(ac)

DEFINITION

Establishing woody plants by planting, by 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 ecological site 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. 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. 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.

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.

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.

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.

Considerations for Organic Systems During Vegetation Establishment

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.

Invasic plant species may be controlled through mulching with fully biodegradable materials; mowing; livestock grazing with protection for plantings; mechanical cultivation; pre-irrigation; flame, heat or electrical means. Use NRCS CPS Prescribed Burning (Code 338), as needed.

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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CONSERVATION ENHANCEMENT ACTIVITY

E612A

Cropland conversion to trees or shrubs for long term improvement of water quality

Conservation Practice 612: TREE/SHRUB ESTABLISHMENT

APPLICABLE LAND USE: Crop (Annual & Mixed); Crop (Perennial)

RESOURCE CONCERN: Water

ENHANCEMENT LIFE SPAN: 15 years

Enhancement Description

Cropland conversion to trees and shrubs for long term erosion control and improvement of water quality. Trees and shrubs are established on cropland where annually-seeded cash crops have been grown. Tree and/or shrub species are selected for their efficacy in holding soil, and the planting design is configured to control runoff and trap sediment.

Criteria

- Current land use must be cropland. Soil must have been cultivated for crop production at least once within the last three years.
- A precondition for tree/shrub establishment is appropriately prepared sites. Refer to NRCS Conservation Practice Standard (CPS) Tree/Shrub Site Preparation (Code 490).
- A combination of tree and shrub species will be used. Species will be adapted to site conditions and selected for their extensive, spreading root systems, rapid establishment, and tolerance for pollutants, nutrients, or contaminants contained in runoff or soils at the site.
- No plants on the Federal or state noxious weeds list shall be planted.
- Only viable, high-quality and adapted planting stock or seed will be used.

- Selection of planting technique and timing will be appropriate for the site and soil conditions.
- Tree or shrub arrangement and spacing will be designed specifically to intercept runoff and trap sediment. The establishment phase will include other forms of erosion control as needed (e.g., mulch, filter fabric) until plantings have achieved the desired purpose of controlling erosion and improving water quality.
- 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.
- The seeding and/or planting will be protected from plant and animal pests (i.e. feral pigs, wild deer, wildlife or livestock). Refer to NRCS Conservation Practice Standard Integrated Pest Management (Code 595) to assist with site-specific strategies for pest prevention, pest avoidance, pest monitoring, and pest suppression.
- The seeding and/or planting will be protected from fire. Refer to NRCS CPS Fuel Break (Code 383) to assist with site-specific strategies for fire pre-suppression, protection and monitoring.
- Each site will be evaluated to determine if mulching, supplemental water or other cultural treatments (e.g., tree protection devices, shade cards, brush mats) will be needed to assure adequate survival and growth.
- Evaluate residual chemical carryover prior to planting. Alter species selection and/or timing of planting/seeding to achieve adequate seed germination and/or seedling establishment.

Documentation and Implementation Requirements

Participant will:

- Prior to implementation, prepare the planned acres for tree or shrub establishment. Refer to NRCS Conservation Practice Standard Tree/Shrub Site Preparation (Code 490). (NRCS will provide technical assistance, as needed.)
- Prior to implementation, select a combination of tree and shrub species selected for their extensive, spreading root systems, rapid establishment, and tolerance for pollutants, nutrients, or contaminants contained in runoff or soils at the site. (NRCS will provide technical assistance, as needed.)

Species	Note specific species characteristic(s)

- Prior to implementation, select planting technique, arrangement and spacing design, and timing appropriate for the site and soil conditions. (NRCS will provide technical assistance, as needed.)

Planting Date	
Planting Technique	
Arrangement and Spacing	

- During implementation, use forms of erosion control as needed for the site. (NRCS will provide technical assistance, as needed.)
- During implementation, notify NRCS of any planned changes to verify changes meet NRCS enhancement criteria.
- During implementation, protect the planting from plant and animal pests and fire.
- During implementation, maintain all erosion control needed for the site.

NRCS will:

- Prior to implementation, verify the enhancement is planned for cropland.
- Prior to implementation, provide and explain NRCS Conservation Practice Standard Tree/Shrub Site Preparation (CPS 490) as it relates to implementing this enhancement. Verify the enhancement is planned for acres that have been appropriately prepared for tree/shrub establishment.
- Prior to implementation, provide and explain NRCS Conservation Practice Standard Integrated Pest Management (Code 595) as it relates to implementing this enhancement.
- Prior to implementation, verify no plants on the Federal or state noxious weeds list are included.
- As needed, prior to implementation, NRCS will provide technical assistance:
    - Planning site preparation meeting NRCS Conservation Practice Standard Tree/Shrub Site Preparation (Code 490).
    - Selecting a combination of tree and shrub species.
    - Selecting planting techniques, arrangement and spacing design, and timing appropriate for the site and soil conditions.
    - Planning the use of additional erosion control, as needed for the site.
    - Preparing specifications for applying this enhancement for each site using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.
- During implementation, evaluate any planned changes to verify they meet the enhancement criteria.
- After implementation, verify the planned trees and shrub species were established to specifications developed for the site.
- After implementation, verify the planting is protected from pests and fire.

- ☐ After implementation, verify all erosion control needed for the site is functioning and is maintained to specifications developed for the site.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

CONSERVATION ENHANCEMENT ACTIVITY

E612B

Planting for high carbon sequestration rate

Conservation Practice 612: TREE/SHRUB ESTABLISHMENT

APPLICABLE LAND USE: Crop (Annual & Mixed); Crop (Perennial), Pasture, Range, Forest, Associated Ag Land, Farmstead

RESOURCE CONCERN: Air

ENHANCEMENT LIFE SPAN: 15 years

Enhancement Description

Plant tree species and use stocking levels for higher growth to increase the rate of carbon sequestration (capture). Use species with a longer life span as well as relatively fast growth, and species suitable for durable manufactured products. Increase stocking levels in forests that are not fully stocked. Implement afforestation on appropriate open lands.

Criteria

- States will apply general criteria from the NRCS National Conservation Practice Standard Tree/Shrub Establishment (Code 612) as listed below, and additional criteria as required by the NRCS State Office.
- Trees and shrubs will be selected for their rate of growth and suitability for use in durable manufactured products as well as their adaptability to site conditions. Refer to state lists.
- Trees and shrubs will be planted on selected areas within any land use.
- Trees and shrubs will be planted in areas with adequate sunlight. If plantings are used to supplement stocking within existing forested acreages, plant trees where light conditions are suitable. Planting rates will follow State NRCS Conservation Practice Standard Tree/Shrub Establishment (Code 612).

- No plants on the Federal or state noxious weeds list, or plants known to be aggressive and/or potentially invasive in the local area, shall 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 for the intended purpose.
- Only viable, high-quality and adapted planting stock or seed will be used.
- A precondition for tree/shrub establishment is appropriately prepared sites. Refer to criteria in NRCS Conservation Practice Standard Tree/Shrub Site Preparation (Code 490).
- Selection of planting technique and timing will be appropriate for the site and soil conditions.
- Refer to criteria in NRCS Conservation Practice Standard Integrated Pest Management (Code 595) to assist with site-specific strategies for pest prevention, pest avoidance, pest monitoring, and pest suppression. Protect plantings from competition from invasive plants.
- Each site will be evaluated to determine if mulching, supplemental water or other treatments (e.g., tree protection devices, shade cards, weed mats) will be needed to assure adequate survival and growth.
- The enhancement will comply with all applicable federal, state, and local laws and regulations, and with States' Forestry Best Management Practices for Air and Water Quality.

Documentation and Implementation Requirements

Participant will:

- ☐ Prior to implementation, prepare the planned acres for tree or shrub establishment. Refer to NRCS Conservation Practice Standard Tree/Shrub Site Preparation (490). (NRCS will provide technical assistance, as needed.)
- ☐ Prior to implementation, select a combination of trees and shrubs for a longer life span as well as relatively fast growth, and suitability for production of durable manufactured products, and their adaptability to site conditions. (NRCS will provide technical assistance, as needed.)

Species	Note selected species characteristic(s)

- ☐ Prior to implementation, select planting technique, arrangement and spacing design, and timing appropriate for the site light and soil conditions. (NRCS will provide technical assistance, as needed.)

TASK	Species	Species	Species
Planting Date			
Planting Technique			
Arrangement and Spacing			

- ☐ During implementation, install and maintain erosion control measures as needed for the site. (NRCS will provide technical assistance, as needed.)
- ☐ During implementation, protect plantings from competition from invasive plants.
- ☐ During implementation, protect the planting from plant and animal pests and fire.
- ☐ During implementation, notify NRCS in writing of any planned changes to verify changes meet NRCS enhancement criteria.

NRCS will:

- ☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Tree/Shrub Site Preparation (Code 490) as it relates to implementing this enhancement.

Verify the enhancement is planned for acres that have been appropriately prepared for tree/shrub establishment.

- Prior to implementation, provide and explain NRCS Conservation Practice Standard Tree/Shrub Establishment (Code 612) as it relates to implementing this enhancement.

- Prior to implementation, provide and explain NRCS Conservation Practice Standard Integrated Pest Management (Code 595) as it relates to implementing this enhancement.

- Prior to implementation, verify no plants on the Federal or state noxious weeds list are included.

- As needed, prior to implementation, NRCS will provide technical assistance:
  - Planning site preparation meeting NRCS Conservation Practice Standard Tree/Shrub Site Preparation (Code 490).
  - Selecting a combination of tree and shrub species to establish stocking levels that meet enhancement criteria.
  - Selecting planting techniques, arrangement and spacing design, and timing appropriate for the site and soil conditions.
  - Planning the use of additional erosion control, as needed for the site.
  - Preparing specifications for applying this enhancement for each site using approved state implementation requirements, national technical notes, appropriate state technical notes, and narrative statements in the conservation plan, or other acceptable documentation.

- During implementation, evaluate any planned changes to verify they meet the enhancement criteria.

- After implementation, verify the planned trees and shrub species were established to specifications developed for the site.

- After implementation, verify the planting is protected from pests and fire.

- After implementation, verify all erosion control needed for the site is functioning and is maintained to specifications developed for the site.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

CONSERVATION ENHANCEMENT ACTIVITY

E612C

Establishing tree/shrub species to restore native plant communities

Conservation Practice 612: Tree/Shrub Establishment

APPLICABLE LAND USE: Forest; Range; Associated Ag Land

RESOURCE CONCERN: Plants

ENHANCEMENT LIFE SPAN: 15 YEARS

Enhancement Description:

Establish trees and/or shrubs to restore elements of plant diversity that have been lost through past diseases or improper management. For example, disease-resistant varieties of elm and chestnut can be established to restore the ecological functions of American elm and American chestnut. At the stand level, past forest management may have eliminated certain native tree species. Restoring stand-level diversity and function addresses a wide array of resource concerns and strengthens ongoing management activities. This enhancement improves a forest that is already in good condition by increasing plant diversity, and improving health and vigor through adding plants with resistance to disease, pests, or other local hazards. Additional benefits include contributing to carbon storage, and providing diversity in wildlife habitat and food sources.

Criteria:

States will apply general criteria from the NRCS National Conservation Practice Standard (CPS) Tree/Shrub Establishment (Code 612) as listed below, and additional criteria as required by the NRCS State Office.

- Trees/shrubs selected for planting will be adapted to site conditions and suited for the restoration of stands where past impacts of disease and/or pests has reduced species diversity.

- No trees on the Federal or state noxious weeds list, or trees known to be aggressive and/or potentially invasive in the local area, shall be planted.

- A minimum of three different species of trees and/or shrubs should be planted. An exception is in situations where a lost species is being restored to a fully-stocked forest stand (i.e., American elm, American chestnut).

- Trees/shrubs selected must be of good quality. Only viable, high-quality and adapted planting stock or seed will be used.

- Proper planting dates and care in handling and planting the trees/shrubs will ensure an acceptable rate of survival.

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

- Planting density will be adequate to accomplish the long-term goal for the property.

- Survival surveys must be conducted to determine if targeted goals are met.

- A precondition for tree/shrub establishment is appropriately prepared sites. Refer to criteria in NRCS CPS Tree/Shrub Site Preparation (Code 490).

- Refer to criteria in NRCS CPS Integrated Pest Management (Code 595) to assist with site-specific strategies for pest prevention, pest avoidance, pest monitoring, and pest suppression. Protect plantings from competition from invasive plants and other environmental stressors.

- Each site will be evaluated to determine if mulching, supplemental water or other treatments (e.g., tree protection devices, shade cards, weed mats) will be needed to assure adequate survival and growth.

- The enhancement will comply with all applicable federal, state, and local laws and regulations, and with States' Forestry Best Management Practices for Water Quality.

Documentation and Implementation Requirements

Participant will:

- ☐ Prior to implementation, prepare the planned acres for tree or shrub establishment. Refer to NRCS CPS Tree/Shrub Site Preparation (Code 490). (NRCS will provide technical assistance, as needed.)

- ☐ Prior to implementation, select a combination of at least three native tree and shrub species that will increase plant and stand diversity and use plants with established resistance to known disease, pests, or other local hazards. (NRCS will provide technical assistance, as needed.)

Species	Note specific species characteristic(s)

- ☐ Prior to implementation, select planting technique, arrangement and spacing design, and timing appropriate for the site and soil conditions. (NRCS will provide technical assistance, as needed.)

Planting Date	
Planting Technique	
Arrangement and Spacing	

- ☐ During implementation, use forms of erosion control as needed for the site. (NRCS will provide technical assistance, as needed.)

- ☐ During implementation, notify NRCS of any planned changes to verify changes meet NRCS enhancement criteria.

- ☐ During implementation, protect the planting from plant and animal pests and fire.

- ☐ During implementation, maintain all erosion control needed for the site.

NRCS will:

- ☐ Prior to implementation, verify the land use planned for this enhancement.

- ☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Tree/Shrub Site Preparation (Code 490) as it relates to implementing this enhancement. Verify the enhancement is planned for acres that have been appropriately prepared for tree/shrub establishment.

- ☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Tree/Shrub Establishment (Code 612) as it relates to implementing this enhancement.
- ☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Integrated Pest Management (Code 595) as it relates to implementing this enhancement.
- ☐ Prior to implementation, verify no plants on the Federal or state noxious weeds list are included.
- ☐ As needed, prior to implementation, NRCS will provide technical assistance:
  - Planning site preparation meeting NRCS Conservation Practice Standard Tree/Shrub Site Preparation (490).
  - Selecting a combination of native and disease resistant tree and shrub species.
  - Selecting planting techniques, arrangement and spacing design, and timing appropriate for the site and soil conditions.
  - Planning the use of additional erosion control, as needed for the site.
  - Preparing specifications for applying this enhancement for each site using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.
- ☐ During implementation, evaluate any planned changes to verify they meet the enhancement criteria.
- ☐ After implementation, verify the planned native trees and shrub species were established to specifications developed for the site.
- ☐ After implementation, verify the planting is protected from pests and fire.
- ☐ After implementation, verify all erosion control needed for the site is functioning and is maintained to specifications developed for the site.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

Conservation Practice Overview

Month, Year

Herbaceous Weed treatment (Code 315)

Herbaceous weed treatment is the removal or control of herbaceous weeds including invasive, noxious, prohibited, or undesirable plants.

Practice Information

This practice applies to all lands—except active cropland—where herbaceous weeds need to be removed, reduced, or otherwise manipulated.

This practice is used to control undesirable plants while protecting or enhancing desired plant species. This practice can enhance the quality and quantity of forage, restore wildlife habitat, protect soils from erosion, reduce fuel loads and wildfire hazards, and control pervasive plants on the site. Ecological site descriptions, when available, other suitable information, and the producer's purpose for applying the practice are used to enhance plant communities adapted to the site.

Treatment methods for undesired plants can be chemical, mechanical, or biological. Herbicide use always requires following product labels. Selective herbicides can treat the target species and minimize impacts to the desired and native vegetation. Mechanical treatment methods can include mowing, manually removing, or other nonchemical methods. Biological treatment with NRCS assistance can be done when using grazing or browsing animals.

Herbaceous weeds can shade out desired species and leave the soil vulnerable to erosion. When treating the weeds, efforts to minimize soil disturbance must be taken to avoid potential erosion. Pervasive weeds may need more than one treatment to control them to the desired level.

Whichever treatment method is chosen—chemical, mechanical, or biological—a written plan with specific details is part of planning to use this practice.

Operation and maintenance of this practice is especially important as weeds can resprout or regrow with favorable conditions.

Common Associated Practices

NRCS Conservation Practice Standard (CPS) Herbaceous Weed Treatment (Code 315) is commonly applied with other conservation practices, such as NRCS CPSs Prescribed Grazing (Code 528), Pasture and Hay Planting (Code 512), Nutrient Management (Code 590), Conservation Cover (Code 327), Range Planting (Code 550), Tree /Shrub Establishment (Code 612), or Wildlife Habitat Planting (Code 420).

For further information, contact your local NRCS field office.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

HERBACEOUS WEED TREATMENT

CODE 315

(ac)

DEFINITION

The removal or control of herbaceous weeds including invasive, noxious, prohibited, or undesirable plants.

PURPOSE

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

- Enhance accessibility, quantity, and/or quality of forage and/or browse
- Restore or release native or desired plant communities for wildlife habitat
- Protect soils and control erosion
- Reduce fine fuel loads and wildfire hazard
- Control pervasive plant species to a desired level of treatment

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on all lands except active cropland where removal, reduction, or manipulation of herbaceous vegetation is desired.

This practice does not apply to removal of herbaceous vegetation for a land use change or by prescribed fire. Refer to NRCS Conservation Practice Standards (CPSs) Land Clearing (Code 460) or Prescribed Burning (Code 338), repectively.

CRITERIA

General Criteria Applicable to All Purposes

Apply herbaceous weed treatment to achieve the desired control of the target species and protection or enhancement of desired species. Desired species contribute positively to land use objectives and site potential. Use mechanical, chemical, or biological methods either alone or in combination.

Control pervasive and undesirable herbaceous vegetation to the desired level of treatment that contributes to the desired state of an ecological site.

NRCS will not develop insect biological control recommendations or chemical treatment recommendations.

NRCS can provide clients with acceptable biological and/or chemical control references to achieve desired management objectives.

NRCS can provide recommendations for biological control to manage herbaceous weeds utilizing grazing animals. Use NRCS CPS Prescribed Grazing (Code 528) to ensure desired results are achieved and maintained.

Nonchemical weed management techniques such as mowing, manually removing, or spot-flaming infestations can be effective.

When using herbicides, follow all environmental hazards and site-specific application criteria listed on herbicide labels and contained in extension service and other approved pest management references. Access the most recent herbicide labels at the Greenbook Web site (http://www.greenbook.net).

Include post-treatment measures to achieve resource management objectives.

Control livestock and human access based on management methods applied and restrictions listed on the herbicide labels.

Manage and/or dispose of treated weed species that prevents the spread of herbaceous weeds to new sites.

When the herbaceous weed treatment of undesirable species results in the need to reestablish desired herbaceous species, follow details in the appropriate vegetation establishment practices such as NRCS CPSs Pasture and Hay Planting (Code 512), Cover Crop (Code 340), Conservation Cover (Code 327), Range Planting (Code 550), Critical Area Planting (Code 342), Tree /Shrub Establishment (Code 612), or Wildlife Habitat Planting (Code 420).

Incorporate weed prevention strategies that include—

- Minimizing soil disturbance.
- Minimizing movement of equipment through weed infested areas.
- Inspecting and cleaning equipment to prevent spread of undesired vegetation.

Apply treatments during periods of the year when weed species are most vulnerable and when restoration of the native or desired plant communities have the best chance of recovery.

Adjacent land uses must be considered before chemicals are used. Also consider the residual effects of chemical use. Follow label and State guidelines on setbacks and other precautions from sensitive areas and surface water bodies or karst topography.

Additional Criteria to Enhance Accessibility, Quantity, and Quality of Forage and/or Browse

Apply herbaceous weed treatments that minimize negative impacts to forages and/or other nontargeted plants. Plan timing and sequence of treatment in coordination with specifications developed for NRCS CPS Prescribed Grazing (Code 528) or Forage Harvest Management (Code 511).

Additional Criteria to Restore or Release Native or Desired Plant Communities for Wildlife Habitat

Apply herbaceous weed treatments that protect the health and vigor of native or desired plant species to preserve and enhance habitat for pollinator insects and wildlife. Time treatments to periods of the year that accommodate reproduction and other life cycle requirements of target wildlife and pollinator species. Select treatments that maintain or enhance plant community composition and structure to meet the requirements of target wildlife and pollinator species.

Use applicable ecological site description (ESD) state and transition models, or other suitable information, to develop specifications that are ecologically sound and defensible. Treatments must be congruent with dynamics of the ecological site(s) and keyed to states and plant community phases that have the potential and capability to support the desired plant community. If an ESD is not available, base specifications on the best approximation of the desired plant community composition, structure, and function.

Use native vegetation to preserve and enhance pollinator insects as well as wildlife.

Additional Criteria to Protect Soils and Control Erosion

Herbaceous weed species shade out desired plants exposing more soil for potential erosion. Use caution when applying herbaceous weed treatments to minimize soil disturbance and soil erosion.

Apply additional treatments to protect soils and prevent erosion.

Additional Criteria to Reduce Fine Fuel Loads and Wildfire Hazard

Treat weed species to create a native or desired plant community that reduces the potential for accumulating excessive fuel loads and wildfire hazards.

Apply treatment methods that minimize the potential for unintended impacts to air resources (e.g., dust, chemical drift, etc.) that could also damage or kill plants, thereby contributing to wildfire hazard.

Additional Criteria to Control Pervasive Plant Species to a Desired Level of Treatment

When specific pervasive plant species cannot be controlled with one treatment, plan and apply additional treatments to achieve effective control through reapplication which may be more than once per growing season or multiple years.

CONSIDERATIONS

Consider using NRCS CPS Pest Management Conservation System (Code 595) in support of herbaceous weed treatment.

Consider soil erosion potential and difficulty of vegetation establishment when choosing a method of control that causes soil disturbance.

Consider the appropriate time period for treatment. Some herbaceous weed treatment activities can be effective when applied within a single year; others may require multiple years of treatments to achieve desired objectives.

Consider impacts to wildlife species. In general, weed treatments that create a mosaic pattern may be the most desirable. Leaving native grasses, forbs, and woody vegetation encourages a higher variety of wildlife and pollinators. When using selective herbicides, leaving other desired plant species also benefits wildlife and pollinators.

Consider impacts to wildlife food supplies, space, and cover availability when planning the method and amount of herbaceous weed treatment.

State-issued licenses may be required when using chemical pesticide treatments.

For air quality purposes, consider using chemical methods of herbaceous weed treatment that minimize chemical drift and excessive chemical usage. Consider mechanical methods of herbaceous weed treatment that minimize the entrainment of particulate matter.

Design and execute a plan using adaptive management to apply knowledge gained from earlier treatment applications.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for each field or treatment unit according to the criteria included in this standard. At a minimum, the herbaceous weed treatment management practice plan shall include—

- Goals and objectives statement.
- Plan map and soil map for the site.
- Pretreatment cover or density of the target plants and the planned post-treatment cover or density.
- Maps, drawings, and/or narratives detailing or identifying areas to be treated, pattern of treatment (if

applicable), and areas that will not be disturbed.

- A monitoring plan that identifies what shall be measured (including timing and frequency) and the changes in the plant community (compare with objectives) that occur.
- Apropriate revegetation conservation practice standard(s) needed following treatment (if applicable).
- For mechanical treatment methods, the first five bulleted items above, plus—
  - Type of equipment to use for management.
  - Dates of treatment for effective management.
  - Operating instructions (if applicable).
  - Techniques and procedures to be followed.
- For chemical treatment methods, the first five bulleted items above, plus—
  - Acceptable chemical treatment references for containment and management of target species.
  - Documented techniques to be used, planned dates, and rates of application.
  - Evaluation and interpretation narrative of herbicide risks associated with the selected treatment(s) using Windows Pesticide Screening Tool (WIN-PST) or other approved tools.
  - Consideration of any special mitigation, timing, or other factors (such as soil texture, distance to water, and organic matter content) to ensure the safest, most effective application of the herbicide.
  - Reference product label instructions.
- For biological treatments methods, the first five bulleted items above, plus—
  - Acceptable biological treatment references for the selected biological control livestock used to contain and manage the target species.
  - Documentation of release date, kind, and number of livestock.
  - Timing, frequency, duration, and intensity of grazing or browsing.
  - Desired degree of grazing or browsing use for effective management of target species.
  - Maximum allowable degree of use on desirable nontarget species.
  - Special mitigation, precautions, or requirements associated with the selected treatment(s).

OPERATION AND MAINTENANCE

Operation

Herbaceous weed treatment methods shall be applied using approved materials and procedures. Operations will comply with all local, State, Tribal, and Federal laws and ordinances. The landowner is responsible for obtaining any permits prior to practice implementation. Observe State and Federal restricted-use pesticides and certified pesticide applicator's license requirements.

Develop a safety plan for individuals exposed to chemicals, including telephone numbers and addresses of emergency treatment centers and the telephone number for the nearest poison control center.

The National Pesticide Information Center (NPIC) telephone number in Corvallis, OR, may also be given for nonemergency information: 1-800-858-7384, Monday to Friday, 6:30 a.m. to 4:30 p.m., Pacific Time. The national Chemical Transportation Emergency Center (CHEMTRAC) telephone number is: 1-800-424-9300.

- Follow label requirements for mixing/loading setbacks from wells, intermittent streams and rivers, natural or impounded ponds and lakes, and reservoirs.
- Post signs according to label directions and/or Federal, State, Tribal, and local laws, around fields

that have been treated. Follow restricted entry intervals.

- Dispose of herbicide and herbicide containers in accordance with label directions and adhere to Federal, State, Tribal, and local regulations.
- Read and follow label directions and maintain appropriate safety data sheets. Safety data sheets and herbicide labels can be accessed at the Greenbook Web site (http://www.greenbook.net).
- Calibrate application equipment according to recommendations before each seasonal use and with each major chemical and site change.
- Replace worn nozzle tips, cracked hoses, and faulty gauges on spray equipment.
- Maintain records of plant management for at least 2 years. Herbicide application records shall be in accordance with USDA Agricultural Marketing Service's Pesticide Recordkeeping Program and State-specific requirements.

Maintenance

Success of the practice shall be determined by evaluating regrowth or reoccurrence of target and desired species after sufficient time has passed to monitor the vegetation and gather reliable data. Length of evaluation periods depend on the herbaceous weed species being monitored, proximity of propagules (seeds, plant materials, and roots) to the site, transport mode of seeds (wind or animals), and methods and materials used.

Following initial application, regrowth, resprouting, or reoccurrence of herbaceous weeds can be expected. Complete spot treatments of individual plants or areas needing retreatment when weed vegetation is most vulnerable to desired treatment procedures.

Review and update the herbaceous weed treatment plan periodically to—

- Incorporate new integrated pest management technology,
- Respond to grazing management and complex weed population changes, and
- Follow cooperative extension service guidance to avoid the development of weed resistance to herbicide chemicals.

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United States Department of Agriculture

Conservation Practice Overview

October 2020

Prescribed Burninig (Code 338)

Prescribed burning is applying a planned fire to a predetermined area of land.

Practice Information

Prescribed burning can be applied for several purposes. For the plant community, prescribed burning is used to manage undesirable vegetation and reduce plant pressure caused by pests, pathogens, and diseases. For safety and protection of property, prescribed burning is used to reduce the various risks associated with wildfire. For wildlife, prescribed burning is used to improve terrestrial habitat for wildlife and invertebrates (pollinators), and it improves plant and seed production, quantity, and/or quality. For livestock, prescribed burning is used to improve the livestock-forage balance by enhancing plant productivity and the distribution of grazing and browsing animals. Prescribed burning also improves habitat for soil organisms, thereby enhancing soil health.

Application of this highly specialized practice requires intensive training and sufficient support personnel and equipment. A safe, successful burn must be timed for proper humidity, wind conditions, air temperature, and fuel conditions (ignitable vegetation). Safety precautions are planned before the burn and monitored during the burn. Be aware of your state's smoke management program and use the specific tools your state has implemented to address smoke. Be mindful of the potential air quality impacts that burning might have on downwind communities.

All burn plans must address the following: location and description of the burn area, resource management objectives, preburn vegetation cover, preburn preparation required, weather conditions, equipment checklist, personnel needs and assignments, safety requirements, firing sequence and ignition method, smoke management plans, notification checklist, approval signatures, and postburn evaluation criteria.

Common Associated Practices

NRCS Conservation Practice Standard (CPS) Prescribed Burning (Code 338) is commonly applied with other practices such as NRCS CPSs Fire Break (Code 394), Prescribed Grazing (Code 528), Forest Stand Improvement (Code 666), Forest Trails and Landings (Code 655), Range Planting (Code 550), Forage and Biomass Planting (Code 512), Pest Management Conservation System (Code 595), and other associated harvesting, planting, and seeding practices.

For further information, contact your local NRCS field office.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

PRESCRIBED BURNING

CODE 338

(ac)

DEFINITION

Planned fire applied to a predetermined area.

PURPOSE

Use this practice to accomplish one or more of the following purposes:

- Manage undesirable vegetation to improve plant community structure and composition
- Manage pests, pathogens, and diseases to reduce plant pressure
- Reduce wildfire hazards from biomass accumulation
- Improve terrestrial habitat for wildlife and invertebrates
- Improve plant and seed production, quantity, and/or quality
- Facilitate distribution of grazing and browsing animals to improve forage-animal balance
- Improve and maintain habitat for soil organisms and enhance soil health

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on all lands as appropriate.

CRITERIA

General Criteria Applicable to All Purposes

All prescribed burn plans and applications shall address the following items:

- Location and description of the burn area
- Preburn vegetation cover
- Resource management objectives
- Required weather conditions for prescribed burn
- Notification checklist
- Preburn preparation
- Equipment checklist, personnel assignments, and needs/safety requirements
- Firing sequence
- Ignition method
- Basic smoke management practices to minimize smoke impacts
- Approval signatures
- Postburn evaluation criteria

Additional Criteria for Prescribed Burn Planning

- The procedure, equipment, weather conditions, and the number of trained personnel shall be adequate to accomplish the intended purposes.
- Inventory the location of utilities, such as electric power lines and natural gas pipelines, to prevent damage to the utility and to avoid personal injury and human and vehicular traffic that may be impeded by heat or smoke.
- Monitor weather parameters, smoke dispersion, and other conditions that will affect fire behavior during the burn.
- Use information in “Basic Smoke Management Practices” (O’Neill et al., 2011) for planning and mitigating smoke impacts. Be aware of your state’s smoke management program and utilize the specific tools your state has implemented to address smoke. Be mindful of the potential air quality impacts that burning might have on downwind communities.
- Timing of burning will correspond with desired soil and site conditions to maintain site productivity and minimize effects on soil health.
- Control points; existing barriers such as lakes, streams, wetlands, roads, and constructed firebreaks; and areas devoid of fuel are important to the design and layout of this practice.
- Notify adjoining landowners, local fire departments, and public health and safety officials as appropriate within the airshed prior to burning.

CONSIDERATIONS

Consider integration of NRCS Conservation Practice Standards (CPSs) Firebreak (Code 394) or Fuel Break (Code 383) into land preparation prior to the prescribed burn. Utilize NRCS CPS Prescribed Grazing (Code 528) to manage fuel loads prior to the burn and grazing use of vegetation postburn.

Consider using prescribed burning as a pathway for restoring ecological sites to reference or other states referred to in the ecological site description(s) and state and transition models for the area. Consider wildlife and pollinator needs such as nesting, brood rearing, feeding, and cover when applying prescribed burns.

Consider cultural resources and inventory any sites found within the burn unit and design the burn to avoid any possible damage.

Consider minimizing carbon release by the timing and intensity of the burn.

Consider utilizing prescribed burning to prepare sites for planting or enhancing seed and seedling production.

Consider using prescribed burning to remove slash and debris.

Integrate safety and health precautions into the timing, location, and expected intensity of the burn.

PLANS AND SPECIFICATIONS

Qualified individuals will complete a written prescribed burn plan with specifications for each site using approved burn plan templates, specification sheets, implementation requirements, and technical notes, in support of the conservation plan. Ensure landowner or operating manager has obtained all necessary State, local, and Tribal permits prior to implementation of the burn plan.

OPERATION AND MAINTENANCE

Operation

During the implementation of this practice, the variability of inherent site factors (e.g., topography, fuels, and weather conditions) on fire behavior, as well as heat and smoke impacts on people, vehicles, and property, must be accounted for and monitored, as appropriate.

Prescribed burning activities shall follow the direction of the burn boss (ultimate decision-maker) and designated personnel in accordance with the approved burn plan and NRCS policy. The prescribed burn plan, and the actions contained in the burn plan as carried out at the direction of the burn boss and designated personnel, will reduce risk to life and public safety and provide protection of values at risk for prescribed fire participants as well as adjacent and local values at risk.

Appropriate levels of trained and equipped personnel are essential for the successful and safe implementation of prescribed fires in all scenarios and land uses.

Requirements for burn weather, necessary resource staffing, and equipment availability correspond to expected fire behavior. The burn boss can override these requirements—in writing at the time of burn—if conditions warrant such action.

A test fire should be ignited prior to all burns to monitor fire behavior, fire effects, consumption, and smoke dispersal.

To effectively minimize postfire escapes, suppression and mop-up must be completed that ensures no fire, embers, or other ignition sources will escape beyond the designated burn area.

Maintenance

All fires will be monitored and evaluated postfire to determine that predetermined burn objectives and metrics were met based on the identified resource concern. This may include but is not limited to targeted—

- Density, structure, and composition of native plant communities.
- Plant productivity and health.
- Reduction of plant pest populations and nonnative plants.
- Reduction in hazardous fuels.
- Improvements in wildlife habitat elements.

All postfire monitoring will be used to inform prescriptions for future burn plans to ensure safe, efficient, and effective application of prescribed fire to achieve resource concern objectives across all scenarios and land uses. Employ NRCS CPS Prescribed Grazing (Code 528) to maintain overall objectives of the burn and manage vegetation for livestock. Consider maintaining firebreaks using NRCS CPS Firebreak (Code 394) for followup burns and wildfire protection.

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Conservation Practice Standard Overview

Tree/Shrub Establishment (Code 612)

Tree/shrub establishment involves planting seedlings or cuttings, seeding, or creating conditions that promote natural regeneration.

Practice Information

Trees and shrubs can be established for a variety of purposes. Conservation benefits may include, but are not limited to—

- establishing forest cover
- enhancing wildlife habitat
- controlling erosion
- improving water quality
- capturing and storing carbon
- conserving energy

Species selection, site preparation, planting date and method, and tree spacing will vary depending on the planned purpose and site conditions. Once planted, trees and shrubs need to be inspected periodically and protected from insects, diseases, competing vegetation, fire, and damage from livestock or wildlife.

Depending on the site, supplemental water may be required to ensure survival during the establishment period, typically 1 to 3 years. Periodic applications of nutrients may be needed to maintain plant vigor.

Common Associated Practices

Tree/Shrub Establishment (Code 612) is commonly associated with conservation practices such as Tree/Shrub Site Preparation (Code 490), Mulching (Code 484), Forest Trails and Landings (Code 655), Upland Wildlife Habitat Management (Code 645), Critical Area Planting (Code 342), Brush Management (Code 314), Herbaceous Weed Control (Code 315), Integrated Pest Management (Code 595), and Access Control (Code 472).

For further information, contact your local NRCS field office.

United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

TREE-SHRUB ESTABLISHMENT

CODE 612

(ac)

DEFINITION

Establishing woody plants by planting, by 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 ecological site 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. 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. 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.

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.

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.

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.

Considerations for Organic Systems During Vegetation Establishment

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.

Invasic plant species may be controlled through mulching with fully biodegradable materials; mowing; livestock grazing with protection for plantings; mechanical cultivation; pre-irrigation; flame, heat or electrical means. Use NRCS CPS Prescribed Burning (Code 338), as needed.

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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CONSERVATION ENHANCEMENT ACTIVITY

E612C

Establishing tree/shrub species to restore native plant communities

Conservation Practice 612: Tree/Shrub Establishment

APPLICABLE LAND USE: Forest; Range; Associated Ag Land

RESOURCE CONCERN: Plants

ENHANCEMENT LIFE SPAN: 15 YEARS

Enhancement Description:

Establish trees and/or shrubs to restore elements of plant diversity that have been lost through past diseases or improper management. For example, disease-resistant varieties of elm and chestnut can be established to restore the ecological functions of American elm and American chestnut. At the stand level, past forest management may have eliminated certain native tree species. Restoring stand-level diversity and function addresses a wide array of resource concerns and strengthens ongoing management activities. This enhancement improves a forest that is already in good condition by increasing plant diversity, and improving health and vigor through adding plants with resistance to disease, pests, or other local hazards. Additional benefits include contributing to carbon storage, and providing diversity in wildlife habitat and food sources.

Criteria:

States will apply general criteria from the NRCS National Conservation Practice Standard (CPS) Tree/Shrub Establishment (Code 612) as listed below, and additional criteria as required by the NRCS State Office.

- Trees/shrubs selected for planting will be adapted to site conditions and suited for the restoration of stands where past impacts of disease and/or pests has reduced species diversity.

- No trees on the Federal or state noxious weeds list, or trees known to be aggressive and/or potentially invasive in the local area, shall be planted.

- A minimum of three different species of trees and/or shrubs should be planted. An exception is in situations where a lost species is being restored to a fully-stocked forest stand (i.e., American elm, American chestnut).

- Trees/shrubs selected must be of good quality. Only viable, high-quality and adapted planting stock or seed will be used.

- Proper planting dates and care in handling and planting the trees/shrubs will ensure an acceptable rate of survival.

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

- Planting density will be adequate to accomplish the long-term goal for the property.

- Survival surveys must be conducted to determine if targeted goals are met.

- A precondition for tree/shrub establishment is appropriately prepared sites. Refer to criteria in NRCS CPS Tree/Shrub Site Preparation (Code 490).

- Refer to criteria in NRCS CPS Integrated Pest Management (Code 595) to assist with site-specific strategies for pest prevention, pest avoidance, pest monitoring, and pest suppression. Protect plantings from competition from invasive plants and other environmental stressors.

- Each site will be evaluated to determine if mulching, supplemental water or other treatments (e.g., tree protection devices, shade cards, weed mats) will be needed to assure adequate survival and growth.

- The enhancement will comply with all applicable federal, state, and local laws and regulations, and with States' Forestry Best Management Practices for Water Quality.

Documentation and Implementation Requirements

Participant will:

- ☐ Prior to implementation, prepare the planned acres for tree or shrub establishment. Refer to NRCS CPS Tree/Shrub Site Preparation (Code 490). (NRCS will provide technical assistance, as needed.)

- ☐ Prior to implementation, select a combination of at least three native tree and shrub species that will increase plant and stand diversity and use plants with established resistance to known disease, pests, or other local hazards. (NRCS will provide technical assistance, as needed.)

Species	Note specific species characteristic(s)

- ☐ Prior to implementation, select planting technique, arrangement and spacing design, and timing appropriate for the site and soil conditions. (NRCS will provide technical assistance, as needed.)

Planting Date	
Planting Technique	
Arrangement and Spacing	

- ☐ During implementation, use forms of erosion control as needed for the site. (NRCS will provide technical assistance, as needed.)
- ☐ During implementation, notify NRCS of any planned changes to verify changes meet NRCS enhancement criteria.
- ☐ During implementation, protect the planting from plant and animal pests and fire.
- ☐ During implementation, maintain all erosion control needed for the site.

NRCS will:

- ☐ Prior to implementation, verify the land use planned for this enhancement.
- ☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Tree/Shrub Site Preparation (Code 490) as it relates to implementing this enhancement. Verify the enhancement is planned for acres that have been appropriately prepared for tree/shrub establishment.

- ☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Tree/Shrub Establishment (Code 612) as it relates to implementing this enhancement.
- ☐ Prior to implementation, provide and explain NRCS Conservation Practice Standard Integrated Pest Management (Code 595) as it relates to implementing this enhancement.
- ☐ Prior to implementation, verify no plants on the Federal or state noxious weeds list are included.
- ☐ As needed, prior to implementation, NRCS will provide technical assistance:
  - Planning site preparation meeting NRCS Conservation Practice Standard Tree/Shrub Site Preparation (490).
  - Selecting a combination of native and disease resistant tree and shrub species.
  - Selecting planting techniques, arrangement and spacing design, and timing appropriate for the site and soil conditions.
  - Planning the use of additional erosion control, as needed for the site.
  - Preparing specifications for applying this enhancement for each site using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.
- ☐ During implementation, evaluate any planned changes to verify they meet the enhancement criteria.
- ☐ After implementation, verify the planned native trees and shrub species were established to specifications developed for the site.
- ☐ After implementation, verify the planting is protected from pests and fire.
- ☐ After implementation, verify all erosion control needed for the site is functioning and is maintained to specifications developed for the site.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

IOWA SUPPLEMENT TO CONSERVATION

ENHANCEMENT ACTIVITY

E612C

Establishing tree/shrub species to restore native plant communities

Additional Criteria for Iowa

- This enhancement must be implemented following a Forest Management Plan developed and/or recently updated by an Iowa Department of Natural Resources (IDNR) Forester or certified TSP.
- Lost species and native species will be determined by the IDNR Forester or certified TSP and included in the Forest Management Plan.

Conservation Practice Overview

November 2022

Forest Stand Improvement (Code 666)

Forest stand improvement is the manipulation of species composition, structure, or density of a stand of trees to achieve desired forest condition.

Practice Information

This practice applies to forestland where competing vegetation interferes with the growth of preferred tree and understory species. Preferred plants are identified and retained to achieve the desired composition and structure of the forest stand.

Specifications for this practice include defining the spacing, density, and number or area of preferred plants. Timing of treatment and retaining dead or dying trees will help minimize impacts on nesting birds and other wildlife. Food and cover for desired wildlife species may be enhanced by modifying tree and understory composition and spacing.

Conservation benefits may include but are not limited to:

- Improved plant health and productivity.
- Improved forest structure and composition.
- Reduced susceptibility to pests and moisture stress.
- Reduced wildfire hazard.
- Improved wildlife, fish, and pollinator habitat.
- Manage natural precipitation more efficiently.
- Increased carbon storage.

Common Associated Practices

Forest Stand Improvement (666) is commonly applied with practices such as Woody Residue Treatment (384), Pest Management Conservation System (595), Brush Management (314), Herbaceous Weed Treatment (315), Access Control (472), Critical Area Planting (342), Firebreak (394), Fuel Break (383), Forest Trails and Landings (655), Access Road (560), Prescribed Burning (338), Tree-Shrub Pruning (660), Upland Wildlife Habitat Management (645), Early Successional Habitat Development-Management (647), Restoration of Rare and Declining Natural Communities (643), Wetland Wildlife Habitat Management (644), and various erosion control practices.

For further information, contact your local NRCS field office.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

FOREST STAND IMPROVEMENT

CODE 666

(ac)

DEFINITION

The manipulation of tree and shrub species composition, structure, or density to achieve desired forest conditions.

PURPOSE

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

- Maintain or improve forest carbon stocks.
- Maintain or improve forest health and productivity.
- Maintain or improve forest structure and composition.
- Maintain or improve wildlife, fish, and pollinator habitat.
- Manage natural precipitation more efficiently.
- Reduce forest pest pressure.
- Reduce forest wildfire hazard.

CONDITIONS WHERE PRACTICE APPLIES

All land where the quantity and quality of trees can be enhanced.

CRITERIA

General Criteria Applicable to All Purposes

Use appropriate silvicultural techniques to achieve the desired future conditions that meet client objectives and are compatible with the site.

Comply with applicable Federal, State, and local laws and regulations. Protect and maintain water quality and hydrologic conditions by controlling and minimizing rutting, compaction, soil erosion, and damage to desirable residual vegetation. Protect soil and site resources from vehicle impacts from temporary vehicle access impacts. Retire unused forest roads, trails, and landings, as needed.

Assess risk to water quality associated with herbicide movement through leaching, solution runoff, and soil absorbed runoff referenced in NRCS CPS Pest Management Conservation System (Code 595), and comply with applicable State and local laws when herbicides are used for forest stand improvement.

Reduce wildfire, safety, environmental, or pest hazards associated with woody debris. Treat remaining woody material to avoid interference with the intended purpose or other management activities. Use prescribed burning to broadcast-burn onsite slash and other debris, as appropriate.

Additional Criteria to Maintain or Improve Carbon Stocks

Manage carbon sequestration by manipulating forest characteristics that alter the rate of plant photosynthesis wherein atmospheric carbon is captured and stored within trees and vegetation. To increase carbon sequestration, maintain or increase the extent of forest stands. Use techniques that increase the growth and vigor of trees and shrubs, especially relatively young plants. Implement appropriate forest regeneration methods following natural or human-caused disturbances and within understocked productive forests.

Manage carbon storage by manipulating the amount of trees, vegetation, woody debris, and soil organic matter, wherein carbon is stored in trees, plants and soils as a “carbon stock.” To increase carbon stocks, retain trees for as long as is practicable and enhance horizontal and vertical distribution of trees. Retain woody debris intact onsite for a long as permissible based on wildfire hazard. Build forest resilience by favoring preferred species that are better adapted to increased temperatures and extreme weather. To increase soil carbon storage, adopt techniques for maintaining and improving soil health, such as appropriately distributing soil organic matter for the site and maintaining future inputs through decomposition of woody debris.

Additional Criteria to Maintain and Improve Forest Health and Productivity

Use appropriate tools, such as ecological site descriptions, tree and shrub suitability groups, natural reference conditions, and regional guidelines to determine trees adapted to the site. Treatments, including litter and woody biomass removal, will be sustainable, will maintain or improve soil organic matter and wildlife habitat, and will recruit and retain acceptable levels of coarse woody debris for the site. Manipulate stand characteristics to mitigate harmful plant, insect, and disease risk.

Additional Criteria to Maintain or Improve Forest Structure and Composition

Manage forest structure by manipulating the horizontal and vertical distribution of trees. Manage forest composition by manipulating proportions of individual tree species. Use appropriate ecological site descriptions, tree and shrub suitability groups, natural reference conditions, and regional guidelines to determine compatible structure and composition. Use appropriate silvicultural methods to ensure adequate natural regeneration or to facilitate artificial regeneration.

Additional Criteria to Maintain or Improve Wildlife, Fish, and Pollinator Habitat

Use appropriate State wildlife habitat guidelines, wildlife habitat evaluation guides, stream or riparian zone assessments, best management practices, or other applicable tools to estimate the value of the treatment area for target wildlife, fish, and pollinators before and after forest stand improvement activities. Manage food (e.g., hard and soft mast, pollen, nectar), cover (e.g., live and dead trees, roosts, nest sites, perches, down woody material), space, and water, as well as the arrangement of these habitat elements, at the appropriate scale to meet desired wildlife, fish, and pollinator habitat requirements.

Time forest stand improvement activities to minimize disturbance to seasonal wildlife, fish, and pollinator activities, such as breeding, dispersal, migration, hibernation, etc. Use habitat creation and maintenance criteria in NRCS CPSs Early Successional Habitat Development/Management (Code 647), Restoration of Rare or Declining Natural Communities (Code 643), Structures for Wildlife (Code 649), Upland Wildlife Habitat Management (Code 645), or Wetland Wildlife Habitat Management (Code 644), as appropriate, to manage wildlife-related activities.

Additional Criteria to Manage Natural Precipitation More Efficiently

Create a mosaic of age classes to increase water yield and stabilize seasonal water yield from watersheds. Create openings in the forest canopy to allow more sunlight to reach the ground, stimulating understory vegetation and diversifying plant species composition and vertical structure. Retain leaf litter, needles, and other biomass onsite. These improvements will increase rainfall infiltration and reduce runoff, thereby reducing soil erosion and improving water quality.

Additional Criteria to Reduce Forest Pest Pressure

Reduce forest damage from harmful plants, animals, diseases, and other pests by creating resilient forest conditions and managing plant hosts. Use appropriate tools, such as USDA Forest Service forest insect and disease leaflets, USDA APHIS pests and diseases resources, ecological site descriptions, tree and shrub suitability groups, regional guidelines, and natural reference conditions to determine resilient forest conditions.

Additional Criteria to Reduce Forest Wildfire Hazard

Manage stocking rates and alter spatial arrangement of trees to reduce wildfire hazard. Use criteria for wildfire risk, including reduction of ladder fuels, in NRCS CPSs Firebreak (Code 394), Fuel Break (Code 383), or Woody Residue Treatment (Code 384), as appropriate.

CONSIDERATIONS

General Considerations

Enlist the assistance of a professional forester in developing management alternatives. Use prevention, avoidance, monitoring, and suppression (“PAMS”) strategies such as cleaning boots, gear, vehicles, and equipment and controlling existing pests prior to forest stand improvement implementation to avoid spreading pests. Cut trees along forest trails and roads to “daylight” these accessways, if compatible with the intended purpose and pests are controlled.

Consider the effects of grazing and browsing by livestock and wildlife on desirable vegetation and implement measures to control, if needed.

Consider retaining slash and woody debris on site for nutrient cycling and carbon storage. When removal of woody materials is necessary, consider using it for bioenergy, renewable energy production, or biochar. Leave trees that are attractive in shape and structure or flower and are appropriate for the site, especially around structures, roads, and home sites.

Considerations to Maintain or Improve Carbon Stocks

Consider the forest’s natural disturbance regime, traits, successional status, structure, and composition as these factors may affect carbon storage and sequestration. In fire-adapted landscapes, implement prescribed burning and thinning treatments that mimic the natural fire regime to reduce catastrophic carbon losses from wildfire. Consider individual species’ growth rate, size at maturity, lifespan, and historical range when selecting species to manage.

Lengthen rotations and manage for species likely to be used in durable manufactured products. Use crop tree management techniques to concentrate growth on suitable long-lived species, where appropriate.

Considerations to Maintain or Improve Forest Health and Productivity

Silvicultural objectives and harvest-regeneration strategies may change over time and may be limited by prior management. Rehabilitation of stands that have been repeatedly degraded by exploitative timber harvesting (e.g., high-grading) may require development of a complex site-specific treatment plan with multiple entries into the stand. Consider crop tree management when making decisions about which trees to retain and which to cut or kill. Successful regeneration of desirable species is usually dependent upon timely application of forest stand improvement and its associated practices.

Within the limits of access, pests, wildfire risk, wildlife movements, and other factors, consider retaining at least one-fourth to one-third of the slash, tops, and limbs after harvest to protect site productivity. When using whole-tree harvesting systems minimize the removal of needles or leaves by harvesting in the dormant season, retaining fine woody materials onsite, or leaving felled trees onsite to allow for needle or leaf drop.

Considerations to Maintain or Improve Wildlife, Fish, and Pollinator Habitat

Mimic natural disturbance regimes to meet habitat requirements of native wildlife, fish, and pollinators. Create a mosaic of stands with different ages, species composition, and vertical structure if the client objective is to benefit a variety of wildlife, fish, and pollinator species. Consider removing vines from crop trees, but retaining vines with wildlife value (e.g., grape and poison ivy) on noncrop trees. Consider the impacts to water temperature and woody debris in the water when using forest stand improvement above and adjacent to aquatic systems.

PLANS AND SPECIFICATIONS

Plans and specifications for applying this practice will be prepared for each site and recorded using approved specification sheets, implementation requirements, technical notes, and narrative statements in the conservation plan or other acceptable documentation. At a minimum, provide—

- Objectives for forest stand improvement.
- Map showing the treatment location including size and relevant topographical features, such as slope, aspect, and landform.
- Silvicultural prescription.
- Treatment method, such as mechanical or hand felling, girdling, stem injection, etc.
- Tree species to be retained or to be cut or killed.
- Timing of treatment relative to seasonal factors, plant physiology, disease, insects, and wildlife impacts.
- Existing, post-treatment, and desired future condition of the stand of trees using appropriate metrics derived from locally accepted forest inventory methods, such as:
    - basal area,
    - diameter at breast height,
    - trees per acre,
    - species composition,
    - stocking, and
    - structure.
- Landowner is responsible for notifications and for obtaining all necessary permits for the project prior to implementation.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the site and review it with the client. The plan will describe actions that must be taken to ensure that the practice is applied correctly during its lifespan. As a minimum, include periodic inspections for assessment of invasive plants, insects, disease, and other pests, damage by storms and trespass, and erosion.

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CONSERVATION ENHANCEMENT ACTIVITY

E666H

CONSERVATION STEWARDSHIP PROGRAM

Increase on-site carbon storage

CONSERVATION PRACTICE: 666 - Forest Stand Improvement

APPLICABLE LAND USE: Forest; Associated Ag Land; Farmstead

RESOURCE CONCERN: Soil, Air

ENHANCEMENT LIFE SPAN: 10 years

Enhancement Description

Use forest management techniques to maintain and increase on-site carbon storage. These include, but are not limited to, applying uneven-aged management, using longer rotations, retaining cavity/den trees, snags, and down woody debris, and protecting or increasing soil organic matter.

Criteria

- Apply all of the following activities:
  - Retain all snags and downed woody debris of 6" diameter or larger at the base.
  - Identify leave-trees or clumps of trees that will be retained on site throughout their life span. These would ideally be trees that also provide wildlife habitat (e.g., future cavity/den trees, species that develop loose bark at older ages, mast producers, etc.).
  - Close unneeded roads and limit off-road vehicular traffic to avoid displacing the forest litter layer.

- Apply at least one activity from among the following as appropriate for the site:
  - Transition from even-aged to uneven-aged management.
  - Use regeneration methods (e.g., group selection, shelterwood, seed-tree, expanding gap) that call for retention of mature trees during the period when advanced regeneration develops.
  - Adopt techniques for maintaining and/or improving soil quality, specifically retention or organic carbon.
  - Maintain canopy cover to shade the forest floor and avoid hastening decomposition.

- During forest management activities, apply the following criteria:
    - Identify and retain preferred tree and understory species to achieve all planned purposes and landowner objectives.
    - Use available guidelines for species and species groups to determine spacing, density, size-class distribution, number of trees, and amount of understory species to be retained. Schedule treatments to maintain the stand, as much as possible, consistent with chosen regeneration method, in a fully stocked condition based on appropriate stocking guide.
    - Describe the current and desired future condition of each stand that will be treated. Include the species, cover type, and size-class distribution. Stocking will be described in terms of crop trees per acre, basal area per acre, trees per acre, between-tree spacing, or by any other appropriate and professionally accepted density or stocking protocol.
    - Implement forest stand improvement activities in ways that avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions. Refer to Conservation Practice Standard Forest Trails and Landings (Code 655) and Road/Trail/Landing Closure and Treatment (Code 654).
    - The enhancement will comply with all applicable federal, state, and local laws and regulations, and with States' Forestry Best Management Practices for Water Quality.

Documentation and Implementation Requirements

Participant will:

☐ Prior to implementation:

- develop a new or updated forest management plan (FMP) that may reflect a change in management objectives.
- review NRCS Conservation Practice Standard Forest Stand Improvement (Code 666) that contains information needed to meet criteria for this enhancement.
- develop an understanding of the management that this is required to increase carbon storage appropriate for the resource setting to include the following activities:
    - implement forest management activities that begin a transition from even-aged to uneven-aged management.
    - retain dead wood and select trees or clumps of trees that are intended to be left on the site throughout their life span.
    - use regeneration methods (e.g., group selection, shelterwood, seed-tree, expanding gap) that require retention of mature trees during the period when advanced regeneration develops.
    - adopt techniques for maintaining and/or improving soil quality, specifically retention of organic carbon.

  - maintain canopy cover to shade the forest floor and avoid hastening decomposition.
- For forest lands, work with professional forester to prepare or update a current FMP that includes activities required to implement this enhancement. NRCS State Office will determine if a FMP will be required for Associated Ag Land or Farmstead settings. (Request NRCS technical assistance, as needed.)
- Arrange to have a professional forester or wildlife specialist, as part of developing or updating an FMP:
  - identify and map areas, selected trees, or groups of leave trees that can serve as wildlife habitat and that are intended to be left on site throughout their lifespan.
  - describe amounts and condition of standing snags and fallen woody debris with 6" or larger basal diameter.
  - identify and map trails or roads that can be planned for closure.
- Recognize that other NRCS Conservation Practice Standards may be needed to apply this enhancement. These may include:
  - Forest Trails and Landings (Code 655)
  - Road/Trial/Landing Closure and Treatment (Code 654)
  - Woody Residue Treatment (Code 384)
- Acquire all necessary approvals and permits (i.e., local, state, or federal, as applicable).

☐ During implementation:

- Follow FMP guidelines follow state-approved Forestry Best Management Practices (BMPs) to protect streams, water quality, and minimize soil loss.
- Follow FMP guidelines, criteria in NRCS Conservation Practice Standard Forest Stand Improvement (Code 666), and in specifications provided by NRCS, to ensure that:
  - overstory tree and understory species are retained to achieve all planned purposes and landowner objectives.
  - establish required spacing, density, size-class distribution, number of trees, and amount of understory species to be retained.
  - schedule treatments to maintain the stand, as much as possible, consistent with the chosen forest regeneration method, in a fully stocked condition based on appropriate stocking guide.
  - avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions.
- Evaluate and review with NRCS any planned changes to verify they meet the enhancement criteria, as needed.

☐ After implementation:

- Ensure that retained leave areas are properly protected.
- Update the FMP to documentation treatment acres, completion dates and methods, and document representative treatments with digital photos.

- Notify NRCS that the work has been completed and make treatment documentation available for NRCS review and certification.

CONSERVATION STEWARDSHIP PROGRAM

NRCS will:

☐ Prior to implementation:

- Provide and explain the following NRCS Conservation Practice Standards as they relate to implementing this enhancement:
  - Forest Stand Improvement (Code 666)
  - Woody Residue Treatment (Code 384)
- Provide technical assistance in, as needed:
  - Guiding the proper sequence and timing of planned FMP treatment activities to meet requirements to maintain and increase on-site carbon storage.
  - Preparing specifications for applying this enhancement for each site using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.
- Ensure that the participant has a current and complete FMP describing all treatment activities for the resource setting.

☐ During implementation:

- Provide technical assistance if requested by the participant.
- Evaluate any planned changes to verify they meet the enhancement criteria.

☐ After Implementation:

- Verify the enhancement was implemented according to the NRCS Conservation Practice Standard Forest Stand Improvement Standard (Code 666) specifications and meets enhancement criteria.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

Facilitating longleaf pine regeneration and establishment

Conservation Practice 666: Forest Stand Improvement

APPLICABLE LAND USE: Forest, Associated Ag Land

RESOURCE CONCERN: Plants, Animals

ENHANCEMENT LIFE SPAN: 10 Years

Enhancement Description

Facilitate longleaf pine regeneration and establishment following a forest stand improvement treatment for natural regeneration (e.g., a regeneration cut), or where longleaf has been previously planted. After a regeneration cut or a planting, competition from invasive brush and undesirable tree and shrub species often suppresses successful establishment of longleaf pine. This enhancement will release seedling and sapling longleaf from competing invasive plants and other undesirable species. A forester will monitor site conditions, treat competition, protect seedlings, and recommend additional follow-up treatments as needed. The enhancement protects investments in longleaf pine regeneration and establishment by providing for follow-up activities that require the expertise of a professional forester.

Criteria

States will apply general criteria from the NRCS National Conservation Practice Standard Forest Stand Improvement (Code 666) as listed below, and additional criteria as required by the NRCS State Office.

- Develop or update a forest management plan (FMP) in consultation with NRCS personnel and a professional forester to direct the management of the property. The FMP will include guidelines for the amount of advanced longleaf pine regeneration needed to achieve the desired future condition. It will describe the types of competition or other stressors that threaten longleaf survival and recruitment in the area, and recommend facilitating controls such as prescribed burning, chemical, and mechanical treatments to achieve desired outcomes. The FMP will also include guidelines for future inspection and monitoring, types of forest health impacts or stand damage to look for during inspections, and potential supplementary activities that may be needed to achieve longleaf establishment and recruitment.

stands that have already had a seed tree, shelterwood, thinning, or other silvicultural treatment designed to regenerate longleaf pine. The stands must contain an adequate amount of longleaf regeneration or planted trees in the seedling and/or sapling stages, sufficient to achieve stand objectives if they survive and become fully established. The stands must also have evidence that the longleaf regeneration is not "free to grow" due to the presence of competing species. This enhancement is not appropriate for stands that have reached the pole timber size class because they are considered fully established at that point and stand management activities will be different.

- A forestry specialist will inspect the stand and identify existing or potential species of harmful insects, tree diseases, and invasive plants, as well as other biotic and abiotic (i.e. ice storms, drought, flooding, etc.) impacts on forest growth, health, structure and/or composition.

- A forestry specialist will conduct regeneration surveys according to methods described in the NRCS National Forestry Handbook, Title 190, Section 636.2.

- The forestry specialist will make recommendations for short-term treatments as needed. A skilled laborer will implement appropriate activities such as applying mechanical and spot chemical treatments.

- In appropriate settings, prescribed burning may be used to control vegetative competition after longleaf root systems are sufficiently established to re-sprout after a fire. With the recommendation of a forestry specialist, use NRCS Conservation Practice Standard Prescribed Burning (Code 338), or CSP Enhancement E338B, Short-interval burn.

- The forestry specialist will recommend additional practices as needed to correct undesirable forest health conditions. Practices may include: NRCS Conservation Practice Standards Integrated Pest Management (Code 595), Brush Management (Code 314), Herbaceous Weed Control (Code 315), etc..

- Forest stands lacking sufficient longleaf regeneration may need an enrichment planting of longleaf. Use NRCS Conservation Practice Standard Tree and Shrub Establishment (Code 612). Prescribed burning may not be appropriate where trees

have been recently planted.

new or updated Forest Management Plan (FMP) that includes activities required to implement this enhancement. The FMP will identify regeneration needs, competition that impedes longleaf regeneration and recruitment, other forest health concerns, and activities recommended for implementation. The participant will make the FMP available for NRCS review.

- Prior to implementation, arrange for a forestry specialist to inspect the stand and perform the tasks identified in this enhancement.
- Prior to implementation, review the NRCS Conservation Practice Standard Forest Stand Improvement (Code 666) conservation practice standard and other applicable implementation documentation and use the information to meet the criteria of this enhancement.
- During implementation, the participant and the forestry specialist will ensure that regenerating longleaf trees are protected from any damage.
- During implementation, notify NRCS if there are any planned changes, to verify they meet the enhancement criteria.
- After implementation, notify NRCS that the work has been completed and make the following information available to NRCS: dates that inspection was conducted, methods used, and the treatments applied to remove competition and protect young longleafs.

NRCS will:

- Prior to implementation, verify the enhancement activity is planned for acres that meet the criteria within the enhancement guide sheet. Verify that a forest stand improvement treatment to initiate longleaf regeneration, or longleaf planting, was previously applied, that regenerating seedling and/or sapling longleaf pines are present, and that longleaf survival is threatened by competing species and/or other environmental stressors.
- Prior to implementation, provide assistance with interpretation of a new or updated FMP on acres targeted by this enhancement.
- Prior to implementation, provide and explain the following NRCS Conservation Practice Standards as they relate to implementing this enhancement:
    - Forest Stand Improvement (Code 666)

- Herbaceous Weed Control (Code 315)
- Tree /Shrub Establishment (Code 612)
- Tree/Shrub Site Preparation (Code 490)

- As needed, prior to implementation, NRCS will provide technical assistance by:
  - Preparing specifications for applying this enhancement for each site using approved guide sheets, implementation requirements, technical notes, and narrative statements in the conservation plan, or other acceptable documentation, and discussing the details with the participant.
  - Providing methods for conducting regeneration surveys.
- During implementation, provide technical assistance if requested by the participant.
- During implementation, as needed, evaluate any planned changes to verify they meet the enhancement criteria.
- After implementation, certify that the enhancement was completed according to the NRCS Conservation Practice Standard Forest Stand Improvement (CPS 666) specifications and the enhancement criteria.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name_____Contract Number _____

Total Amount Applied_____Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

United States Department of Agriculture

Conservation Practice Overview

October 2020

Prescribed Burninig (Code 338)

Prescribed burning is applying a planned fire to a predetermined area of land.

Practice Information

Prescribed burning can be applied for several purposes. For the plant community, prescribed burning is used to manage undesirable vegetation and reduce plant pressure caused by pests, pathogens, and diseases. For safety and protection of property, prescribed burning is used to reduce the various risks associated with wildfire. For wildlife, prescribed burning is used to improve terrestrial habitat for wildlife and invertebrates (pollinators), and it improves plant and seed production, quantity, and/or quality. For livestock, prescribed burning is used to improve the livestock-forage balance by enhancing plant productivity and the distribution of grazing and browsing animals. Prescribed burning also improves habitat for soil organisms, thereby enhancing soil health.

Application of this highly specialized practice requires intensive training and sufficient support personnel and equipment. A safe, successful burn must be timed for proper humidity, wind conditions, air temperature, and fuel conditions (ignitable vegetation). Safety precautions are planned before the burn and monitored during the burn. Be aware of your state's smoke management program and use the specific tools your state has implemented to address smoke. Be mindful of the potential air quality impacts that burning might have on downwind communities.

All burn plans must address the following: location and description of the burn area, resource management objectives, preburn vegetation cover, preburn preparation required, weather conditions, equipment checklist, personnel needs and assignments, safety requirements, firing sequence and ignition method, smoke management plans, notification checklist, approval signatures, and postburn evaluation criteria.

Common Associated Practices

NRCS Conservation Practice Standard (CPS) Prescribed Burning (Code 338) is commonly applied with other practices such as NRCS CPSs Fire Break (Code 394), Prescribed Grazing (Code 528), Forest Stand Improvement (Code 666), Forest Trails and Landings (Code 655), Range Planting (Code 550), Forage and Biomass Planting (Code 512), Pest Management Conservation System (Code 595), and other associated harvesting, planting, and seeding practices.

For further information, contact your local NRCS field office.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

PRESCRIBED BURNING

CODE 338

(ac)

DEFINITION

Planned fire applied to a predetermined area.

PURPOSE

Use this practice to accomplish one or more of the following purposes:

- Manage undesirable vegetation to improve plant community structure and composition
- Manage pests, pathogens, and diseases to reduce plant pressure
- Reduce wildfire hazards from biomass accumulation
- Improve terrestrial habitat for wildlife and invertebrates
- Improve plant and seed production, quantity, and/or quality
- Facilitate distribution of grazing and browsing animals to improve forage-animal balance
- Improve and maintain habitat for soil organisms and enhance soil health

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on all lands as appropriate.

CRITERIA

General Criteria Applicable to All Purposes

All prescribed burn plans and applications shall address the following items:

- Location and description of the burn area
- Preburn vegetation cover
- Resource management objectives
- Required weather conditions for prescribed burn
- Notification checklist
- Preburn preparation
- Equipment checklist, personnel assignments, and needs/safety requirements
- Firing sequence
- Ignition method
- Basic smoke management practices to minimize smoke impacts
- Approval signatures
- Postburn evaluation criteria

Additional Criteria for Prescribed Burn Planning

- The procedure, equipment, weather conditions, and the number of trained personnel shall be adequate to accomplish the intended purposes.
- Inventory the location of utilities, such as electric power lines and natural gas pipelines, to prevent damage to the utility and to avoid personal injury and human and vehicular traffic that may be impeded by heat or smoke.
- Monitor weather parameters, smoke dispersion, and other conditions that will affect fire behavior during the burn.
- Use information in “Basic Smoke Management Practices” (O’Neill et al., 2011) for planning and mitigating smoke impacts. Be aware of your state’s smoke management program and utilize the specific tools your state has implemented to address smoke. Be mindful of the potential air quality impacts that burning might have on downwind communities.
- Timing of burning will correspond with desired soil and site conditions to maintain site productivity and minimize effects on soil health.
- Control points; existing barriers such as lakes, streams, wetlands, roads, and constructed firebreaks; and areas devoid of fuel are important to the design and layout of this practice.
- Notify adjoining landowners, local fire departments, and public health and safety officials as appropriate within the airshed prior to burning.

CONSIDERATIONS

Consider integration of NRCS Conservation Practice Standards (CPSs) Firebreak (Code 394) or Fuel Break (Code 383) into land preparation prior to the prescribed burn. Utilize NRCS CPS Prescribed Grazing (Code 528) to manage fuel loads prior to the burn and grazing use of vegetation postburn.

Consider using prescribed burning as a pathway for restoring ecological sites to reference or other states referred to in the ecological site description(s) and state and transition models for the area. Consider wildlife and pollinator needs such as nesting, brood rearing, feeding, and cover when applying prescribed burns.

Consider cultural resources and inventory any sites found within the burn unit and design the burn to avoid any possible damage.

Consider minimizing carbon release by the timing and intensity of the burn.

Consider utilizing prescribed burning to prepare sites for planting or enhancing seed and seedling production.

Consider using prescribed burning to remove slash and debris.

Integrate safety and health precautions into the timing, location, and expected intensity of the burn.

PLANS AND SPECIFICATIONS

Qualified individuals will complete a written prescribed burn plan with specifications for each site using approved burn plan templates, specification sheets, implementation requirements, and technical notes, in support of the conservation plan. Ensure landowner or operating manager has obtained all necessary State, local, and Tribal permits prior to implementation of the burn plan.

OPERATION AND MAINTENANCE

Operation

During the implementation of this practice, the variability of inherent site factors (e.g., topography, fuels, and weather conditions) on fire behavior, as well as heat and smoke impacts on people, vehicles, and property, must be accounted for and monitored, as appropriate.

Prescribed burning activities shall follow the direction of the burn boss (ultimate decision-maker) and designated personnel in accordance with the approved burn plan and NRCS policy. The prescribed burn plan, and the actions contained in the burn plan as carried out at the direction of the burn boss and designated personnel, will reduce risk to life and public safety and provide protection of values at risk for prescribed fire participants as well as adjacent and local values at risk.

Appropriate levels of trained and equipped personnel are essential for the successful and safe implementation of prescribed fires in all scenarios and land uses.

Requirements for burn weather, necessary resource staffing, and equipment availability correspond to expected fire behavior. The burn boss can override these requirements—in writing at the time of burn—if conditions warrant such action.

A test fire should be ignited prior to all burns to monitor fire behavior, fire effects, consumption, and smoke dispersal.

To effectively minimize postfire escapes, suppression and mop-up must be completed that ensures no fire, embers, or other ignition sources will escape beyond the designated burn area.

Maintenance

All fires will be monitored and evaluated postfire to determine that predetermined burn objectives and metrics were met based on the identified resource concern. This may include but is not limited to targeted—

- Density, structure, and composition of native plant communities.
- Plant productivity and health.
- Reduction of plant pest populations and nonnative plants.
- Reduction in hazardous fuels.
- Improvements in wildlife habitat elements.

All postfire monitoring will be used to inform prescriptions for future burn plans to ensure safe, efficient, and effective application of prescribed fire to achieve resource concern objectives across all scenarios and land uses. Employ NRCS CPS Prescribed Grazing (Code 528) to maintain overall objectives of the burn and manage vegetation for livestock. Consider maintaining firebreaks using NRCS CPS Firebreak (Code 394) for followup burns and wildfire protection.

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United States Department of Agriculture

Conservation Practice Standard Overview

Tree/Shrub Establishment (Code 612)

Tree/shrub establishment involves planting seedlings or cuttings, seeding, or creating conditions that promote natural regeneration.

Practice Information

Trees and shrubs can be established for a variety of purposes. Conservation benefits may include, but are not limited to—

- establishing forest cover
- enhancing wildlife habitat
- controlling erosion
- improving water quality
- capturing and storing carbon
- conserving energy

Species selection, site preparation, planting date and method, and tree spacing will vary depending on the planned purpose and site conditions. Once planted, trees and shrubs need to be inspected periodically and protected from insects, diseases, competing vegetation, fire, and damage from livestock or wildlife.

Depending on the site, supplemental water may be required to ensure survival during the establishment period, typically 1 to 3 years. Periodic applications of nutrients may be needed to maintain plant vigor.

Common Associated Practices

Tree/Shrub Establishment (Code 612) is commonly associated with conservation practices such as Tree/Shrub Site Preparation (Code 490), Mulching (Code 484), Forest Trails and Landings (Code 655), Upland Wildlife Habitat Management (Code 645), Critical Area Planting (Code 342), Brush Management (Code 314), Herbaceous Weed Control (Code 315), Integrated Pest Management (Code 595), and Access Control (Code 472).

For further information, contact your local NRCS field office.

United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

TREE-SHRUB ESTABLISHMENT

CODE 612

(ac)

DEFINITION

Establishing woody plants by planting, by 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 ecological site 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. 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. 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.

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.

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.

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.

Considerations for Organic Systems During Vegetation Establishment

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.

Invasic plant species may be controlled through mulching with fully biodegradable materials; mowing; livestock grazing with protection for plantings; mechanical cultivation; pre-irrigation; flame, heat or electrical means. Use NRCS CPS Prescribed Burning (Code 338), as needed.

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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Conservation Practice Overview

November 2022

Forest Stand Improvement (Code 666)

Forest stand improvement is the manipulation of species composition, structure, or density of a stand of trees to achieve desired forest condition.

Practice Information

This practice applies to forestland where competing vegetation interferes with the growth of preferred tree and understory species. Preferred plants are identified and retained to achieve the desired composition and structure of the forest stand.

Specifications for this practice include defining the spacing, density, and number or area of preferred plants. Timing of treatment and retaining dead or dying trees will help minimize impacts on nesting birds and other wildlife. Food and cover for desired wildlife species may be enhanced by modifying tree and understory composition and spacing.

Conservation benefits may include but are not limited to:

- Improved plant health and productivity.
- Improved forest structure and composition.
- Reduced susceptibility to pests and moisture stress.
- Reduced wildfire hazard.
- Improved wildlife, fish, and pollinator habitat.
- Manage natural precipitation more efficiently.
- Increased carbon storage.

Common Associated Practices

Forest Stand Improvement (666) is commonly applied with practices such as Woody Residue Treatment (384), Pest Management Conservation System (595), Brush Management (314), Herbaceous Weed Treatment (315), Access Control (472), Critical Area Planting (342), Firebreak (394), Fuel Break (383), Forest Trails and Landings (655), Access Road (560), Prescribed Burning (338), Tree-Shrub Pruning (660), Upland Wildlife Habitat Management (645), Early Successional Habitat Development-Management (647), Restoration of Rare and Declining Natural Communities (643), Wetland Wildlife Habitat Management (644), and various erosion control practices.

For further information, contact your local NRCS field office.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

FOREST STAND IMPROVEMENT

CODE 666

(ac)

DEFINITION

The manipulation of tree and shrub species composition, structure, or density to achieve desired forest conditions.

PURPOSE

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

- Maintain or improve forest carbon stocks.
- Maintain or improve forest health and productivity.
- Maintain or improve forest structure and composition.
- Maintain or improve wildlife, fish, and pollinator habitat.
- Manage natural precipitation more efficiently.
- Reduce forest pest pressure.
- Reduce forest wildfire hazard.

CONDITIONS WHERE PRACTICE APPLIES

All land where the quantity and quality of trees can be enhanced.

CRITERIA

General Criteria Applicable to All Purposes

Use appropriate silvicultural techniques to achieve the desired future conditions that meet client objectives and are compatible with the site.

Comply with applicable Federal, State, and local laws and regulations. Protect and maintain water quality and hydrologic conditions by controlling and minimizing rutting, compaction, soil erosion, and damage to desirable residual vegetation. Protect soil and site resources from vehicle impacts from temporary vehicle access impacts. Retire unused forest roads, trails, and landings, as needed.

Assess risk to water quality associated with herbicide movement through leaching, solution runoff, and soil absorbed runoff referenced in NRCS CPS Pest Management Conservation System (Code 595), and comply with applicable State and local laws when herbicides are used for forest stand improvement.

Reduce wildfire, safety, environmental, or pest hazards associated with woody debris. Treat remaining woody material to avoid interference with the intended purpose or other management activities. Use prescribed burning to broadcast-burn onsite slash and other debris, as appropriate.

Additional Criteria to Maintain or Improve Carbon Stocks

Manage carbon sequestration by manipulating forest characteristics that alter the rate of plant photosynthesis wherein atmospheric carbon is captured and stored within trees and vegetation. To increase carbon sequestration, maintain or increase the extent of forest stands. Use techniques that increase the growth and vigor of trees and shrubs, especially relatively young plants. Implement appropriate forest regeneration methods following natural or human-caused disturbances and within understocked productive forests.

Manage carbon storage by manipulating the amount of trees, vegetation, woody debris, and soil organic matter, wherein carbon is stored in trees, plants and soils as a “carbon stock.” To increase carbon stocks, retain trees for as long as is practicable and enhance horizontal and vertical distribution of trees. Retain woody debris intact onsite for a long as permissible based on wildfire hazard. Build forest resilience by favoring preferred species that are better adapted to increased temperatures and extreme weather. To increase soil carbon storage, adopt techniques for maintaining and improving soil health, such as appropriately distributing soil organic matter for the site and maintaining future inputs through decomposition of woody debris.

Additional Criteria to Maintain and Improve Forest Health and Productivity

Use appropriate tools, such as ecological site descriptions, tree and shrub suitability groups, natural reference conditions, and regional guidelines to determine trees adapted to the site. Treatments, including litter and woody biomass removal, will be sustainable, will maintain or improve soil organic matter and wildlife habitat, and will recruit and retain acceptable levels of coarse woody debris for the site. Manipulate stand characteristics to mitigate harmful plant, insect, and disease risk.

Additional Criteria to Maintain or Improve Forest Structure and Composition

Manage forest structure by manipulating the horizontal and vertical distribution of trees. Manage forest composition by manipulating proportions of individual tree species. Use appropriate ecological site descriptions, tree and shrub suitability groups, natural reference conditions, and regional guidelines to determine compatible structure and composition. Use appropriate silvicultural methods to ensure adequate natural regeneration or to facilitate artificial regeneration.

Additional Criteria to Maintain or Improve Wildlife, Fish, and Pollinator Habitat

Use appropriate State wildlife habitat guidelines, wildlife habitat evaluation guides, stream or riparian zone assessments, best management practices, or other applicable tools to estimate the value of the treatment area for target wildlife, fish, and pollinators before and after forest stand improvement activities. Manage food (e.g., hard and soft mast, pollen, nectar), cover (e.g., live and dead trees, roosts, nest sites, perches, down woody material), space, and water, as well as the arrangement of these habitat elements, at the appropriate scale to meet desired wildlife, fish, and pollinator habitat requirements.

Time forest stand improvement activities to minimize disturbance to seasonal wildlife, fish, and pollinator activities, such as breeding, dispersal, migration, hibernation, etc. Use habitat creation and maintenance criteria in NRCS CPSs Early Successional Habitat Development/Management (Code 647), Restoration of Rare or Declining Natural Communities (Code 643), Structures for Wildlife (Code 649), Upland Wildlife Habitat Management (Code 645), or Wetland Wildlife Habitat Management (Code 644), as appropriate, to manage wildlife-related activities.

Additional Criteria to Manage Natural Precipitation More Efficiently

Create a mosaic of age classes to increase water yield and stabilize seasonal water yield from watersheds. Create openings in the forest canopy to allow more sunlight to reach the ground, stimulating understory vegetation and diversifying plant species composition and vertical structure. Retain leaf litter, needles, and other biomass onsite. These improvements will increase rainfall infiltration and reduce runoff, thereby reducing soil erosion and improving water quality.

Additional Criteria to Reduce Forest Pest Pressure

Reduce forest damage from harmful plants, animals, diseases, and other pests by creating resilient forest conditions and managing plant hosts. Use appropriate tools, such as USDA Forest Service forest insect and disease leaflets, USDA APHIS pests and diseases resources, ecological site descriptions, tree and shrub suitability groups, regional guidelines, and natural reference conditions to determine resilient forest conditions.

Additional Criteria to Reduce Forest Wildfire Hazard

Manage stocking rates and alter spatial arrangement of trees to reduce wildfire hazard. Use criteria for wildfire risk, including reduction of ladder fuels, in NRCS CPSs Firebreak (Code 394), Fuel Break (Code 383), or Woody Residue Treatment (Code 384), as appropriate.

CONSIDERATIONS

General Considerations

Enlist the assistance of a professional forester in developing management alternatives. Use prevention, avoidance, monitoring, and suppression (“PAMS”) strategies such as cleaning boots, gear, vehicles, and equipment and controlling existing pests prior to forest stand improvement implementation to avoid spreading pests. Cut trees along forest trails and roads to “daylight” these accessways, if compatible with the intended purpose and pests are controlled.

Consider the effects of grazing and browsing by livestock and wildlife on desirable vegetation and implement measures to control, if needed.

Consider retaining slash and woody debris on site for nutrient cycling and carbon storage. When removal of woody materials is necessary, consider using it for bioenergy, renewable energy production, or biochar. Leave trees that are attractive in shape and structure or flower and are appropriate for the site, especially around structures, roads, and home sites.

Considerations to Maintain or Improve Carbon Stocks

Consider the forest’s natural disturbance regime, traits, successional status, structure, and composition as these factors may affect carbon storage and sequestration. In fire-adapted landscapes, implement prescribed burning and thinning treatments that mimic the natural fire regime to reduce catastrophic carbon losses from wildfire. Consider individual species’ growth rate, size at maturity, lifespan, and historical range when selecting species to manage.

Lengthen rotations and manage for species likely to be used in durable manufactured products. Use crop tree management techniques to concentrate growth on suitable long-lived species, where appropriate.

Considerations to Maintain or Improve Forest Health and Productivity

Silvicultural objectives and harvest-regeneration strategies may change over time and may be limited by prior management. Rehabilitation of stands that have been repeatedly degraded by exploitative timber harvesting (e.g., high-grading) may require development of a complex site-specific treatment plan with multiple entries into the stand. Consider crop tree management when making decisions about which trees to retain and which to cut or kill. Successful regeneration of desirable species is usually dependent upon timely application of forest stand improvement and its associated practices.

Within the limits of access, pests, wildfire risk, wildlife movements, and other factors, consider retaining at least one-fourth to one-third of the slash, tops, and limbs after harvest to protect site productivity. When using whole-tree harvesting systems minimize the removal of needles or leaves by harvesting in the dormant season, retaining fine woody materials onsite, or leaving felled trees onsite to allow for needle or leaf drop.

Considerations to Maintain or Improve Wildlife, Fish, and Pollinator Habitat

Mimic natural disturbance regimes to meet habitat requirements of native wildlife, fish, and pollinators. Create a mosaic of stands with different ages, species composition, and vertical structure if the client objective is to benefit a variety of wildlife, fish, and pollinator species. Consider removing vines from crop trees, but retaining vines with wildlife value (e.g., grape and poison ivy) on noncrop trees. Consider the impacts to water temperature and woody debris in the water when using forest stand improvement above and adjacent to aquatic systems.

PLANS AND SPECIFICATIONS

Plans and specifications for applying this practice will be prepared for each site and recorded using approved specification sheets, implementation requirements, technical notes, and narrative statements in the conservation plan or other acceptable documentation. At a minimum, provide—

- Objectives for forest stand improvement.
- Map showing the treatment location including size and relevant topographical features, such as slope, aspect, and landform.
- Silvicultural prescription.
- Treatment method, such as mechanical or hand felling, girdling, stem injection, etc.
- Tree species to be retained or to be cut or killed.
- Timing of treatment relative to seasonal factors, plant physiology, disease, insects, and wildlife impacts.
- Existing, post-treatment, and desired future condition of the stand of trees using appropriate metrics derived from locally accepted forest inventory methods, such as:
    - basal area,
    - diameter at breast height,
    - trees per acre,
    - species composition,
    - stocking, and
    - structure.
- Landowner is responsible for notifications and for obtaining all necessary permits for the project prior to implementation.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the site and review it with the client. The plan will describe actions that must be taken to ensure that the practice is applied correctly during its lifespan. As a minimum, include periodic inspections for assessment of invasive plants, insects, disease, and other pests, damage by storms and trespass, and erosion.

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CONSERVATION ENHANCEMENT ACTIVITY

E666H

CONSERVATION STEWARDSHIP PROGRAM

Increase on-site carbon storage

CONSERVATION PRACTICE: 666 - Forest Stand Improvement

APPLICABLE LAND USE: Forest; Associated Ag Land; Farmstead

RESOURCE CONCERN: Soil, Air

ENHANCEMENT LIFE SPAN: 10 years

Enhancement Description

Use forest management techniques to maintain and increase on-site carbon storage. These include, but are not limited to, applying uneven-aged management, using longer rotations, retaining cavity/den trees, snags, and down woody debris, and protecting or increasing soil organic matter.

Criteria

- Apply all of the following activities:
  - Retain all snags and downed woody debris of 6" diameter or larger at the base.
  - Identify leave-trees or clumps of trees that will be retained on site throughout their life span. These would ideally be trees that also provide wildlife habitat (e.g., future cavity/den trees, species that develop loose bark at older ages, mast producers, etc.).
  - Close unneeded roads and limit off-road vehicular traffic to avoid displacing the forest litter layer.

- Apply at least one activity from among the following as appropriate for the site:
  - Transition from even-aged to uneven-aged management.
  - Use regeneration methods (e.g., group selection, shelterwood, seed-tree, expanding gap) that call for retention of mature trees during the period when advanced regeneration develops.
  - Adopt techniques for maintaining and/or improving soil quality, specifically retention or organic carbon.
  - Maintain canopy cover to shade the forest floor and avoid hastening decomposition.

- During forest management activities, apply the following criteria:
    - Identify and retain preferred tree and understory species to achieve all planned purposes and landowner objectives.
    - Use available guidelines for species and species groups to determine spacing, density, size-class distribution, number of trees, and amount of understory species to be retained. Schedule treatments to maintain the stand, as much as possible, consistent with chosen regeneration method, in a fully stocked condition based on appropriate stocking guide.
    - Describe the current and desired future condition of each stand that will be treated. Include the species, cover type, and size-class distribution. Stocking will be described in terms of crop trees per acre, basal area per acre, trees per acre, between-tree spacing, or by any other appropriate and professionally accepted density or stocking protocol.
    - Implement forest stand improvement activities in ways that avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions. Refer to Conservation Practice Standard Forest Trails and Landings (Code 655) and Road/Trail/Landing Closure and Treatment (Code 654).
    - The enhancement will comply with all applicable federal, state, and local laws and regulations, and with States' Forestry Best Management Practices for Water Quality.

Documentation and Implementation Requirements

Participant will:

☐ Prior to implementation:

- develop a new or updated forest management plan (FMP) that may reflect a change in management objectives.
- review NRCS Conservation Practice Standard Forest Stand Improvement (Code 666) that contains information needed to meet criteria for this enhancement.
- develop an understanding of the management that this is required to increase carbon storage appropriate for the resource setting to include the following activities:
    - implement forest management activities that begin a transition from even-aged to uneven-aged management.
    - retain dead wood and select trees or clumps of trees that are intended to be left on the site throughout their life span.
    - use regeneration methods (e.g., group selection, shelterwood, seed-tree, expanding gap) that require retention of mature trees during the period when advanced regeneration develops.
    - adopt techniques for maintaining and/or improving soil quality, specifically retention of organic carbon.

CONSERVATION STEWARDSHIP PROGRAM

  - maintain canopy cover to shade the forest floor and avoid hastening decomposition.
- For forest lands, work with professional forester to prepare or update a current FMP that includes activities required to implement this enhancement. NRCS State Office will determine if a FMP will be required for Associated Ag Land or Farmstead settings. (Request NRCS technical assistance, as needed.)
- Arrange to have a professional forester or wildlife specialist, as part of developing or updating an FMP:
  - identify and map areas, selected trees, or groups of leave trees that can serve as wildlife habitat and that are intended to be left on site throughout their lifespan.
  - describe amounts and condition of standing snags and fallen woody debris with 6" or larger basal diameter.
  - identify and map trails or roads that can be planned for closure.
- Recognize that other NRCS Conservation Practice Standards may be needed to apply this enhancement. These may include:
  - Forest Trails and Landings (Code 655)
  - Road/Trial/Landing Closure and Treatment (Code 654)
  - Woody Residue Treatment (Code 384)
- Acquire all necessary approvals and permits (i.e., local, state, or federal, as applicable).

☐ During implementation:

- Follow FMP guidelines follow state-approved Forestry Best Management Practices (BMPs) to protect streams, water quality, and minimize soil loss.
- Follow FMP guidelines, criteria in NRCS Conservation Practice Standard Forest Stand Improvement (Code 666), and in specifications provided by NRCS, to ensure that:
  - overstory tree and understory species are retained to achieve all planned purposes and landowner objectives.
  - establish required spacing, density, size-class distribution, number of trees, and amount of understory species to be retained.
  - schedule treatments to maintain the stand, as much as possible, consistent with the chosen forest regeneration method, in a fully stocked condition based on appropriate stocking guide.
  - avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions.
- Evaluate and review with NRCS any planned changes to verify they meet the enhancement criteria, as needed.

☐ After implementation:

- Ensure that retained leave areas are properly protected.
- Update the FMP to documentation treatment acres, completion dates and methods, and document representative treatments with digital photos.

- Notify NRCS that the work has been completed and make treatment documentation available for NRCS review and certification.

CONSERVATION STEWARDSHIP PROGRAM

NRCS will:

☐ Prior to implementation:

- Provide and explain the following NRCS Conservation Practice Standards as they relate to implementing this enhancement:
  - Forest Stand Improvement (Code 666)
  - Woody Residue Treatment (Code 384)
- Provide technical assistance in, as needed:
  - Guiding the proper sequence and timing of planned FMP treatment activities to meet requirements to maintain and increase on-site carbon storage.
  - Preparing specifications for applying this enhancement for each site using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.
- Ensure that the participant has a current and complete FMP describing all treatment activities for the resource setting.

☐ During implementation:

- Provide technical assistance if requested by the participant.
- Evaluate any planned changes to verify they meet the enhancement criteria.

☐ After Implementation:

- Verify the enhancement was implemented according to the NRCS Conservation Practice Standard Forest Stand Improvement Standard (Code 666) specifications and meets enhancement criteria.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

CONSERVATION ENHANCEMENT ACTIVITY

E666K

Creating structural diversity with patch openings

Conservation Practice 666: Forest Stand Improvement

APPLICABLE LAND USE: Forest, Associated Ag Land, Farmstead

RESOURCE CONCERN: Plants, Animals

PRACTICE LIFE SPAN: 10 Years

Enhancement Description:

Forest stand improvement that creates patch openings. Size, shape, and arrangement of patches will be based on natural features, and emulate patches that would result from natural disturbance regimes of wind or fire, varying geographically and by forest type, and by tree species desired from natural regeneration. The treatment will create diversity in stand composition and structure, increase pest resistance, and enhance wildlife food availability. Openings may provide regeneration sites and restore natural plant communities, and achieve or maintain a desired understory plant community for wildlife habitat. **Criteria:**

States will apply general criteria from the NRCS National Conservation Practice Standard Forest Stand Improvement (Code 666) as listed below, and additional criteria as required by the NRCS State Office.

- Develop or update a forest management plan in consultation with NRCS personnel and a professional forester to direct the management of the property.
- This enhancement may be applied only to forested acres that have an “acceptable growing stock” level. For tree species with stocking charts, this is at least the B line, the lowest level of a fully stocked stand.
- The size of patches to be treated for wildlife can vary from 1 to 10 acres, be distributed throughout the forest and cannot total more than 30% of the acres meeting the “acceptable growing stock” level.
- Size of patches to be treated for degraded plant condition can vary from 1 to 10 acres, be distributed throughout the forest and cannot total more than 50 percent of the acres meeting the “acceptable growing stock” level.

- Forested acres targeted for patch development must contain species for regeneration from the NRCS state list of suitable trees. Species on this list have the ability to regenerate from seed, sprouts, or other natural regeneration sources.
- Preferentially locate patch openings in areas that lack crop trees or wildlife trees, and where there is an aggregation of trees that are:
    - At high risk of mortality or failure (unless retained as a wildlife tree)
    - Of low crown vigor
    - Of poor stem form and quality
    - Less-desirable species.
- Trees removed during patch development having marketable quality can be sold.
- Where slash and debris will be generated, use NRCS Conservation Practice Standard Woody Residue Treatment (Code 384), to appropriately treat slash and debris, as necessary, to assure that it will not present an unacceptable fire, safety, environmental, or pest hazard. Remaining woody material will be placed so that it does not interfere with the intended purpose or other management activities. Do not burn vegetative residues except where fire hazard or threats from diseases and insects are of concern or when other management objectives are best achieved through burning. When slash and other debris will be burned onsite use NRCS Conservation Practice Standard Prescribed Burning (Code 338).
- Slash and cull trees must be managed if the material interferes with the production of wildlife food. The material may be managed as follows:
    - Windrowing or Wildlife piles
    - Chipping or Cutting for firewood
    - In appropriate stands, prescribed burning may be used.
- Refer to criteria in NRCS Conservation Practice Standard Integrated Pest Management (Code 595) to assist with site-specific strategies for pest prevention, pest avoidance, pest monitoring, and pest suppression. Time tree felling to avoid buildup of insect or disease populations.
- Control measures may be used on undesirable competing vegetation, to favor the development of desirable vegetative communities on the site. Vegetation may be treated by chemical methods such as spraying or single stem treatments, or mechanical methods like a heavy duty brush cutter or similar equipment. Refer to criteria in NRCS Conservation Practice Standard Integrated Pest Management (Code 595).

- For areas adjacent to patch openings, leave residual trees and shrubs that provide a diversity of wildlife food sources.
- Implement forest stand improvement activities in ways that avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions. Protect site resources by selecting the method, felling direction and timing of tree felling, and heavy equipment operation. For temporary access use NRCS Conservation Practice Standard Forest Trails and Landings (Code 655), to protect soil and site resources from vehicle impacts.
- Use NRCS Conservation Practice Standard Access Road (Code 560), for more heavily used roads associated with forest stand improvement activities.
- The enhancement will comply with all applicable federal, state, and local laws and regulations, and with States' Forestry Best Management Practices for Water Quality.
- If management of the remaining forest area (between patch openings) provides a conservation benefit, management can be accomplished at the same time as patch opening creation. Use applicable criteria from NRCS Conservation Practice Standard Forest Stand Improvement (Code 666) when managing the general forest area.

Documentation and Implementation Requirements:

Participant will:

- ☐ Prior to implementation, work with NRCS or your forester to develop or update a forest management plan which will include management practices to address the documented resource concerns. (NRCS will provide technical assistance, as needed.)
- ☐ Prior to implementation, select areas for patch openings that contain species for regeneration from the NRCS state list of suitable trees that have the ability to regenerate from seed, sprouts, or other natural means. Document that the trees are present and vigorous enough to regenerate. (NRCS will provide technical assistance, as needed.)
- ☐ Prior to implementation, determine the resource concern, size, shape, location, and distribution of openings throughout the forest. The size of each opening ranges from 1-10 acres, and the total acreage in openings will be less than 30% of eligible forest acres based on stocking. Locate openings in areas that lack crop trees or wildlife trees and where there is an aggregation of trees that are:
    - o At high risk of mortality or failure
    - o Of low crown vigor
    - o Of poor stem form or quality
    - o Less-desirable species
- ☐ During implementation, manage slash and cull trees by windrowing, creating wildlife piles, chipping, cutting for firewood, and/or prescribed burning if appropriate.
- ☐ During implementation, protect the site from plant and animal pests, fire, and adverse impacts to the soil resource.
- ☐ After implementation, provide NRCS a map showing the location of patches and photos documenting that patch cuts were completed according to specifications.

NRCS will:

- ☐ Prior to implementation, verify the enhancement activity is planned for acres that meet the criteria within the enhancement guide sheet.
- ☐ Prior to implementation, provide technical assistance in:
    - o Identifying size, shape, location, and distribution of openings, including percentage of the stand that will be in openings, to meet the criteria within the enhancement guide sheet.

- Evaluating stocking and acceptable growing stock for both pre- and post-treatment stand conditions.
- Identifying desired species to be regenerated in the openings.

- ☐ Prior to implementation, provide and explain NRCS Conservation Practice Standards Forest Stand Improvement (Code 666), CPS Woody Residue Treatment (Code 384), CPS Prescribed Burning (Code 338), CPS Integrated Pest Management (Code 595), and CPS Forest Trails and Landings (Code 655) as they relate to implementing this enhancement.
- ☐ During implementation, evaluate any planned changes to verify they meet the enhancement criteria.
- ☐ After implementation, verify the planned patch openings were established to specifications developed for the site.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

IDAHO SUPPLEMENT TO

CONSERVATION ENHANCEMENT ACTIVITY

E666K

Creating structural diversity with patch openings

Additional Criteria for Idaho

In addition to the criteria specified in the National job sheet E666K the following additional criteria apply in Idaho:

- Total area of the created openings (ie ”patches”) will be no less than 5%, and will not exceed 30%, of the total forested area which meets the requirements of ”acceptable growing stock” (AGS). Individual created openings should be no bigger than 10 acres in size with the average opening less than 450 feet wide. Areas created should be varying in size and shape.

- ”Acceptable growing stock (AGS)” are the early and appropriate mid-seral and late seral tree species which are adapted to the Habitat Type of the named soil. Refer to the ”Trees to Manage” section of the soil survey report for guidance. Stands are considered to meet AGS when the majority of the mature component of the stand is comprised of these species.

- Species for regeneration are identified by the Habitat Type associated with the named soil. For conifer species, refer to the ”Trees to Manage” section of the soil survey report for guidance.

- The minimum amount of aggregated patch acreage must be 5% or more of the offered forestland in order to broadly mimic the natural structural diversity found in conifer forestlands.

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Additional Documentation Requirements for Idaho

In additon to the documentation requirements specified in the National job sheet E666K the following additional documentation requirements apply in Idaho:

- Forest Management or Stewardship Plan, written by an NRCS or partner forester, describing the existing and planned ecological perimeter for the site as well as documenting the stocking level (must be fully stocked but not overstocked), the desirable trees that will be left post treatment. The plan will ensure that snags and downed woody material is left in place as appropriate for the site. The management plan will detail the treatment activities, how those activities will be implemented to meet the enhancement objectives, and what is expected after the treatment has been performed.

- 645 Upland Wildlife Habitat Management Job Sheet specifying what species the enhancement is targeting and how and when the planned activities will provide food for that species.

- For forest species, follow the species specific WHEGs that are available on the Idaho NRCS website under Technical Resources, Biology: **https://www.nrcs.usda.gov/wps/portal/nrcs/detail/id/technical/ecoscience/bio/?cid=nrcs144p2_046476**

- Species specific Technical Notes currently available include: TN 32 for Sage-grouse and Sharp-tailed grouse, TN 34 for Pollinators, and TN 36 for Monarch butterflies. A Technical Note for flood-irrigated habitat is also anticipated to be available for 2020 sign ups. All other general habitat assessments should use TN 19 Wildlife Habitat Appraisal Guides for Idaho.

- Additional information on Pollinator life requirements can also be found on the Plant Material Website here: **https://www.nrcs.usda.gov/wps/portal/nrcs/detail/id/plantsanimals/?cid=nrcs144p2_047763#technotes**

- A NRCS Area or State Biologist can also provide species specific narrative as needed however must be pre-approved by the State Biologist.

- List of all invasive species present.

Facilitating longleaf pine regeneration and establishment

Conservation Practice 666: Forest Stand Improvement

APPLICABLE LAND USE: Forest, Associated Ag Land

RESOURCE CONCERN: Plants, Animals

ENHANCEMENT LIFE SPAN: 10 Years

Enhancement Description

Facilitate longleaf pine regeneration and establishment following a forest stand improvement treatment for natural regeneration (e.g., a regeneration cut), or where longleaf has been previously planted. After a regeneration cut or a planting, competition from invasive brush and undesirable tree and shrub species often suppresses successful establishment of longleaf pine. This enhancement will release seedling and sapling longleaf from competing invasive plants and other undesirable species. A forester will monitor site conditions, treat competition, protect seedlings, and recommend additional follow-up treatments as needed. The enhancement protects investments in longleaf pine regeneration and establishment by providing for follow-up activities that require the expertise of a professional forester.

Criteria

States will apply general criteria from the NRCS National Conservation Practice Standard Forest Stand Improvement (Code 666) as listed below, and additional criteria as required by the NRCS State Office.

- Develop or update a forest management plan (FMP) in consultation with NRCS personnel and a professional forester to direct the management of the property. The FMP will include guidelines for the amount of advanced longleaf pine regeneration needed to achieve the desired future condition. It will describe the types of competition or other stressors that threaten longleaf survival and recruitment in the area, and recommend facilitating controls such as prescribed burning, chemical, and mechanical treatments to achieve desired outcomes. The FMP will also include guidelines for future inspection and monitoring, types of forest health impacts or stand damage to look for during inspections, and potential supplementary activities that may be needed to achieve longleaf establishment and recruitment.

stands that have already had a seed tree, shelterwood, thinning, or other silvicultural treatment designed to regenerate longleaf pine. The stands must contain an adequate amount of longleaf regeneration or planted trees in the seedling and/or sapling stages, sufficient to achieve stand objectives if they survive and become fully established. The stands must also have evidence that the longleaf regeneration is not "free to grow" due to the presence of competing species. This enhancement is not appropriate for stands that have reached the pole timber size class because they are considered fully established at that point and stand management activities will be different.

- A forestry specialist will inspect the stand and identify existing or potential species of harmful insects, tree diseases, and invasive plants, as well as other biotic and abiotic (i.e. ice storms, drought, flooding, etc.) impacts on forest growth, health, structure and/or composition.

- A forestry specialist will conduct regeneration surveys according to methods described in the NRCS National Forestry Handbook, Title 190, Section 636.2.

- The forestry specialist will make recommendations for short-term treatments as needed. A skilled laborer will implement appropriate activities such as applying mechanical and spot chemical treatments.

- In appropriate settings, prescribed burning may be used to control vegetative competition after longleaf root systems are sufficiently established to re-sprout after a fire. With the recommendation of a forestry specialist, use NRCS Conservation Practice Standard Prescribed Burning (Code 338), or CSP Enhancement E338B, Short-interval burn.

- The forestry specialist will recommend additional practices as needed to correct undesirable forest health conditions. Practices may include: NRCS Conservation Practice Standards Integrated Pest Management (Code 595), Brush Management (Code 314), Herbaceous Weed Control (Code 315), etc..

- Forest stands lacking sufficient longleaf regeneration may need an enrichment planting of longleaf. Use NRCS Conservation Practice Standard Tree and Shrub Establishment (Code 612). Prescribed burning may not be appropriate where trees

have been recently planted.

new or updated Forest Management Plan (FMP) that includes activities required to implement this enhancement. The FMP will identify regeneration needs, competition that impedes longleaf regeneration and recruitment, other forest health concerns, and activities recommended for implementation. The participant will make the FMP available for NRCS review.

- Prior to implementation, arrange for a forestry specialist to inspect the stand and perform the tasks identified in this enhancement.
- Prior to implementation, review the NRCS Conservation Practice Standard Forest Stand Improvement (Code 666) conservation practice standard and other applicable implementation documentation and use the information to meet the criteria of this enhancement.
- During implementation, the participant and the forestry specialist will ensure that regenerating longleaf trees are protected from any damage.
- During implementation, notify NRCS if there are any planned changes, to verify they meet the enhancement criteria.
- After implementation, notify NRCS that the work has been completed and make the following information available to NRCS: dates that inspection was conducted, methods used, and the treatments applied to remove competition and protect young longleafs.

NRCS will:

- Prior to implementation, verify the enhancement activity is planned for acres that meet the criteria within the enhancement guide sheet. Verify that a forest stand improvement treatment to initiate longleaf regeneration, or longleaf planting, was previously applied, that regenerating seedling and/or sapling longleaf pines are present, and that longleaf survival is threatened by competing species and/or other environmental stressors.
- Prior to implementation, provide assistance with interpretation of a new or updated FMP on acres targeted by this enhancement.
- Prior to implementation, provide and explain the following NRCS Conservation Practice Standards as they relate to implementing this enhancement:
    - Forest Stand Improvement (Code 666)

- Herbaceous Weed Control (Code 315)
- Tree /Shrub Establishment (Code 612)
- Tree/Shrub Site Preparation (Code 490)

- As needed, prior to implementation, NRCS will provide technical assistance by:
  - Preparing specifications for applying this enhancement for each site using approved guide sheets, implementation requirements, technical notes, and narrative statements in the conservation plan, or other acceptable documentation, and discussing the details with the participant.
  - Providing methods for conducting regeneration surveys.
- During implementation, provide technical assistance if requested by the participant.
- During implementation, as needed, evaluate any planned changes to verify they meet the enhancement criteria.
- After implementation, certify that the enhancement was completed according to the NRCS Conservation Practice Standard Forest Stand Improvement (CPS 666) specifications and the enhancement criteria.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name_____Contract Number _____

Total Amount Applied_____Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

United States Department of Agriculture

Conservation Practice Overview

November 2022

Forest Stand Improvement (Code 666)

Forest stand improvement is the manipulation of species composition, structure, or density of a stand of trees to achieve desired forest condition.

Practice Information

This practice applies to forestland where competing vegetation interferes with the growth of preferred tree and understory species. Preferred plants are identified and retained to achieve the desired composition and structure of the forest stand.

Specifications for this practice include defining the spacing, density, and number or area of preferred plants. Timing of treatment and retaining dead or dying trees will help minimize impacts on nesting birds and other wildlife. Food and cover for desired wildlife species may be enhanced by modifying tree and understory composition and spacing.

Conservation benefits may include but are not limited to:

- Improved plant health and productivity.
- Improved forest structure and composition.
- Reduced susceptibility to pests and moisture stress.
- Reduced wildfire hazard.
- Improved wildlife, fish, and pollinator habitat.
- Manage natural precipitation more efficiently.
- Increased carbon storage.

Common Associated Practices

Forest Stand Improvement (666) is commonly applied with practices such as Woody Residue Treatment (384), Pest Management Conservation System (595), Brush Management (314), Herbaceous Weed Treatment (315), Access Control (472), Critical Area Planting (342), Firebreak (394), Fuel Break (383), Forest Trails and Landings (655), Access Road (560), Prescribed Burning (338), Tree-Shrub Pruning (660), Upland Wildlife Habitat Management (645), Early Successional Habitat Development-Management (647), Restoration of Rare and Declining Natural Communities (643), Wetland Wildlife Habitat Management (644), and various erosion control practices.

For further information, contact your local NRCS field office.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

FOREST STAND IMPROVEMENT

CODE 666

(ac)

DEFINITION

The manipulation of tree and shrub species composition, structure, or density to achieve desired forest conditions.

PURPOSE

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

- Maintain or improve forest carbon stocks.
- Maintain or improve forest health and productivity.
- Maintain or improve forest structure and composition.
- Maintain or improve wildlife, fish, and pollinator habitat.
- Manage natural precipitation more efficiently.
- Reduce forest pest pressure.
- Reduce forest wildfire hazard.

CONDITIONS WHERE PRACTICE APPLIES

All land where the quantity and quality of trees can be enhanced.

CRITERIA

General Criteria Applicable to All Purposes

Use appropriate silvicultural techniques to achieve the desired future conditions that meet client objectives and are compatible with the site.

Comply with applicable Federal, State, and local laws and regulations. Protect and maintain water quality and hydrologic conditions by controlling and minimizing rutting, compaction, soil erosion, and damage to desirable residual vegetation. Protect soil and site resources from vehicle impacts from temporary vehicle access impacts. Retire unused forest roads, trails, and landings, as needed.

Assess risk to water quality associated with herbicide movement through leaching, solution runoff, and soil absorbed runoff referenced in NRCS CPS Pest Management Conservation System (Code 595), and comply with applicable State and local laws when herbicides are used for forest stand improvement.

Reduce wildfire, safety, environmental, or pest hazards associated with woody debris. Treat remaining woody material to avoid interference with the intended purpose or other management activities. Use prescribed burning to broadcast-burn onsite slash and other debris, as appropriate.

Additional Criteria to Maintain or Improve Carbon Stocks

Manage carbon sequestration by manipulating forest characteristics that alter the rate of plant photosynthesis wherein atmospheric carbon is captured and stored within trees and vegetation. To increase carbon sequestration, maintain or increase the extent of forest stands. Use techniques that increase the growth and vigor of trees and shrubs, especially relatively young plants. Implement appropriate forest regeneration methods following natural or human-caused disturbances and within understocked productive forests.

Manage carbon storage by manipulating the amount of trees, vegetation, woody debris, and soil organic matter, wherein carbon is stored in trees, plants and soils as a “carbon stock.” To increase carbon stocks, retain trees for as long as is practicable and enhance horizontal and vertical distribution of trees. Retain woody debris intact onsite for a long as permissible based on wildfire hazard. Build forest resilience by favoring preferred species that are better adapted to increased temperatures and extreme weather. To increase soil carbon storage, adopt techniques for maintaining and improving soil health, such as appropriately distributing soil organic matter for the site and maintaining future inputs through decomposition of woody debris.

Additional Criteria to Maintain and Improve Forest Health and Productivity

Use appropriate tools, such as ecological site descriptions, tree and shrub suitability groups, natural reference conditions, and regional guidelines to determine trees adapted to the site. Treatments, including litter and woody biomass removal, will be sustainable, will maintain or improve soil organic matter and wildlife habitat, and will recruit and retain acceptable levels of coarse woody debris for the site. Manipulate stand characteristics to mitigate harmful plant, insect, and disease risk.

Additional Criteria to Maintain or Improve Forest Structure and Composition

Manage forest structure by manipulating the horizontal and vertical distribution of trees. Manage forest composition by manipulating proportions of individual tree species. Use appropriate ecological site descriptions, tree and shrub suitability groups, natural reference conditions, and regional guidelines to determine compatible structure and composition. Use appropriate silvicultural methods to ensure adequate natural regeneration or to facilitate artificial regeneration.

Additional Criteria to Maintain or Improve Wildlife, Fish, and Pollinator Habitat

Use appropriate State wildlife habitat guidelines, wildlife habitat evaluation guides, stream or riparian zone assessments, best management practices, or other applicable tools to estimate the value of the treatment area for target wildlife, fish, and pollinators before and after forest stand improvement activities. Manage food (e.g., hard and soft mast, pollen, nectar), cover (e.g., live and dead trees, roosts, nest sites, perches, down woody material), space, and water, as well as the arrangement of these habitat elements, at the appropriate scale to meet desired wildlife, fish, and pollinator habitat requirements.

Time forest stand improvement activities to minimize disturbance to seasonal wildlife, fish, and pollinator activities, such as breeding, dispersal, migration, hibernation, etc. Use habitat creation and maintenance criteria in NRCS CPSs Early Successional Habitat Development/Management (Code 647), Restoration of Rare or Declining Natural Communities (Code 643), Structures for Wildlife (Code 649), Upland Wildlife Habitat Management (Code 645), or Wetland Wildlife Habitat Management (Code 644), as appropriate, to manage wildlife-related activities.

Additional Criteria to Manage Natural Precipitation More Efficiently

Create a mosaic of age classes to increase water yield and stabilize seasonal water yield from watersheds. Create openings in the forest canopy to allow more sunlight to reach the ground, stimulating understory vegetation and diversifying plant species composition and vertical structure. Retain leaf litter, needles, and other biomass onsite. These improvements will increase rainfall infiltration and reduce runoff, thereby reducing soil erosion and improving water quality.

Additional Criteria to Reduce Forest Pest Pressure

Reduce forest damage from harmful plants, animals, diseases, and other pests by creating resilient forest conditions and managing plant hosts. Use appropriate tools, such as USDA Forest Service forest insect and disease leaflets, USDA APHIS pests and diseases resources, ecological site descriptions, tree and shrub suitability groups, regional guidelines, and natural reference conditions to determine resilient forest conditions.

Additional Criteria to Reduce Forest Wildfire Hazard

Manage stocking rates and alter spatial arrangement of trees to reduce wildfire hazard. Use criteria for wildfire risk, including reduction of ladder fuels, in NRCS CPSs Firebreak (Code 394), Fuel Break (Code 383), or Woody Residue Treatment (Code 384), as appropriate.

CONSIDERATIONS

General Considerations

Enlist the assistance of a professional forester in developing management alternatives. Use prevention, avoidance, monitoring, and suppression (“PAMS”) strategies such as cleaning boots, gear, vehicles, and equipment and controlling existing pests prior to forest stand improvement implementation to avoid spreading pests. Cut trees along forest trails and roads to “daylight” these accessways, if compatible with the intended purpose and pests are controlled.

Consider the effects of grazing and browsing by livestock and wildlife on desirable vegetation and implement measures to control, if needed.

Consider retaining slash and woody debris on site for nutrient cycling and carbon storage. When removal of woody materials is necessary, consider using it for bioenergy, renewable energy production, or biochar. Leave trees that are attractive in shape and structure or flower and are appropriate for the site, especially around structures, roads, and home sites.

Considerations to Maintain or Improve Carbon Stocks

Consider the forest’s natural disturbance regime, traits, successional status, structure, and composition as these factors may affect carbon storage and sequestration. In fire-adapted landscapes, implement prescribed burning and thinning treatments that mimic the natural fire regime to reduce catastrophic carbon losses from wildfire. Consider individual species’ growth rate, size at maturity, lifespan, and historical range when selecting species to manage.

Lengthen rotations and manage for species likely to be used in durable manufactured products. Use crop tree management techniques to concentrate growth on suitable long-lived species, where appropriate.

Considerations to Maintain or Improve Forest Health and Productivity

Silvicultural objectives and harvest-regeneration strategies may change over time and may be limited by prior management. Rehabilitation of stands that have been repeatedly degraded by exploitative timber harvesting (e.g., high-grading) may require development of a complex site-specific treatment plan with multiple entries into the stand. Consider crop tree management when making decisions about which trees to retain and which to cut or kill. Successful regeneration of desirable species is usually dependent upon timely application of forest stand improvement and its associated practices.

Within the limits of access, pests, wildfire risk, wildlife movements, and other factors, consider retaining at least one-fourth to one-third of the slash, tops, and limbs after harvest to protect site productivity. When using whole-tree harvesting systems minimize the removal of needles or leaves by harvesting in the dormant season, retaining fine woody materials onsite, or leaving felled trees onsite to allow for needle or leaf drop.

Considerations to Maintain or Improve Wildlife, Fish, and Pollinator Habitat

Mimic natural disturbance regimes to meet habitat requirements of native wildlife, fish, and pollinators. Create a mosaic of stands with different ages, species composition, and vertical structure if the client objective is to benefit a variety of wildlife, fish, and pollinator species. Consider removing vines from crop trees, but retaining vines with wildlife value (e.g., grape and poison ivy) on noncrop trees. Consider the impacts to water temperature and woody debris in the water when using forest stand improvement above and adjacent to aquatic systems.

PLANS AND SPECIFICATIONS

Plans and specifications for applying this practice will be prepared for each site and recorded using approved specification sheets, implementation requirements, technical notes, and narrative statements in the conservation plan or other acceptable documentation. At a minimum, provide—

- Objectives for forest stand improvement.
- Map showing the treatment location including size and relevant topographical features, such as slope, aspect, and landform.
- Silvicultural prescription.
- Treatment method, such as mechanical or hand felling, girdling, stem injection, etc.
- Tree species to be retained or to be cut or killed.
- Timing of treatment relative to seasonal factors, plant physiology, disease, insects, and wildlife impacts.
- Existing, post-treatment, and desired future condition of the stand of trees using appropriate metrics derived from locally accepted forest inventory methods, such as:
    - basal area,
    - diameter at breast height,
    - trees per acre,
    - species composition,
    - stocking, and
    - structure.
- Landowner is responsible for notifications and for obtaining all necessary permits for the project prior to implementation.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the site and review it with the client. The plan will describe actions that must be taken to ensure that the practice is applied correctly during its lifespan. As a minimum, include periodic inspections for assessment of invasive plants, insects, disease, and other pests, damage by storms and trespass, and erosion.

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CONSERVATION ENHANCEMENT ACTIVITY

E666H

CONSERVATION STEWARDSHIP PROGRAM

Increase on-site carbon storage

CONSERVATION PRACTICE: 666 - Forest Stand Improvement

APPLICABLE LAND USE: Forest; Associated Ag Land; Farmstead

RESOURCE CONCERN: Soil, Air

ENHANCEMENT LIFE SPAN: 10 years

Enhancement Description

Use forest management techniques to maintain and increase on-site carbon storage. These include, but are not limited to, applying uneven-aged management, using longer rotations, retaining cavity/den trees, snags, and down woody debris, and protecting or increasing soil organic matter.

Criteria

- Apply all of the following activities:
  - Retain all snags and downed woody debris of 6" diameter or larger at the base.
  - Identify leave-trees or clumps of trees that will be retained on site throughout their life span. These would ideally be trees that also provide wildlife habitat (e.g., future cavity/den trees, species that develop loose bark at older ages, mast producers, etc.).
  - Close unneeded roads and limit off-road vehicular traffic to avoid displacing the forest litter layer.

- Apply at least one activity from among the following as appropriate for the site:
  - Transition from even-aged to uneven-aged management.
  - Use regeneration methods (e.g., group selection, shelterwood, seed-tree, expanding gap) that call for retention of mature trees during the period when advanced regeneration develops.
  - Adopt techniques for maintaining and/or improving soil quality, specifically retention or organic carbon.
  - Maintain canopy cover to shade the forest floor and avoid hastening decomposition.

- During forest management activities, apply the following criteria:
    - Identify and retain preferred tree and understory species to achieve all planned purposes and landowner objectives.
    - Use available guidelines for species and species groups to determine spacing, density, size-class distribution, number of trees, and amount of understory species to be retained. Schedule treatments to maintain the stand, as much as possible, consistent with chosen regeneration method, in a fully stocked condition based on appropriate stocking guide.
    - Describe the current and desired future condition of each stand that will be treated. Include the species, cover type, and size-class distribution. Stocking will be described in terms of crop trees per acre, basal area per acre, trees per acre, between-tree spacing, or by any other appropriate and professionally accepted density or stocking protocol.
    - Implement forest stand improvement activities in ways that avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions. Refer to Conservation Practice Standard Forest Trails and Landings (Code 655) and Road/Trail/Landing Closure and Treatment (Code 654).
    - The enhancement will comply with all applicable federal, state, and local laws and regulations, and with States' Forestry Best Management Practices for Water Quality.

Documentation and Implementation Requirements

Participant will:

☐ Prior to implementation:

- develop a new or updated forest management plan (FMP) that may reflect a change in management objectives.
- review NRCS Conservation Practice Standard Forest Stand Improvement (Code 666) that contains information needed to meet criteria for this enhancement.
- develop an understanding of the management that this is required to increase carbon storage appropriate for the resource setting to include the following activities:
    - implement forest management activities that begin a transition from even-aged to uneven-aged management.
    - retain dead wood and select trees or clumps of trees that are intended to be left on the site throughout their life span.
    - use regeneration methods (e.g., group selection, shelterwood, seed-tree, expanding gap) that require retention of mature trees during the period when advanced regeneration develops.
    - adopt techniques for maintaining and/or improving soil quality, specifically retention of organic carbon.

  - maintain canopy cover to shade the forest floor and avoid hastening decomposition.
- For forest lands, work with professional forester to prepare or update a current FMP that includes activities required to implement this enhancement. NRCS State Office will determine if a FMP will be required for Associated Ag Land or Farmstead settings. (Request NRCS technical assistance, as needed.)
- Arrange to have a professional forester or wildlife specialist, as part of developing or updating an FMP:
  - identify and map areas, selected trees, or groups of leave trees that can serve as wildlife habitat and that are intended to be left on site throughout their lifespan.
  - describe amounts and condition of standing snags and fallen woody debris with 6" or larger basal diameter.
  - identify and map trails or roads that can be planned for closure.
- Recognize that other NRCS Conservation Practice Standards may be needed to apply this enhancement. These may include:
  - Forest Trails and Landings (Code 655)
  - Road/Trial/Landing Closure and Treatment (Code 654)
  - Woody Residue Treatment (Code 384)
- Acquire all necessary approvals and permits (i.e., local, state, or federal, as applicable).

☐ During implementation:

- Follow FMP guidelines follow state-approved Forestry Best Management Practices (BMPs) to protect streams, water quality, and minimize soil loss.
- Follow FMP guidelines, criteria in NRCS Conservation Practice Standard Forest Stand Improvement (Code 666), and in specifications provided by NRCS, to ensure that:
  - overstory tree and understory species are retained to achieve all planned purposes and landowner objectives.
  - establish required spacing, density, size-class distribution, number of trees, and amount of understory species to be retained.
  - schedule treatments to maintain the stand, as much as possible, consistent with the chosen forest regeneration method, in a fully stocked condition based on appropriate stocking guide.
  - avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions.
- Evaluate and review with NRCS any planned changes to verify they meet the enhancement criteria, as needed.

☐ After implementation:

- Ensure that retained leave areas are properly protected.
- Update the FMP to documentation treatment acres, completion dates and methods, and document representative treatments with digital photos.

- Notify NRCS that the work has been completed and make treatment documentation available for NRCS review and certification.

CONSERVATION STEWARDSHIP PROGRAM

NRCS will:

☐ Prior to implementation:

- Provide and explain the following NRCS Conservation Practice Standards as they relate to implementing this enhancement:
  - Forest Stand Improvement (Code 666)
  - Woody Residue Treatment (Code 384)
- Provide technical assistance in, as needed:
  - Guiding the proper sequence and timing of planned FMP treatment activities to meet requirements to maintain and increase on-site carbon storage.
  - Preparing specifications for applying this enhancement for each site using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.
- Ensure that the participant has a current and complete FMP describing all treatment activities for the resource setting.

☐ During implementation:

- Provide technical assistance if requested by the participant.
- Evaluate any planned changes to verify they meet the enhancement criteria.

☐ After Implementation:

- Verify the enhancement was implemented according to the NRCS Conservation Practice Standard Forest Stand Improvement Standard (Code 666) specifications and meets enhancement criteria.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

Facilitating longleaf pine regeneration and establishment

Conservation Practice 666: Forest Stand Improvement

APPLICABLE LAND USE: Forest, Associated Ag Land

RESOURCE CONCERN: Plants, Animals

ENHANCEMENT LIFE SPAN: 10 Years

Enhancement Description

Facilitate longleaf pine regeneration and establishment following a forest stand improvement treatment for natural regeneration (e.g., a regeneration cut), or where longleaf has been previously planted. After a regeneration cut or a planting, competition from invasive brush and undesirable tree and shrub species often suppresses successful establishment of longleaf pine. This enhancement will release seedling and sapling longleaf from competing invasive plants and other undesirable species. A forester will monitor site conditions, treat competition, protect seedlings, and recommend additional follow-up treatments as needed. The enhancement protects investments in longleaf pine regeneration and establishment by providing for follow-up activities that require the expertise of a professional forester.

Criteria

States will apply general criteria from the NRCS National Conservation Practice Standard Forest Stand Improvement (Code 666) as listed below, and additional criteria as required by the NRCS State Office.

- Develop or update a forest management plan (FMP) in consultation with NRCS personnel and a professional forester to direct the management of the property. The FMP will include guidelines for the amount of advanced longleaf pine regeneration needed to achieve the desired future condition. It will describe the types of competition or other stressors that threaten longleaf survival and recruitment in the area, and recommend facilitating controls such as prescribed burning, chemical, and mechanical treatments to achieve desired outcomes. The FMP will also include guidelines for future inspection and monitoring, types of forest health impacts or stand damage to look for during inspections, and potential supplementary activities that may be needed to achieve longleaf establishment and recruitment.

stands that have already had a seed tree, shelterwood, thinning, or other silvicultural treatment designed to regenerate longleaf pine. The stands must contain an adequate amount of longleaf regeneration or planted trees in the seedling and/or sapling stages, sufficient to achieve stand objectives if they survive and become fully established. The stands must also have evidence that the longleaf regeneration is not "free to grow" due to the presence of competing species. This enhancement is not appropriate for stands that have reached the pole timber size class because they are considered fully established at that point and stand management activities will be different.

- A forestry specialist will inspect the stand and identify existing or potential species of harmful insects, tree diseases, and invasive plants, as well as other biotic and abiotic (i.e. ice storms, drought, flooding, etc.) impacts on forest growth, health, structure and/or composition.

- A forestry specialist will conduct regeneration surveys according to methods described in the NRCS National Forestry Handbook, Title 190, Section 636.2.

- The forestry specialist will make recommendations for short-term treatments as needed. A skilled laborer will implement appropriate activities such as applying mechanical and spot chemical treatments.

- In appropriate settings, prescribed burning may be used to control vegetative competition after longleaf root systems are sufficiently established to re-sprout after a fire. With the recommendation of a forestry specialist, use NRCS Conservation Practice Standard Prescribed Burning (Code 338), or CSP Enhancement E338B, Short-interval burn.

- The forestry specialist will recommend additional practices as needed to correct undesirable forest health conditions. Practices may include: NRCS Conservation Practice Standards Integrated Pest Management (Code 595), Brush Management (Code 314), Herbaceous Weed Control (Code 315), etc..

- Forest stands lacking sufficient longleaf regeneration may need an enrichment planting of longleaf. Use NRCS Conservation Practice Standard Tree and Shrub Establishment (Code 612). Prescribed burning may not be appropriate where trees

have been recently planted.

new or updated Forest Management Plan (FMP) that includes activities required to implement this enhancement. The FMP will identify regeneration needs, competition that impedes longleaf regeneration and recruitment, other forest health concerns, and activities recommended for implementation. The participant will make the FMP available for NRCS review.

- Prior to implementation, arrange for a forestry specialist to inspect the stand and perform the tasks identified in this enhancement.
- Prior to implementation, review the NRCS Conservation Practice Standard Forest Stand Improvement (Code 666) conservation practice standard and other applicable implementation documentation and use the information to meet the criteria of this enhancement.
- During implementation, the participant and the forestry specialist will ensure that regenerating longleaf trees are protected from any damage.
- During implementation, notify NRCS if there are any planned changes, to verify they meet the enhancement criteria.
- After implementation, notify NRCS that the work has been completed and make the following information available to NRCS: dates that inspection was conducted, methods used, and the treatments applied to remove competition and protect young longleafs.

NRCS will:

- Prior to implementation, verify the enhancement activity is planned for acres that meet the criteria within the enhancement guide sheet. Verify that a forest stand improvement treatment to initiate longleaf regeneration, or longleaf planting, was previously applied, that regenerating seedling and/or sapling longleaf pines are present, and that longleaf survival is threatened by competing species and/or other environmental stressors.
- Prior to implementation, provide assistance with interpretation of a new or updated FMP on acres targeted by this enhancement.
- Prior to implementation, provide and explain the following NRCS Conservation Practice Standards as they relate to implementing this enhancement:
    - Forest Stand Improvement (Code 666)

- Herbaceous Weed Control (Code 315)
- Tree /Shrub Establishment (Code 612)
- Tree/Shrub Site Preparation (Code 490)

- As needed, prior to implementation, NRCS will provide technical assistance by:
  - Preparing specifications for applying this enhancement for each site using approved guide sheets, implementation requirements, technical notes, and narrative statements in the conservation plan, or other acceptable documentation, and discussing the details with the participant.
  - Providing methods for conducting regeneration surveys.
- During implementation, provide technical assistance if requested by the participant.
- During implementation, as needed, evaluate any planned changes to verify they meet the enhancement criteria.
- After implementation, certify that the enhancement was completed according to the NRCS Conservation Practice Standard Forest Stand Improvement (CPS 666) specifications and the enhancement criteria.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name_____Contract Number _____

Total Amount Applied_____Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

United States Department of Agriculture

Conservation Practice Overview

November 2022

Forest Stand Improvement (Code 666)

Forest stand improvement is the manipulation of species composition, structure, or density of a stand of trees to achieve desired forest condition.

Practice Information

This practice applies to forestland where competing vegetation interferes with the growth of preferred tree and understory species. Preferred plants are identified and retained to achieve the desired composition and structure of the forest stand.

Specifications for this practice include defining the spacing, density, and number or area of preferred plants. Timing of treatment and retaining dead or dying trees will help minimize impacts on nesting birds and other wildlife. Food and cover for desired wildlife species may be enhanced by modifying tree and understory composition and spacing.

Conservation benefits may include but are not limited to:

- Improved plant health and productivity.
- Improved forest structure and composition.
- Reduced susceptibility to pests and moisture stress.
- Reduced wildfire hazard.
- Improved wildlife, fish, and pollinator habitat.
- Manage natural precipitation more efficiently.
- Increased carbon storage.

Common Associated Practices

Forest Stand Improvement (666) is commonly applied with practices such as Woody Residue Treatment (384), Pest Management Conservation System (595), Brush Management (314), Herbaceous Weed Treatment (315), Access Control (472), Critical Area Planting (342), Firebreak (394), Fuel Break (383), Forest Trails and Landings (655), Access Road (560), Prescribed Burning (338), Tree-Shrub Pruning (660), Upland Wildlife Habitat Management (645), Early Successional Habitat Development-Management (647), Restoration of Rare and Declining Natural Communities (643), Wetland Wildlife Habitat Management (644), and various erosion control practices.

For further information, contact your local NRCS field office.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

FOREST STAND IMPROVEMENT

CODE 666

(ac)

DEFINITION

The manipulation of tree and shrub species composition, structure, or density to achieve desired forest conditions.

PURPOSE

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

- Maintain or improve forest carbon stocks.
- Maintain or improve forest health and productivity.
- Maintain or improve forest structure and composition.
- Maintain or improve wildlife, fish, and pollinator habitat.
- Manage natural precipitation more efficiently.
- Reduce forest pest pressure.
- Reduce forest wildfire hazard.

CONDITIONS WHERE PRACTICE APPLIES

All land where the quantity and quality of trees can be enhanced.

CRITERIA

General Criteria Applicable to All Purposes

Use appropriate silvicultural techniques to achieve the desired future conditions that meet client objectives and are compatible with the site.

Comply with applicable Federal, State, and local laws and regulations. Protect and maintain water quality and hydrologic conditions by controlling and minimizing rutting, compaction, soil erosion, and damage to desirable residual vegetation. Protect soil and site resources from vehicle impacts from temporary vehicle access impacts. Retire unused forest roads, trails, and landings, as needed.

Assess risk to water quality associated with herbicide movement through leaching, solution runoff, and soil absorbed runoff referenced in NRCS CPS Pest Management Conservation System (Code 595), and comply with applicable State and local laws when herbicides are used for forest stand improvement.

Reduce wildfire, safety, environmental, or pest hazards associated with woody debris. Treat remaining woody material to avoid interference with the intended purpose or other management activities. Use prescribed burning to broadcast-burn onsite slash and other debris, as appropriate.

Additional Criteria to Maintain or Improve Carbon Stocks

Manage carbon sequestration by manipulating forest characteristics that alter the rate of plant photosynthesis wherein atmospheric carbon is captured and stored within trees and vegetation. To increase carbon sequestration, maintain or increase the extent of forest stands. Use techniques that increase the growth and vigor of trees and shrubs, especially relatively young plants. Implement appropriate forest regeneration methods following natural or human-caused disturbances and within understocked productive forests.

Manage carbon storage by manipulating the amount of trees, vegetation, woody debris, and soil organic matter, wherein carbon is stored in trees, plants and soils as a “carbon stock.” To increase carbon stocks, retain trees for as long as is practicable and enhance horizontal and vertical distribution of trees. Retain woody debris intact onsite for a long as permissible based on wildfire hazard. Build forest resilience by favoring preferred species that are better adapted to increased temperatures and extreme weather. To increase soil carbon storage, adopt techniques for maintaining and improving soil health, such as appropriately distributing soil organic matter for the site and maintaining future inputs through decomposition of woody debris.

Additional Criteria to Maintain and Improve Forest Health and Productivity

Use appropriate tools, such as ecological site descriptions, tree and shrub suitability groups, natural reference conditions, and regional guidelines to determine trees adapted to the site. Treatments, including litter and woody biomass removal, will be sustainable, will maintain or improve soil organic matter and wildlife habitat, and will recruit and retain acceptable levels of coarse woody debris for the site. Manipulate stand characteristics to mitigate harmful plant, insect, and disease risk.

Additional Criteria to Maintain or Improve Forest Structure and Composition

Manage forest structure by manipulating the horizontal and vertical distribution of trees. Manage forest composition by manipulating proportions of individual tree species. Use appropriate ecological site descriptions, tree and shrub suitability groups, natural reference conditions, and regional guidelines to determine compatible structure and composition. Use appropriate silvicultural methods to ensure adequate natural regeneration or to facilitate artificial regeneration.

Additional Criteria to Maintain or Improve Wildlife, Fish, and Pollinator Habitat

Use appropriate State wildlife habitat guidelines, wildlife habitat evaluation guides, stream or riparian zone assessments, best management practices, or other applicable tools to estimate the value of the treatment area for target wildlife, fish, and pollinators before and after forest stand improvement activities. Manage food (e.g., hard and soft mast, pollen, nectar), cover (e.g., live and dead trees, roosts, nest sites, perches, down woody material), space, and water, as well as the arrangement of these habitat elements, at the appropriate scale to meet desired wildlife, fish, and pollinator habitat requirements.

Time forest stand improvement activities to minimize disturbance to seasonal wildlife, fish, and pollinator activities, such as breeding, dispersal, migration, hibernation, etc. Use habitat creation and maintenance criteria in NRCS CPSs Early Successional Habitat Development/Management (Code 647), Restoration of Rare or Declining Natural Communities (Code 643), Structures for Wildlife (Code 649), Upland Wildlife Habitat Management (Code 645), or Wetland Wildlife Habitat Management (Code 644), as appropriate, to manage wildlife-related activities.

Additional Criteria to Manage Natural Precipitation More Efficiently

Create a mosaic of age classes to increase water yield and stabilize seasonal water yield from watersheds. Create openings in the forest canopy to allow more sunlight to reach the ground, stimulating understory vegetation and diversifying plant species composition and vertical structure. Retain leaf litter, needles, and other biomass onsite. These improvements will increase rainfall infiltration and reduce runoff, thereby reducing soil erosion and improving water quality.

Additional Criteria to Reduce Forest Pest Pressure

Reduce forest damage from harmful plants, animals, diseases, and other pests by creating resilient forest conditions and managing plant hosts. Use appropriate tools, such as USDA Forest Service forest insect and disease leaflets, USDA APHIS pests and diseases resources, ecological site descriptions, tree and shrub suitability groups, regional guidelines, and natural reference conditions to determine resilient forest conditions.

Additional Criteria to Reduce Forest Wildfire Hazard

Manage stocking rates and alter spatial arrangement of trees to reduce wildfire hazard. Use criteria for wildfire risk, including reduction of ladder fuels, in NRCS CPSs Firebreak (Code 394), Fuel Break (Code 383), or Woody Residue Treatment (Code 384), as appropriate.

CONSIDERATIONS

General Considerations

Enlist the assistance of a professional forester in developing management alternatives. Use prevention, avoidance, monitoring, and suppression (“PAMS”) strategies such as cleaning boots, gear, vehicles, and equipment and controlling existing pests prior to forest stand improvement implementation to avoid spreading pests. Cut trees along forest trails and roads to “daylight” these accessways, if compatible with the intended purpose and pests are controlled.

Consider the effects of grazing and browsing by livestock and wildlife on desirable vegetation and implement measures to control, if needed.

Consider retaining slash and woody debris on site for nutrient cycling and carbon storage. When removal of woody materials is necessary, consider using it for bioenergy, renewable energy production, or biochar. Leave trees that are attractive in shape and structure or flower and are appropriate for the site, especially around structures, roads, and home sites.

Considerations to Maintain or Improve Carbon Stocks

Consider the forest’s natural disturbance regime, traits, successional status, structure, and composition as these factors may affect carbon storage and sequestration. In fire-adapted landscapes, implement prescribed burning and thinning treatments that mimic the natural fire regime to reduce catastrophic carbon losses from wildfire. Consider individual species’ growth rate, size at maturity, lifespan, and historical range when selecting species to manage.

Lengthen rotations and manage for species likely to be used in durable manufactured products. Use crop tree management techniques to concentrate growth on suitable long-lived species, where appropriate.

Considerations to Maintain or Improve Forest Health and Productivity

Silvicultural objectives and harvest-regeneration strategies may change over time and may be limited by prior management. Rehabilitation of stands that have been repeatedly degraded by exploitative timber harvesting (e.g., high-grading) may require development of a complex site-specific treatment plan with multiple entries into the stand. Consider crop tree management when making decisions about which trees to retain and which to cut or kill. Successful regeneration of desirable species is usually dependent upon timely application of forest stand improvement and its associated practices.

Within the limits of access, pests, wildfire risk, wildlife movements, and other factors, consider retaining at least one-fourth to one-third of the slash, tops, and limbs after harvest to protect site productivity. When using whole-tree harvesting systems minimize the removal of needles or leaves by harvesting in the dormant season, retaining fine woody materials onsite, or leaving felled trees onsite to allow for needle or leaf drop.

Considerations to Maintain or Improve Wildlife, Fish, and Pollinator Habitat

Mimic natural disturbance regimes to meet habitat requirements of native wildlife, fish, and pollinators. Create a mosaic of stands with different ages, species composition, and vertical structure if the client objective is to benefit a variety of wildlife, fish, and pollinator species. Consider removing vines from crop trees, but retaining vines with wildlife value (e.g., grape and poison ivy) on noncrop trees. Consider the impacts to water temperature and woody debris in the water when using forest stand improvement above and adjacent to aquatic systems.

PLANS AND SPECIFICATIONS

Plans and specifications for applying this practice will be prepared for each site and recorded using approved specification sheets, implementation requirements, technical notes, and narrative statements in the conservation plan or other acceptable documentation. At a minimum, provide—

- Objectives for forest stand improvement.
- Map showing the treatment location including size and relevant topographical features, such as slope, aspect, and landform.
- Silvicultural prescription.
- Treatment method, such as mechanical or hand felling, girdling, stem injection, etc.
- Tree species to be retained or to be cut or killed.
- Timing of treatment relative to seasonal factors, plant physiology, disease, insects, and wildlife impacts.
- Existing, post-treatment, and desired future condition of the stand of trees using appropriate metrics derived from locally accepted forest inventory methods, such as:
    - basal area,
    - diameter at breast height,
    - trees per acre,
    - species composition,
    - stocking, and
    - structure.
- Landowner is responsible for notifications and for obtaining all necessary permits for the project prior to implementation.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for the site and review it with the client. The plan will describe actions that must be taken to ensure that the practice is applied correctly during its lifespan. As a minimum, include periodic inspections for assessment of invasive plants, insects, disease, and other pests, damage by storms and trespass, and erosion.

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CONSERVATION ENHANCEMENT ACTIVITY

E666H

CONSERVATION STEWARDSHIP PROGRAM

Increase on-site carbon storage

CONSERVATION PRACTICE: 666 - Forest Stand Improvement

APPLICABLE LAND USE: Forest; Associated Ag Land; Farmstead

RESOURCE CONCERN: Soil, Air

ENHANCEMENT LIFE SPAN: 10 years

Enhancement Description

Use forest management techniques to maintain and increase on-site carbon storage. These include, but are not limited to, applying uneven-aged management, using longer rotations, retaining cavity/den trees, snags, and down woody debris, and protecting or increasing soil organic matter.

Criteria

- Apply all of the following activities:
  - Retain all snags and downed woody debris of 6" diameter or larger at the base.
  - Identify leave-trees or clumps of trees that will be retained on site throughout their life span. These would ideally be trees that also provide wildlife habitat (e.g., future cavity/den trees, species that develop loose bark at older ages, mast producers, etc.).
  - Close unneeded roads and limit off-road vehicular traffic to avoid displacing the forest litter layer.

- Apply at least one activity from among the following as appropriate for the site:
  - Transition from even-aged to uneven-aged management.
  - Use regeneration methods (e.g., group selection, shelterwood, seed-tree, expanding gap) that call for retention of mature trees during the period when advanced regeneration develops.
  - Adopt techniques for maintaining and/or improving soil quality, specifically retention or organic carbon.
  - Maintain canopy cover to shade the forest floor and avoid hastening decomposition.

- During forest management activities, apply the following criteria:
    - Identify and retain preferred tree and understory species to achieve all planned purposes and landowner objectives.
    - Use available guidelines for species and species groups to determine spacing, density, size-class distribution, number of trees, and amount of understory species to be retained. Schedule treatments to maintain the stand, as much as possible, consistent with chosen regeneration method, in a fully stocked condition based on appropriate stocking guide.
    - Describe the current and desired future condition of each stand that will be treated. Include the species, cover type, and size-class distribution. Stocking will be described in terms of crop trees per acre, basal area per acre, trees per acre, between-tree spacing, or by any other appropriate and professionally accepted density or stocking protocol.
    - Implement forest stand improvement activities in ways that avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions. Refer to Conservation Practice Standard Forest Trails and Landings (Code 655) and Road/Trail/Landing Closure and Treatment (Code 654).
    - The enhancement will comply with all applicable federal, state, and local laws and regulations, and with States' Forestry Best Management Practices for Water Quality.

Documentation and Implementation Requirements

Participant will:

☐ Prior to implementation:

- develop a new or updated forest management plan (FMP) that may reflect a change in management objectives.
- review NRCS Conservation Practice Standard Forest Stand Improvement (Code 666) that contains information needed to meet criteria for this enhancement.
- develop an understanding of the management that this is required to increase carbon storage appropriate for the resource setting to include the following activities:
    - implement forest management activities that begin a transition from even-aged to uneven-aged management.
    - retain dead wood and select trees or clumps of trees that are intended to be left on the site throughout their life span.
    - use regeneration methods (e.g., group selection, shelterwood, seed-tree, expanding gap) that require retention of mature trees during the period when advanced regeneration develops.
    - adopt techniques for maintaining and/or improving soil quality, specifically retention of organic carbon.

  - maintain canopy cover to shade the forest floor and avoid hastening decomposition.
- For forest lands, work with professional forester to prepare or update a current FMP that includes activities required to implement this enhancement. NRCS State Office will determine if a FMP will be required for Associated Ag Land or Farmstead settings. (Request NRCS technical assistance, as needed.)
- Arrange to have a professional forester or wildlife specialist, as part of developing or updating an FMP:
  - identify and map areas, selected trees, or groups of leave trees that can serve as wildlife habitat and that are intended to be left on site throughout their lifespan.
  - describe amounts and condition of standing snags and fallen woody debris with 6" or larger basal diameter.
  - identify and map trails or roads that can be planned for closure.
- Recognize that other NRCS Conservation Practice Standards may be needed to apply this enhancement. These may include:
  - Forest Trails and Landings (Code 655)
  - Road/Trial/Landing Closure and Treatment (Code 654)
  - Woody Residue Treatment (Code 384)
- Acquire all necessary approvals and permits (i.e., local, state, or federal, as applicable).

☐ During implementation:

- Follow FMP guidelines follow state-approved Forestry Best Management Practices (BMPs) to protect streams, water quality, and minimize soil loss.
- Follow FMP guidelines, criteria in NRCS Conservation Practice Standard Forest Stand Improvement (Code 666), and in specifications provided by NRCS, to ensure that:
  - overstory tree and understory species are retained to achieve all planned purposes and landowner objectives.
  - establish required spacing, density, size-class distribution, number of trees, and amount of understory species to be retained.
  - schedule treatments to maintain the stand, as much as possible, consistent with the chosen forest regeneration method, in a fully stocked condition based on appropriate stocking guide.
  - avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions.
- Evaluate and review with NRCS any planned changes to verify they meet the enhancement criteria, as needed.

☐ After implementation:

- Ensure that retained leave areas are properly protected.
- Update the FMP to documentation treatment acres, completion dates and methods, and document representative treatments with digital photos.

- Notify NRCS that the work has been completed and make treatment documentation available for NRCS review and certification.

CONSERVATION STEWARDSHIP PROGRAM

NRCS will:

☐ Prior to implementation:

- Provide and explain the following NRCS Conservation Practice Standards as they relate to implementing this enhancement:
  - Forest Stand Improvement (Code 666)
  - Woody Residue Treatment (Code 384)
- Provide technical assistance in, as needed:
  - Guiding the proper sequence and timing of planned FMP treatment activities to meet requirements to maintain and increase on-site carbon storage.
  - Preparing specifications for applying this enhancement for each site using approved specification sheets, job sheets, technical notes, and narrative statements in the conservation plan, or other acceptable documentation.
- Ensure that the participant has a current and complete FMP describing all treatment activities for the resource setting.

☐ During implementation:

- Provide technical assistance if requested by the participant.
- Evaluate any planned changes to verify they meet the enhancement criteria.

☐ After Implementation:

- Verify the enhancement was implemented according to the NRCS Conservation Practice Standard Forest Stand Improvement Standard (Code 666) specifications and meets enhancement criteria.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

Facilitating longleaf pine regeneration and establishment

Conservation Practice 666: Forest Stand Improvement

APPLICABLE LAND USE: Forest, Associated Ag Land

RESOURCE CONCERN: Plants, Animals

ENHANCEMENT LIFE SPAN: 10 Years

Enhancement Description

Facilitate longleaf pine regeneration and establishment following a forest stand improvement treatment for natural regeneration (e.g., a regeneration cut), or where longleaf has been previously planted. After a regeneration cut or a planting, competition from invasive brush and undesirable tree and shrub species often suppresses successful establishment of longleaf pine. This enhancement will release seedling and sapling longleaf from competing invasive plants and other undesirable species. A forester will monitor site conditions, treat competition, protect seedlings, and recommend additional follow-up treatments as needed. The enhancement protects investments in longleaf pine regeneration and establishment by providing for follow-up activities that require the expertise of a professional forester.

Criteria

States will apply general criteria from the NRCS National Conservation Practice Standard Forest Stand Improvement (Code 666) as listed below, and additional criteria as required by the NRCS State Office.

- Develop or update a forest management plan (FMP) in consultation with NRCS personnel and a professional forester to direct the management of the property. The FMP will include guidelines for the amount of advanced longleaf pine regeneration needed to achieve the desired future condition. It will describe the types of competition or other stressors that threaten longleaf survival and recruitment in the area, and recommend facilitating controls such as prescribed burning, chemical, and mechanical treatments to achieve desired outcomes. The FMP will also include guidelines for future inspection and monitoring, types of forest health impacts or stand damage to look for during inspections, and potential supplementary activities that may be needed to achieve longleaf establishment and recruitment.

stands that have already had a seed tree, shelterwood, thinning, or other silvicultural treatment designed to regenerate longleaf pine. The stands must contain an adequate amount of longleaf regeneration or planted trees in the seedling and/or sapling stages, sufficient to achieve stand objectives if they survive and become fully established. The stands must also have evidence that the longleaf regeneration is not "free to grow" due to the presence of competing species. This enhancement is not appropriate for stands that have reached the pole timber size class because they are considered fully established at that point and stand management activities will be different.

- A forestry specialist will inspect the stand and identify existing or potential species of harmful insects, tree diseases, and invasive plants, as well as other biotic and abiotic (i.e. ice storms, drought, flooding, etc.) impacts on forest growth, health, structure and/or composition.

- A forestry specialist will conduct regeneration surveys according to methods described in the NRCS National Forestry Handbook, Title 190, Section 636.2.

- The forestry specialist will make recommendations for short-term treatments as needed. A skilled laborer will implement appropriate activities such as applying mechanical and spot chemical treatments.

- In appropriate settings, prescribed burning may be used to control vegetative competition after longleaf root systems are sufficiently established to re-sprout after a fire. With the recommendation of a forestry specialist, use NRCS Conservation Practice Standard Prescribed Burning (Code 338), or CSP Enhancement E338B, Short-interval burn.

- The forestry specialist will recommend additional practices as needed to correct undesirable forest health conditions. Practices may include: NRCS Conservation Practice Standards Integrated Pest Management (Code 595), Brush Management (Code 314), Herbaceous Weed Control (Code 315), etc..

- Forest stands lacking sufficient longleaf regeneration may need an enrichment planting of longleaf. Use NRCS Conservation Practice Standard Tree and Shrub Establishment (Code 612). Prescribed burning may not be appropriate where trees

have been recently planted.

new or updated Forest Management Plan (FMP) that includes activities required to implement this enhancement. The FMP will identify regeneration needs, competition that impedes longleaf regeneration and recruitment, other forest health concerns, and activities recommended for implementation. The participant will make the FMP available for NRCS review.

- Prior to implementation, arrange for a forestry specialist to inspect the stand and perform the tasks identified in this enhancement.
- Prior to implementation, review the NRCS Conservation Practice Standard Forest Stand Improvement (Code 666) conservation practice standard and other applicable implementation documentation and use the information to meet the criteria of this enhancement.
- During implementation, the participant and the forestry specialist will ensure that regenerating longleaf trees are protected from any damage.
- During implementation, notify NRCS if there are any planned changes, to verify they meet the enhancement criteria.
- After implementation, notify NRCS that the work has been completed and make the following information available to NRCS: dates that inspection was conducted, methods used, and the treatments applied to remove competition and protect young longleafs.

NRCS will:

- Prior to implementation, verify the enhancement activity is planned for acres that meet the criteria within the enhancement guide sheet. Verify that a forest stand improvement treatment to initiate longleaf regeneration, or longleaf planting, was previously applied, that regenerating seedling and/or sapling longleaf pines are present, and that longleaf survival is threatened by competing species and/or other environmental stressors.
- Prior to implementation, provide assistance with interpretation of a new or updated FMP on acres targeted by this enhancement.
- Prior to implementation, provide and explain the following NRCS Conservation Practice Standards as they relate to implementing this enhancement:
    - Forest Stand Improvement (Code 666)

- Herbaceous Weed Control (Code 315)
- Tree /Shrub Establishment (Code 612)
- Tree/Shrub Site Preparation (Code 490)

- As needed, prior to implementation, NRCS will provide technical assistance by:
  - Preparing specifications for applying this enhancement for each site using approved guide sheets, implementation requirements, technical notes, and narrative statements in the conservation plan, or other acceptable documentation, and discussing the details with the participant.
  - Providing methods for conducting regeneration surveys.
- During implementation, provide technical assistance if requested by the participant.
- During implementation, as needed, evaluate any planned changes to verify they meet the enhancement criteria.
- After implementation, certify that the enhancement was completed according to the NRCS Conservation Practice Standard Forest Stand Improvement (CPS 666) specifications and the enhancement criteria.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name_____Contract Number _____

Total Amount Applied_____Fiscal Year Completed _____

_____ _____

NRCS Technical Adequacy Signature Date

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

HERBACEOUS WEED TREATMENT

CODE 315

(ac)

DEFINITION

The removal or control of herbaceous weeds including invasive, noxious, prohibited, or undesirable plants.

PURPOSE

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

- Enhance accessibility, quantity, and/or quality of forage and/or browse
- Restore or release native or desired plant communities for wildlife habitat
- Protect soils and control erosion
- Reduce fine fuel loads and wildfire hazard
- Control pervasive plant species to a desired level of treatment

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on all lands except active cropland where removal, reduction, or manipulation of herbaceous vegetation is desired.

This practice does not apply to removal of herbaceous vegetation for a land use change or by prescribed fire. Refer to NRCS Conservation Practice Standards (CPSs) Land Clearing (Code 460) or Prescribed Burning (Code 338), repectively.

CRITERIA

General Criteria Applicable to All Purposes

Apply herbaceous weed treatment to achieve the desired control of the target species and protection or enhancement of desired species. Desired species contribute positively to land use objectives and site potential. Use mechanical, chemical, or biological methods either alone or in combination.

Control pervasive and undesirable herbaceous vegetation to the desired level of treatment that contributes to the desired state of an ecological site.

NRCS will not develop insect biological control recommendations or chemical treatment recommendations.

NRCS can provide clients with acceptable biological and/or chemical control references to achieve desired management objectives.

NRCS can provide recommendations for biological control to manage herbaceous weeds utilizing grazing animals. Use NRCS CPS Prescribed Grazing (Code 528) to ensure desired results are achieved and maintained.

Nonchemical weed management techniques such as mowing, manually removing, or spot-flaming infestations can be effective.

When using herbicides, follow all environmental hazards and site-specific application criteria listed on herbicide labels and contained in extension service and other approved pest management references. Access the most recent herbicide labels at the Greenbook Web site (http://www.greenbook.net).

Include post-treatment measures to achieve resource management objectives.

Control livestock and human access based on management methods applied and restrictions listed on the herbicide labels.

Manage and/or dispose of treated weed species that prevents the spread of herbaceous weeds to new sites.

When the herbaceous weed treatment of undesirable species results in the need to reestablish desired herbaceous species, follow details in the appropriate vegetation establishment practices such as NRCS CPSs Pasture and Hay Planting (Code 512), Cover Crop (Code 340), Conservation Cover (Code 327), Range Planting (Code 550), Critical Area Planting (Code 342), Tree /Shrub Establishment (Code 612), or Wildlife Habitat Planting (Code 420).

Incorporate weed prevention strategies that include—

- Minimizing soil disturbance.
- Minimizing movement of equipment through weed infested areas.
- Inspecting and cleaning equipment to prevent spread of undesired vegetation.

Apply treatments during periods of the year when weed species are most vulnerable and when restoration of the native or desired plant communities have the best chance of recovery.

Adjacent land uses must be considered before chemicals are used. Also consider the residual effects of chemical use. Follow label and State guidelines on setbacks and other precautions from sensitive areas and surface water bodies or karst topography.

Additional Criteria to Enhance Accessibility, Quantity, and Quality of Forage and/or Browse

Apply herbaceous weed treatments that minimize negative impacts to forages and/or other nontargeted plants. Plan timing and sequence of treatment in coordination with specifications developed for NRCS CPS Prescribed Grazing (Code 528) or Forage Harvest Management (Code 511).

Additional Criteria to Restore or Release Native or Desired Plant Communities for Wildlife Habitat

Apply herbaceous weed treatments that protect the health and vigor of native or desired plant species to preserve and enhance habitat for pollinator insects and wildlife. Time treatments to periods of the year that accommodate reproduction and other life cycle requirements of target wildlife and pollinator species. Select treatments that maintain or enhance plant community composition and structure to meet the requirements of target wildlife and pollinator species.

Use applicable ecological site description (ESD) state and transition models, or other suitable information, to develop specifications that are ecologically sound and defensible. Treatments must be congruent with dynamics of the ecological site(s) and keyed to states and plant community phases that have the potential and capability to support the desired plant community. If an ESD is not available, base specifications on the best approximation of the desired plant community composition, structure, and function.

Use native vegetation to preserve and enhance pollinator insects as well as wildlife.

Additional Criteria to Protect Soils and Control Erosion

Herbaceous weed species shade out desired plants exposing more soil for potential erosion. Use caution when applying herbaceous weed treatments to minimize soil disturbance and soil erosion.

Apply additional treatments to protect soils and prevent erosion.

Additional Criteria to Reduce Fine Fuel Loads and Wildfire Hazard

Treat weed species to create a native or desired plant community that reduces the potential for accumulating excessive fuel loads and wildfire hazards.

Apply treatment methods that minimize the potential for unintended impacts to air resources (e.g., dust, chemical drift, etc.) that could also damage or kill plants, thereby contributing to wildfire hazard.

Additional Criteria to Control Pervasive Plant Species to a Desired Level of Treatment

When specific pervasive plant species cannot be controlled with one treatment, plan and apply additional treatments to achieve effective control through reapplication which may be more than once per growing season or multiple years.

CONSIDERATIONS

Consider using NRCS CPS Pest Management Conservation System (Code 595) in support of herbaceous weed treatment.

Consider soil erosion potential and difficulty of vegetation establishment when choosing a method of control that causes soil disturbance.

Consider the appropriate time period for treatment. Some herbaceous weed treatment activities can be effective when applied within a single year; others may require multiple years of treatments to achieve desired objectives.

Consider impacts to wildlife species. In general, weed treatments that create a mosaic pattern may be the most desirable. Leaving native grasses, forbs, and woody vegetation encourages a higher variety of wildlife and pollinators. When using selective herbicides, leaving other desired plant species also benefits wildlife and pollinators.

Consider impacts to wildlife food supplies, space, and cover availability when planning the method and amount of herbaceous weed treatment.

State-issued licenses may be required when using chemical pesticide treatments.

For air quality purposes, consider using chemical methods of herbaceous weed treatment that minimize chemical drift and excessive chemical usage. Consider mechanical methods of herbaceous weed treatment that minimize the entrainment of particulate matter.

Design and execute a plan using adaptive management to apply knowledge gained from earlier treatment applications.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for each field or treatment unit according to the criteria included in this standard. At a minimum, the herbaceous weed treatment management practice plan shall include—

- Goals and objectives statement.
- Plan map and soil map for the site.
- Pretreatment cover or density of the target plants and the planned post-treatment cover or density.
- Maps, drawings, and/or narratives detailing or identifying areas to be treated, pattern of treatment (if

applicable), and areas that will not be disturbed.

- A monitoring plan that identifies what shall be measured (including timing and frequency) and the changes in the plant community (compare with objectives) that occur.
- Apropriate revegetation conservation practice standard(s) needed following treatment (if applicable).
- For mechanical treatment methods, the first five bulleted items above, plus—
  - Type of equipment to use for management.
  - Dates of treatment for effective management.
  - Operating instructions (if applicable).
  - Techniques and procedures to be followed.
- For chemical treatment methods, the first five bulleted items above, plus—
  - Acceptable chemical treatment references for containment and management of target species.
  - Documented techniques to be used, planned dates, and rates of application.
  - Evaluation and interpretation narrative of herbicide risks associated with the selected treatment(s) using Windows Pesticide Screening Tool (WIN-PST) or other approved tools.
  - Consideration of any special mitigation, timing, or other factors (such as soil texture, distance to water, and organic matter content) to ensure the safest, most effective application of the herbicide.
  - Reference product label instructions.
- For biological treatments methods, the first five bulleted items above, plus—
  - Acceptable biological treatment references for the selected biological control livestock used to contain and manage the target species.
  - Documentation of release date, kind, and number of livestock.
  - Timing, frequency, duration, and intensity of grazing or browsing.
  - Desired degree of grazing or browsing use for effective management of target species.
  - Maximum allowable degree of use on desirable nontarget species.
  - Special mitigation, precautions, or requirements associated with the selected treatment(s).

OPERATION AND MAINTENANCE

Operation

Herbaceous weed treatment methods shall be applied using approved materials and procedures. Operations will comply with all local, State, Tribal, and Federal laws and ordinances. The landowner is responsible for obtaining any permits prior to practice implementation. Observe State and Federal restricted-use pesticides and certified pesticide applicator's license requirements.

Develop a safety plan for individuals exposed to chemicals, including telephone numbers and addresses of emergency treatment centers and the telephone number for the nearest poison control center.

The National Pesticide Information Center (NPIC) telephone number in Corvallis, OR, may also be given for nonemergency information: 1-800-858-7384, Monday to Friday, 6:30 a.m. to 4:30 p.m., Pacific Time. The national Chemical Transportation Emergency Center (CHEMTRAC) telephone number is: 1-800-424-9300.

- Follow label requirements for mixing/loading setbacks from wells, intermittent streams and rivers, natural or impounded ponds and lakes, and reservoirs.
- Post signs according to label directions and/or Federal, State, Tribal, and local laws, around fields

that have been treated. Follow restricted entry intervals.

- Dispose of herbicide and herbicide containers in accordance with label directions and adhere to Federal, State, Tribal, and local regulations.
- Read and follow label directions and maintain appropriate safety data sheets. Safety data sheets and herbicide labels can be accessed at the Greenbook Web site (http://www.greenbook.net).
- Calibrate application equipment according to recommendations before each seasonal use and with each major chemical and site change.
- Replace worn nozzle tips, cracked hoses, and faulty gauges on spray equipment.
- Maintain records of plant management for at least 2 years. Herbicide application records shall be in accordance with USDA Agricultural Marketing Service's Pesticide Recordkeeping Program and State-specific requirements.

Maintenance

Success of the practice shall be determined by evaluating regrowth or reoccurrence of target and desired species after sufficient time has passed to monitor the vegetation and gather reliable data. Length of evaluation periods depend on the herbaceous weed species being monitored, proximity of propagules (seeds, plant materials, and roots) to the site, transport mode of seeds (wind or animals), and methods and materials used.

Following initial application, regrowth, resprouting, or reoccurrence of herbaceous weeds can be expected. Complete spot treatments of individual plants or areas needing retreatment when weed vegetation is most vulnerable to desired treatment procedures.

Review and update the herbaceous weed treatment plan periodically to—

- Incorporate new integrated pest management technology,
- Respond to grazing management and complex weed population changes, and
- Follow cooperative extension service guidance to avoid the development of weed resistance to herbicide chemicals.

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STATEMENT OF WORK
Herbaceous Weed Treatment (315)
South Carolina

These deliverables apply to this individual practice. For deliverables for other planned practices, refer to those specific Statements of Work.

DESIGN

Deliverables

1. Design documents that demonstrate criteria in NRCS practice standard have been met and are compatible with planned and applied practices.
   a. Practice purpose(s) as identified in the conservation plan.
   b. List of required permits to be obtained by the client.
   c. Compliance with NRCS national and State utility safety policy (NRCS National Engineering Manual (NEM) (Title 210), Part 503, “Safety,” Section 503.00 through 503.22).
   d. List all required and/or facilitating practices.
   e. Practice standard criteria-related computations and analyses to develop plans and specifications including but not limited to—
      i. Timing and sequence of treatment.
      ii. Identified target species of concern.
      iii. Planned retreatment if needed.
2. Written plans and implementation requirements shall be provided to the client that adequately describe the requirements to install the practice and obtain necessary permits.
3. Identify fields where practice is to be applied on a farm or ranch plan map.
4. Operation and maintenance plan.
5. Certification the plan meets practice standard criteria and complies with applicable laws and regulations.
6. Design modifications during installation as required.

INSTALLATION

Deliverables

1. Preimplementation conference with client.
2. Verification that client has obtained required permits.
3. Practice application guidance as needed.
4. Facilitate and implement required practice application modifications with client and original planner.
5. Advise client/NRCS on compliance issues with all Federal, State, Tribal, and local laws, regulations, and NRCS policies during implementation.
6. Certification the installation process and materials meet plan and permit requirements.

CHECK OUT

Deliverables

1. Records of application.
   a. Extent of acres applied with map.
   b. Actual materials and methods used.
2. Certification the application meets NRCS standards and specifications and is following permits.
3. Progress reporting.
4. Exit conference with client and contractor.

REFERENCES

- USDA NRCS. Field Office Technical Guide (eFOTG), Section IV, Conservation Practice Standard - Herbaceous Weed Control, 315
- USDA NRCS. 2008. National Range and Pasture Handbook (Title 190). Washington, D.C. https://directives.sc.egov.usda.gov/
- USDA NRCS. 2016. National Environmental Compliance Handbook (TItle 190). Washington, D.C. https://directives.sc.egov.usda.gov/
- USDA NRCS. 2017. National Engineering Manual (Title 210). Washington, D.C. https://directives.sc.egov.usda.gov/
- USDA NRCS. 2018. National Cultural Resources Procedures Handbook (Title 190). Washington, D.C. https://directives.sc.egov.usda.gov/

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

PRESCRIBED BURNING

CODE 338

(ac)

DEFINITION

Planned fire applied to a predetermined area.

PURPOSE

Use this practice to accomplish one or more of the following purposes:

- Manage undesirable vegetation to improve plant community structure and composition
- Manage pests, pathogens, and diseases to reduce plant pressure
- Reduce wildfire hazards from biomass accumulation
- Improve terrestrial habitat for wildlife and invertebrates
- Improve plant and seed production, quantity, and/or quality
- Facilitate distribution of grazing and browsing animals to improve forage-animal balance
- Improve and maintain habitat for soil organisms and enhance soil health

CONDITIONS WHERE PRACTICE APPLIES

This practice applies on all lands as appropriate.

CRITERIA

General Criteria Applicable to All Purposes

All prescribed burn plans and applications shall address the following items:

- Location and description of the burn area
- Preburn vegetation cover
- Resource management objectives
- Required weather conditions for prescribed burn
- Notification checklist
- Preburn preparation
- Equipment checklist, personnel assignments, and needs/safety requirements
- Firing sequence
- Ignition method
- Basic smoke management practices to minimize smoke impacts
- Approval signatures
- Postburn evaluation criteria

Additional Criteria for Prescribed Burn Planning

- The procedure, equipment, weather conditions, and the number of trained personnel shall be adequate to accomplish the intended purposes.
- Inventory the location of utilities, such as electric power lines and natural gas pipelines, to prevent damage to the utility and to avoid personal injury and human and vehicular traffic that may be impeded by heat or smoke.
- Monitor weather parameters, smoke dispersion, and other conditions that will affect fire behavior during the burn.
- Use information in “Basic Smoke Management Practices” (O’Neill et al., 2011) for planning and mitigating smoke impacts. Be aware of your state’s smoke management program and utilize the specific tools your state has implemented to address smoke. Be mindful of the potential air quality impacts that burning might have on downwind communities.
- Timing of burning will correspond with desired soil and site conditions to maintain site productivity and minimize effects on soil health.
- Control points; existing barriers such as lakes, streams, wetlands, roads, and constructed firebreaks; and areas devoid of fuel are important to the design and layout of this practice.
- Notify adjoining landowners, local fire departments, and public health and safety officials as appropriate within the airshed prior to burning.

CONSIDERATIONS

Consider integration of NRCS Conservation Practice Standards (CPSs) Firebreak (Code 394) or Fuel Break (Code 383) into land preparation prior to the prescribed burn. Utilize NRCS CPS Prescribed Grazing (Code 528) to manage fuel loads prior to the burn and grazing use of vegetation postburn.

Consider using prescribed burning as a pathway for restoring ecological sites to reference or other states referred to in the ecological site description(s) and state and transition models for the area. Consider wildlife and pollinator needs such as nesting, brood rearing, feeding, and cover when applying prescribed burns.

Consider cultural resources and inventory any sites found within the burn unit and design the burn to avoid any possible damage.

Consider minimizing carbon release by the timing and intensity of the burn.

Consider utilizing prescribed burning to prepare sites for planting or enhancing seed and seedling production.

Consider using prescribed burning to remove slash and debris.

Integrate safety and health precautions into the timing, location, and expected intensity of the burn.

PLANS AND SPECIFICATIONS

Qualified individuals will complete a written prescribed burn plan with specifications for each site using approved burn plan templates, specification sheets, implementation requirements, and technical notes, in support of the conservation plan. Ensure landowner or operating manager has obtained all necessary State, local, and Tribal permits prior to implementation of the burn plan.

OPERATION AND MAINTENANCE

Operation

During the implementation of this practice, the variability of inherent site factors (e.g., topography, fuels, and weather conditions) on fire behavior, as well as heat and smoke impacts on people, vehicles, and property, must be accounted for and monitored, as appropriate.

Prescribed burning activities shall follow the direction of the burn boss (ultimate decision-maker) and designated personnel in accordance with the approved burn plan and NRCS policy. The prescribed burn plan, and the actions contained in the burn plan as carried out at the direction of the burn boss and designated personnel, will reduce risk to life and public safety and provide protection of values at risk for prescribed fire participants as well as adjacent and local values at risk.

Appropriate levels of trained and equipped personnel are essential for the successful and safe implementation of prescribed fires in all scenarios and land uses.

Requirements for burn weather, necessary resource staffing, and equipment availability correspond to expected fire behavior. The burn boss can override these requirements—in writing at the time of burn—if conditions warrant such action.

A test fire should be ignited prior to all burns to monitor fire behavior, fire effects, consumption, and smoke dispersal.

To effectively minimize postfire escapes, suppression and mop-up must be completed that ensures no fire, embers, or other ignition sources will escape beyond the designated burn area.

Maintenance

All fires will be monitored and evaluated postfire to determine that predetermined burn objectives and metrics were met based on the identified resource concern. This may include but is not limited to targeted—

- Density, structure, and composition of native plant communities.
- Plant productivity and health.
- Reduction of plant pest populations and nonnative plants.
- Reduction in hazardous fuels.
- Improvements in wildlife habitat elements.

All postfire monitoring will be used to inform prescriptions for future burn plans to ensure safe, efficient, and effective application of prescribed fire to achieve resource concern objectives across all scenarios and land uses. Employ NRCS CPS Prescribed Grazing (Code 528) to maintain overall objectives of the burn and manage vegetation for livestock. Consider maintaining firebreaks using NRCS CPS Firebreak (Code 394) for followup burns and wildfire protection.

REFERENCES

Hardy, C.C., R.D. Ottmar, J.L. Peterson, J.E. Core, P. Seamon. 2001. Smoke Management Guide for Prescribed and Wildland Fire. PMS 420-2. NFES 1279. Boise ID: National Wildfire Coordination Group. https://www.fs.usda.gov/treesearch/pubs/5388

Fuhlendorf, S.D., R.F. Limb., D.M. Engle, and R.F. Miller. 2011. Assessment of Prescribed Fire as a Conservation Practice. Conservation Benefits of Rangeland Practices Assessment, Recommendations, and Knowledge Gaps 2:75-104.

O'Neill, S., P. Lahm., and A. Mathews. 2011. Basic Smoke Management Practices. U.S. Forest Service and USDA Natural Resources Conservation Service Report. Washington, D.C. https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=stelprdb1046311&ext=pdf

U.S. Environmental Protection Agency. 1998. Interim Air Quality Policy on Wildland and Prescribed Fires. Research Triangle Park, NC.

Weir, J.R. 2009. Conducting Prescribed Fires, a Comprehensive Manual. College Station, TX: Texas A&M University Press.

Wright, H.A. and A.W. Bailey. 1982. Fire Ecology: United States and Southern Canada. New York, NY: Wiley and Sons.

U.S. Environmental Protection Agency. 2016. Treatment of Data Influenced by Exceptional Events, Table 3 Summary of Basic Smoke Management Practices, Benefit Achieved with the BSMP, and When It is Applied. 81 FR 68216. Washington, D.C. https://www.govinfo.gov/app/details/FR-2016-10-03/2016-22983

USDA NRCS and U.S. Environmental Protection Agency. 2012. Agricultural Air Quality Conservation Measures: Reference Guide for Cropping Systems and General Land Management. Washington, D.C. https://www.epa.gov/sites/production/files/2016-06/documents/agaqconsmeasures.pdf

USDA NRCS
Natural Resources Conservation Service

Prescribed Burning

Controlled fire applied to a predetermined area.

Lifespan of Practice: 1 year

South Carolina Implementation Requirements No. SC-IR-338

The following must be identified in the prescribed burn plan:

- Location and description of the burn area;
- Pre-burn vegetation cover;
- Resource management objectives;
- Required weather conditions for prescribed burn;
- Notification check list, pre-burn preparation;
- Equipment checklist;
- Personnel assignments and needs/safety requirements;
- Post-burn evaluation criteria;
- Firing sequence;
- Ignition method; and,
- Approval signatures.

The procedure, equipment, and number of trained personnel must be adequate to accomplish the intended purposes.

Integrate into the timing, location, and expected intensity of the burn the expected weather conditions, human and vehicular traffic that may be impeded by heat or smoke, liability (e.g., utility lines) and safety and health precautions into the prescribed burn plan. Timing of burning will commensurate with soil and site conditions to maintain site productivity and minimize effects on soil erosion and soil properties (structure, soil moisture).

Monitor weather parameters and other data that affect fire behavior during the burn. Minimize carbon release by the timing and burn intensity.

Anticipate and mitigate impact of smoke created by the prescribed burn.

Clear Form

Landowner: _____ **Date:** _____

Farm No.: _____ **Tract No:** _____

Fields: _____ **Stands:** _____

Additional Information and Instructions:

☐ Approved burn plan attached ☐ SC prescribed burning laws provided to client

A professional must prepare a burn plan for prescribed burns. NRCS employees must have the appropriate job approval authority to write prescribed burn plans.

The burn plan should identify the landowner's purposes/objectives as well as the required conditions for the burn. Any burn plans not written by NRCS must be submitted to NRCS upon request for review of purposes/objectives **prior to** conducting the burn.

All pertinent conditions required to meet the purpose(s) on the prescribed burn **must** be covered in the burn plan. These include, but are not limited to:

- Equipment, crew, and protective gear required;
- Fuel and fuel moisture;
- Prescribed weather conditions and parameters;
- Season of burn;
- Smoke management;
- Required firebreaks;
- Protection of sensitive areas (plants, animals, utilities, cultural resources);
- Mop-up requirements; and,
- Emergency plan, including emergency contact phone numbers, safety zones, etc.

Installation and application of this practice **must** comply with all applicable federal, state, and local laws/ordinances.

Additional Instructions:

Operation and Maintenance:
Monitor the kinds and expected variability of site factors (e.g., fuel condition and moisture content, weather conditions, human and vehicular traffic that may be impeded by heat or smoke, liability, and safety and health precautions) during the implementation of this practice. Make available sufficient fire suppression equipment and personnel commensurate with the expected behavior of these factors during the burn to prevent wildfire or other safety, health or liability incident. Maintenance must include monitoring of the burned site and adjacent areas until ash, debris and other consumed materials are at pre-burn temperatures. Complete post-burn evaluation to determine if the burn objectives were met. **Additional Operation and Maintenance Requirements:**

Maps and Field(s) Location:
See conservation plan map for location of prescribed burning fields/stands.

By signing this implementation requirements sheet, the landowner certifies that he/she is familiar with South Carolina's prescribed fire laws and assumes liability associated with the prescribed burn according to South Carolina State Law.

Landowner Signature: _____ **Date:** _____

Conservation Planner Name: _____ **ESJAA:** _____

Conservation Planner Signature: _____ **Date:** _____

Job Approval by:

Name: _____ **Date:** _____

Signature: _____

Installation:
Prescribed Burn Completed by: _____ **Review of post burn evaluation and fire effects:**

This practice addresses resource concerns and meets NRCS standards/specifications.

Practice Certified By:

Name: _____ **ESJAA Level:** _____

Signature: _____ **Date:** _____

Practice Name, Code, and Unit(s)	Specific Conservation Planning and Design Documentation (Consider all that are applicable)	Specific Certification Documentation (All items in boxes below must be completed)
Prescribed Burning (338), ac.	☐ Identified purpose of the prescribed burn ☐ Prescribed burn plan	☐ Copy of prescribed burn plan used to conduct the burn ☐ Photos (after)

Note: This summary does not address all requirements and consideration in the SC Prescribed Burning Conservation Practice Standard (SC-338). Consult the conservation practice standard for further details.

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

TREE-SHRUB SITE PREPARATION

CODE 490

(ac)

DEFINITION

Treatment of sites to enhance the success of natural or artificial regeneration of desired trees and/or shrubs.

PURPOSE

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

- Manage soil conditions, naturally available water, and seasonally high water to favor tree and shrub establishment, survival, and growth
- Modify the habitat of weeds, pests, and diseases to reduce pressure on naturally or artificially regenerated trees and shrubs
- Facilitate the establishment, survival, and growth of tree and shrub species

CONDITIONS WHERE PRACTICE APPLIES

On all lands suited to growing woody plants where current site conditions are not suitable for the natural or artificial establishment of desired trees and shrubs.

CRITERIA

General Criteria

- Use mechanical, chemical, or prescribed burning methods either alone or in combination to alter woody residue, vegetation, ground cover, soil, or microsite conditions to prepare the site for planting, seeding, or natural regeneration of desired tree and shrub species. Where herbicides will be used, evaluate and interpret risks using the Windows Pesticide Screening Tool (WIN-PST) or other approved tools or guides, or use NRCS Conservation Practice Standard (CPS) Pest Management Conservation System (Code 595).
- Expose mineral soil as needed to achieve the desired distribution of plants to be established by seed for tree and shrub species that require mineral soil for germination and establishment.
- Determine method(s), intensity, and timing of site preparation activities depending on topography, and on soil and site conditions. Schedule silviculture and site preparation activities so they are completed at the optimal time prior to the commencement of planting or seeding activities, or to the initiation of natural regeneration.
- Leave woody residue in place to provide soil protection and wildlife habitat, retain soil moisture and organic matter, and protect the soil surface from temperature extremes—except where it will pose a fire hazard, increase the risk of pest damage, or interfere with management activities.
- Use NRCS CPS Prescribed Burning (Code 338) when using fire to prepare a site.
- On soils prone to compaction or rut formation, use low ground-pressure equipment or nonmechanized site preparation methods. When preparing compacted cropland or pasture sites

for tree planting, chisel, rip, and/or subsoil to mitigate compacted soil layers, as needed. Use criteria in NRCS CPS Deep Tillage (Code 324).

- Retain desirable surface and canopy cover to protect soil and site conditions. Alternatively use NRCS CPS Cover Crop (Code 340) or Critical Area Planting (Code 342) and/or other measures as needed to control erosion, runoff, and displacement from typical rainfall events.
- Do not use wheeled and tracked equipment on slopes where operability causes safety concerns or adverse impacts on soil conditions. Perform ground-disturbing site preparation activities on the contour where feasible. Restrict the use of wheeled and tracked equipment to periods when the soil is either frozen or unsaturated. Use designated trails or establish a trail system as appropriate and feasible. Use NRCS CPS Forest Trails and Landings (Code 655).
- Mitigate site preparation activities near wetlands, water bodies, and in or near riparian areas to reduce negative water quality impacts.
- Follow State's best management practices for water quality.

Additional Criteria for Reducing Habitat for Harmful Pests and Diseases of Woody Plants

- Remove vegetation infected with transmittable disease (e.g., mistletoe and certain root rots). Consult a professional forester to aid in identifying sanitation measures.
- Treat slash and woody debris so that it does not create habitat for, or harbor, harmful levels of pests. Refer to criteria in NRCS CPS Woody Residue Treatment (Code 384).
- Clean equipment and gear before and after site preparation activities where risk of spread and potential impact from invasive species or harmful pathogens is likely.

Additional Criteria for Ponding, Flooding, and Seasonally High Water

- On sites where a seasonal excess of surface water restricts the establishment or regeneration of desired and adapted trees or shrubs, use temporary water management techniques as allowable by regulation, laws, and policy as needed.
- Where temporary water management is used, limit the depth, spacing, and number of channels to the minimum amount needed to remove excess surface water for tree/shrub establishment or regeneration.
- Temporary water management channels must empty into areas where runoff will be diffused and filtered by vegetation and soils before reaching a natural water body.
- Apply water management activities, including spoil placement, in compliance with the Clean Water Act, Food Security Act, and NRCS Wetland Compliance.

CONSIDERATIONS

To reduce problems associated with insects in logging debris and the reestablishment of undesirable species, consider doing site preparation within one year after logging, followed promptly by planting or natural regeneration.

To reduce negative impacts on wildlife species and their habitat, consider the timing of site preparation to minimize actions that disturb seasonal wildlife activities.

Particulates, smoke, dust, and other air pollutants generated by site preparation may have negative effects on air quality. Consider proximity to populated areas, roads, and visually sensitive areas when planning method and timing of site preparation activities.

Where site preparation requires treatment of competing vegetation, consider alternatives to chemical treatments such as thermal applications, mulching, or solarization. Use other emerging technologies when applicable.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for site preparation in accordance with this standard. Clearly describe the requirements for applying the practice to achieve its intended purpose. As a minimum, include the following in the implementation requirements document:

- Maps, drawings, and narratives, showing areas to be treated, and showing details of the layout of site preparation activities relative to streams, wetlands, or water bodies, underground or overhead utilities, existing access or other infrastructure, etc., as applicable.
- Description of existing land use and vegetative cover.
- Description of site preparation methods to be used and application dates.
- Description of mitigations for compaction, erosion, soil organic matter removal, and any other anticipated site impacts.
- State whether site preparation is for natural or artificial regeneration. If artificial, provide the planned date for tree planting, timed appropriately relative to site preparation.
- Details on undesirable plant species to be treated and control methods to be used.
- Description of contingency plans in case of flooding or other disturbances that impact implementation schedules or mitigations.
- References to other conservation practice specifications, if applicable.

OPERATION AND MAINTENANCE

Operation

Site preparation operations will comply with all local, State, and Federal laws and ordinances, and with State's forestry best management practices for water quality.

For site preparation using herbicides, the operator will develop a safety plan for individuals exposed to chemicals, including telephone numbers and addresses of emergency treatment centers and the telephone number for the nearest poison control center. The National Pesticide Information Center (NPIC) telephone number in Corvallis, Oregon, may also be given for nonemergency information: 1-800-858-7384, Monday to Friday, 6:30 a.m. to 4:30 p.m. Pacific Time. The national Chemical Transportation Emergency Center (CHEMTRAC) telephone number is 1-800-424-9300.

- Follow label requirements for mixing/loading setbacks from wells, intermittent streams, and rivers, natural or impounded ponds and lakes, and reservoirs.
- Post signs, according to label directions and/or Federal, State, Tribal, and local laws, around fields that have been treated. Follow restricted entry intervals.
- Dispose of herbicides and herbicide containers in accordance with label directions and adhere to Federal, State, Tribal, and local regulations.
- Read and follow label directions and maintain appropriate material safety data sheets.
- Calibrate application equipment according to recommendations before each seasonal use and with each major chemical and site change.
- Replace worn nozzle tips, cracked hoses, and faulty gauges on spray equipment.
- Herbicide application records shall be kept in accordance with USDA Agricultural Marketing Service's Pesticide Recordkeeping Program and State-specific requirements.

Determine the success of the practice by evaluating post-treatment conditions and verifying that they are suitable for the establishment of desired trees and shrubs.

Maintenance

Following initial application, some regrowth, sprouting, or reoccurrence of undesirable plants may be expected. Spot treatment of individual plants or areas needing retreatment should be completed as needed while woody vegetation is small and can be most successfully treated, during the lifespan of this

practice. This includes maintaining erosion control measures as necessary and controlling access by vehicles, wildlife, or livestock, to support successful establishment of this practice.

REFERENCES

Black, H.C. 1992. Silvicultural Approaches to Animal Damage Management in Pacific Northwest Forests. Gen. Tech. Rep. PNW-GTR-287. USDA Forest Service, Pacific Northwest Research Station. Portland, OR.

Cleary, B.D., R.D Greaves, and R.K. Hermann. 1978. Regenerating Oregon's Forests. Oregon State University Extension Service. Corvallis, OR.

Harrington, C.A. and S.H. Schoenholtz. 2005. Productivity of Western Forests: A Forest Products Focus. Gen. Tech. Rep. PNW-GTR-642. USDA Forest Service, Pacific Northwest Research Station. Portland, OR.

Lof, M., D.C. Dey, R.M. Navarro, and D.F. Jacobs. 2012. Mechanical Site Preparation for Forest Restoration. New Forests 43:825–848.

Pesticide Action Network Europe. 2018. Alternative Methods in Weed Management to the Use of Glyphosate and Other Herbicides. Integrated Weed Management. Brussels, Belgium.https://www.pan-europe.info/sites/pan-europe.info/files/Report_Alternatives%20to%20Glyphosate_July_2018.pdf

Skaggs, R.W., S. Tian, G.M. Chescheir, A. Devendra, and M.S. Youssef. 2016. Forest Drainage. In: Amatya et al. (eds.), Forest Hydrology: Processes, Management and Assessment. CABI Publishers, U.K. 124-140. 17 p.

USDA Forest Service. 1990. Agriculture Handbook 654, Silvics of North America: Volume 1. Washington, D.C.

U.S. Environmental Protection Agency. 1972. Clean Water Act. Section 404(f), 33 U.S.C. Section 1344. See also: 33 CFR Part 323.4 and 40 CFR Part 232.3.

United States Department of Agriculture
Natural Resources Conservation Service

490 – Tree/Shrub Site Preparation Implementation Requirements

Client: _____ **Date:** _____

Farm No.: _____ **Tract No:** _____

Field(s): _____ **Acres:** _____

DEFINITION

Treatment of areas to improve site conditions for establishing trees and/or shrubs.

PURPOSE

- Encourage natural regeneration of desirable woody plants.
- Permit artificial establishment of woody plants.

CRITERIA

The method, intensity and timing of site preparation will match the limitations of the site, equipment, and the requirements for establishing the desired woody species.

An appropriate site preparation method will be chosen to achieve the intended purpose and to protect desirable vegetation, site and soil conditions. Other complementary practices and measures will be used as necessary to control erosion, runoff, compaction and displacement to acceptable levels.

Remaining slash and debris will not create habitat for or harbor harmful levels of pests.

Remaining slash and debris must not hinder needed equipment operations or create an undue fire hazard. Refer to the Prescribed Burning (338) conservation practice standard for slash and debris that will be burned.

Measures, including the use of equipment, will be implemented to control or protect against locally invasive and noxious species that may arise from site preparation activities.

All chemicals will be applied in accordance with label guidelines.

Site preparation activities occur just prior to planting or within 12 months of tree/shrub establishment.

Comply with applicable Federal, state, and local laws and regulations, including Guide to Forestry Best Management Practices (BMPs) in Tennessee, during the installation, operation, and maintenance of this practice.

NOTE: *NRCS does not make pesticide recommendations. Landowners should be instructed to read product labels and follow product specifications.*

Client Signature: _____ **Date:** _____

Conservation Planner Name: _____ **ESJAA:** _____

Conservation Planner Signature: _____ **Date:** _____

Clear Form

Objective:			
☐	Natural Regeneration	☐	Wildlife Planting
☐	Tree and Shrub Establishment	☐	Other

Site Preparation Method:				
Field	**Acres**	**Method[1] – Select from options listed below.**	**Planned Date**	**WIN-PST Report Attached**

Method[1] Options:

1. Chemical	**NRCS does not make pesticide recommendations. Contact the local SC Cooperative Extension Service.** Clients should request the product name, strength, and amount used. All chemicals must be applied in accordance with label guidelines. If product name is known, identify in the Additional Notes section on next page.
2. Hand	**Cutting** **Scalping**
3. Mechanical	**Bedding** **Root Raking** **Chopping** **Scalping** **Disking** **Shearing** **Mowing** **Subsoiling**
4. Prescribed Burn	**Implement a prescribed burn by following 338 practice standard.**

Specifications and Notes (if any);

Operation and Maintenance:
Repair or maintain erosion control measures as necessary to ensure proper function. Access by vehicles during or after site preparation should be controlled to minimize erosion, compaction, and other site impacts. Practice areas should be checked periodically, but especially in the first three to six months after planting to see if additional control of competition is needed to ensure the survival of desired vegetation. Control locally invasive and noxious plants as necessary. **Additional Operation and Maintenance Requirements:**

Checkout Notes:

This practice addresses resource concerns and meets NRCS standards/specifications.

Practice Certified By:

Name: _____ **ESJAA Level:** _____

Signature: _____ **Date:** _____

APPENDIX A: TOXICITY RATINGS OF COMMON HERBICIDES

Commonly Used Pesticides in South Carolina with Low or Very Low Toxicity Ratings *If any pesticide is used that is not listed, WIN-PST must be run.*

PESTICIDE TYPE	ACTIVE INGREDIENTS	HUMAN TOX	FISH EXPOSURE TOX	FISH SEDIMENT TOX
COMBINATION HERBICIDES	Metsulfuron-methyl, 2,4-D dimethylamine salt, & Dicamba dimethylamine salt	VERY LOW LOW VERY LOW	VERY LOW VERY LOW VERY LOW	VERY LOW VERY LOW VERY LOW
COMBINATION HERBICIDES	Imazapic & Glyphosate	VERY LOW VERY LOW	VERY LOW LOW	VERY LOW VERY LOW
COMBINATION HERBICIDES	2,4-D dimethylamine salt & Dicamba dimethylamine salt	LOW VERY LOW	VERY LOW VERY LOW	VERY LOW VERY LOW
COMBINATION HERBICIDES	Dicamba dimethylamine salt & Diflufenzopyr	VERY LOW VERY LOW	VERY LOW VERY LOW	VERY LOW VERY LOW
COMBINATION HERBICIDES	Sulfometuron-methyl & Metsulfuron-methyl	VERY LOW VERY LOW	VERY LOW VERY LOW	VERY LOW VERY LOW
HERBICIDES	2,4-D, dimethylamine salt	LOW	VERY LOW	VERY LOW
HERBICIDES	2,4-DB, dimethylamine salt	LOW	VERY LOW	LOW
HERBICIDES	2,4-Dichlorophenoxyacetic acid, triisopropanolamine salt	LOW	VERY LOW	VERY LOW
HERBICIDES	Aminopyralid	VERY LOW	VERY LOW	LOW
HERBICIDES	Clethodim	LOW	VERY LOW	VERY LOW
HERBICIDES	Dicamba, diglycoamine salt	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Dicamba, dimethylamine salt	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Glyphosate, isopropylamine salt	VERY LOW	LOW	VERY LOW
HERBICIDES	Halosulfuron-methyl	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Imazapic, ammonium salt	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Imazapyr	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Imazethapyr, ammonium salt	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Metsulfuron-methyl	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Picloram, trisopropanolamine salt	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Sethoxydim	VERY LOW	LOW	LOW
HERBICIDES	Sodium bentazon	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Sulfometuron-methyl	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Sulfosulfuron	VERY LOW	VERY LOW	VERY LOW
HERBICIDES	Thifensulfuron methyl	LOW	VERY LOW	VERY LOW
HERBICIDES	Triethylamine triclopyr	VERY LOW	VERY LOW	VERY LOW

For additional information or questions, contact the State Biologist.

Practice Name, Code, and Unit(s)	Specific Conservation Planning and Design Documentation (Consider all that are applicable)	Specific Certification Documentation (All items in boxes below must be completed)
Forest Site Preparation (490), ac.	☐ Statement of method of site preparation ☐ Identify any planned erosion control measures	☐ Photos (preferable after)

Note: This summary does not address all requirements and consideration in the SC Tree/Shrub Site Prep Establishment Conservation Practice Standard (SC-490). Consult the conservation practice standard for further details.

STATEMENT OF WORK
Tree-Shrub Site Prep (490)
South Carolina

These deliverables apply to this individual practice. For deliverables for other planned practices, refer to those specific Statements of Work.

DESIGN

Deliverables

1. Design documents that demonstrate criteria in NRCS practice standard have been met and are compatible with planned and applied practices. Include—
   a. Practice standard criteria-related computations and analyses to develop plans and specifications including but not limited to:
      i. Determination of appropriate method, intensity, and timing to prepare the site for planting, seeding, or natural regeneration.
      ii. Mitigation of erosion, runoff, soil compaction, and soil displacement to acceptable levels.
      iii. Handling/disposal of remaining slash/debris and protection of existing desirable vegetation.
2. Written plans and specifications including location map, sketches, and drawings shall be provided to the client that adequately describe the requirements to apply the practice and obtain necessary permits.
3. Documentation of needed operation and maintenance.
4. Certification the design meets practice standard criteria and complies with applicable laws and regulations.
5. Documentation requirements for design modifications during practice application.
6. Itemized cost estimate.

INSTALLATION

Deliverables

1. Documentation of preapplication conference with client.
2. Verification that client has obtained required permits.
3. Staking and layout according to plans and specifications including applicable layout notes.
4. Application guidance as needed.
5. Facilitate, implement, and document required design modifications with client, original designer, and permitting and funding agencies.
6. Advise client/NRCS on compliance issues with all Federal, State, Tribal, and local laws, regulations, and NRCS policies during application.
7. Certification the application process and materials meet design and permit requirements.

CHECK OUT

Deliverables

1. Records of application.
   a. Extent of practice units applied and location identified on a map.
   b. Actual erosion and compaction mitigation measures used and applied.
2. Certification the application meets NRCS standards and specifications and is in compliance with permits.
3. Provide the following information to the NRCS field office servicing the relevant land unit for entry into the Performance Results System (PRS):
   a. Technical service provider name
   b. Customer name

c. USDA program funding the practice (if known)
d. Location of work (State, county, conservation district, land tract identifier)
e. Land use of field where the practice was applied (cropland, etc.)
f. NRCS practice name and quantity of practice applied in appropriate units
g. Documentation of exit conference with client and contractor

REFERENCES

- USDA NRCS. Wisconsin Field Office Technical Guide (eFOTG), Section IV, Conservation Practice Standard - Forest Site Preparation, 490.
- USDA NRCS. 2004. National Forestry Handbook (Title 190), Part 636.4, Planning Considerations. Washington, D.C. https://directives.sc.egov.usda.gov/
- USDA NRCS. 2016. National Environmental Compliance Handbook (Title 190). Washington, D.C. https://directives.sc.egov.usda.gov/
- USDA NRCS. 2018. National Cultural Resources Procedures Handbook (Title 190). Washington, D.C. https://directives.sc.egov.usda.gov/

United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

TREE/SHRUB ESTABLISHMENT

CODE 612

(ac)

DEFINITION

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

PURPOSE

Establish woody plants to—

- Maintain or improve desirable plant diversity, productivity, and health by establishing woody plants
- Create or improve habitat for desired wildlife species compatible with ecological characteristics of the site
- Control erosion
- Reduce excess nutrients and other pollutants in runoff and groundwater
- Sequester and store carbon
- Restore or maintain native plant communities
- Develop renewable energy systems
- Conserve energy
- Provide for beneficial organisms and pollinators

CONDITIONS WHERE PRACTICE APPLIES

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 soil and site conditions, and appropriate for the planned purpose(s).

Determine desired stocking levels for trees and/or shrubs based on ecological characteristics of the site and species, and landowner objectives. Plant, seed, and/or naturally regenerate at densities/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.

Ensure that a source of seed and/or vegetative propagules is or will be present, or that advanced reproduction exists, sufficient to achieve objectives. Where natural regeneration relies on seed sources, apply any needed stand treatments and/or site preparation at appropriate times to facilitate germination

and establishment of seeds from desired species when utilizing natural regeneration to establish trees and/or shrubs. Modify forest stand conditions as needed, using CPS Forest Stand Improvement (Code 666), to create favorable stand structure for initiating natural regeneration. Use NRCS CPSs Prescribed Burning (Code 338), Brush Management (Code 314), and/or Herbaceous Weed Control (Code 315), as needed, to obtain the desired species composition, density, and arrangement of trees/shrubs in naturally regenerated areas. 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.

Use tree/shrub planting to accomplish or supplement forest stand regeneration in locations where natural regeneration of desired species is not possible, or will not meet objectives.

Select only viable, high-quality, and adapted plant materials. 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). Do not plant any species on the Federal or State invasive species or noxious weed lists.

Choose appropriate planting dates and handling methods to increase rates of survival. Select planting techniques and timing appropriate for soil and site conditions.

Alter species selection and/or timing of planting/seeding to minimize potential effects of residual chemical carryover, 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 assure adequate survival and establishment. Minimize the need for supplemental water and/or nutrients by choosing site-adapted plant materials, planting methods, and planting seasons. Where supplemental moisture is needed to achieve tree/shrub establishment use NRCS CPS Irrigation System, Microirrigation (Code 441).

Protect tree and shrub plantings, seeded areas, and naturally regenerated areas, from unacceptable adverse impacts of pests, wildlife, livestock, and/or fire. Protect from pests, as necessary, by applying integrated pest management techniques for pest prevention, avoidance, monitoring, and suppression.

Remove products (e.g., trees, biomass, medicinal herbs, nuts, fruits, etc.) if desired, provided that conservation purpose(s) are not compromised by the loss of vegetation or by harvesting disturbance.

When planting on sites with greater than 5 percent slope, plant on the contour to control erosion.

Additional Criteria to Improve Water Quality by Reducing Nutrients and Pollutants

Select species that have fast-growth characteristics, extensive root systems, and a high-nutrient uptake capacity when plantings are used to remove excess nutrients from runoff or groundwater. Trees and shrubs used to reduce pollutants must be tolerant of the types of pollutants contained in effluent or soils at the site.

Additional Criteria for Restoring or Maintaining Native Plant Communities

Select native species that will create a successional state that progresses toward the identified target plant community.

Additional Criteria for Sequestering and Storing Carbon

Select species that have high-growth rates, recognizing that they are typically short-lived for shorter term, rapid carbon sequestration. For longer term storage of carbon, select plants with a long life span, the ability to reach a large size, high-wood density, and potential for use in long-lived products for longer term storage of carbon establish and maintain a fully stocked stand.

Additional Criteria to Conserve Energy

Increase energy efficiency by planting trees to provide shade for buildings.

Select plants with a potential height growth that will be taller than the structure or facility being protected. Use proper plant densities to optimize the shade produced.

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.

Use NRCS CPS Windbreak Establishment (Code 380) to protect structures from heat loss due to wind.

Additional Criteria for Habitat for Beneficial Organisms

Plant trees and shrubs that provide habitat and food sources for beneficial organisms, such as pollinators, predatory and parasitic insects, spiders, insectivorous birds and bats, raptors, and terrestrial rodent predators. Select plant species that meet dietary, nesting, and cover requirements for the intended beneficial organisms during the critical period for control of target pests and, if possible, for the entire year.

Protect beneficial organisms from harmful pesticides.

CONSIDERATIONS

Consider utilizing plant materials that have been selected and tested in the Plant Materials Program or in similar tree/shrub improvement programs

Consider using diverse tree and shrub species combinations which best meet the needs of desired wildlife and pollinator species.

Consider whether the species, variety, or cultivar possesses aggressive traits, and whether it poses a potential threat to the existing or desired plant community when selecting plant materials

Consider the potential impacts of extreme weather events (e.g., drought, flooding, wind, late spring frosts) when selecting plant species and sites for planting.

Consider using modeling tools to predict carbon sequestration rates and amounts of stored carbon when using trees and shrubs for carbon sequestration and storage.

Anticipate the need for future access lanes for purposes of stand management and fire control when considering tree/shrub arrangement and spacing.

Consider establishing species with growth rates and at densities that make them competitive with weeds and undesirable plants.

Consider using species that provide subsistence and cultural values, (e.g., as used by Tribes).

Consider designing plantings to enhance visual quality in farmsteads, recreation areas, and along public rights-of-way, by applying foliage color, season and color of flowering, mature plant height, edge-feathering, and other landscaping techniques.

Considerations for Organic Systems During Vegetation Establishment

Consider natural mulches, such as wood products or hay, to support tree/shrub establishment by controlling competing vegetation, as a viable alternative to using herbicides. Certified weed-free mulches are preferred. Use NRCS CPS Mulching (Code 484).

Manage pests 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.

Control Invasive plant species mulching with fully biodegradable materials; mowing; livestock grazing with protection for plantings; hand weeding and mechanical cultivation; pre-irrigation; flame, heat, or electrical means. Use NRCS CPS Prescribed Burning (Code 338), as needed.

Considerations for Conserving Energy Use

Plant trees on the west side of buildings to reduce summer energy use. The second priority is the east 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.

Plant deciduous tree and shrub species adjacent to the south side of buildings in cool climates to 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 job sheets or other acceptable documentation. At a minimum, provide—

- Objective(s) for establishment.
- Sketches, drawings, and detail drawings.
- Map showing the location of plantings and/or natural regeneration areas.
- Soils map, and description of soils and Ecological Sites (if available).
- Establishment method by species or vegetation type.
- Number of trees/shrubs per acre to be planted, by species.
- Timing of planting and/or natural regeneration relative to considerations for seasonal factors, plant physiology, disease, insects, and wildlife impacts.
- Mitigation measures, if needed, to reduce wildfire hazard or the potential for disease and insect pests.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan for this site. As a minimum, include the following activities:

- Burn or mow the area periodically, if needed to maintain the health of the plant community. Do not conduct maintenance practices and activities during the primary reproductive period of wildlife. Exceptions can be considered to maintain the health of the vegetative community if such exceptions do not conflict with agency requirements.
- Control access by vehicles and/or equipment during or after tree/shrub establishment to protect new plants and minimize erosion, compaction and other site impacts.
- Inspect the site at an appropriate time following planting, seeding, and/or natural regeneration to determine whether the survival rate for tree and shrubs meets practice and client objectives. Replant or provide supplemental planting when survival is not adequate.
- Inspect the trees and shrubs periodically, and protect them from adverse impacts of insects, diseases, competing vegetation, fire, livestock, wildlife, non-functioning tree shelters and/or weed barriers, etc.
- Control competing vegetation until the desired trees/shrubs are established. Control plant species on the Federal or State invasive species and noxious weed lists.
- Apply nutrients to maintain vigor of desirable trees/shrubs.

REFERENCES

AmericanHort. 2014. American Standard for Nursery Stock. W.A. Quinn, Ed. ANSI Z60.1. Available at http://americanhort.org/documents/ansi_nursery_stock_standards_americanhort_2014.pdf (verified 25 Jan 2016).

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Landis, T.D.; Dumroese, R.K.; Haase, D.L. 2010. The Container Tree Nursery Manual. Volume 7, Seedling Processing, Storage, and Outplanting. Available at http://www.fs.fed.us/rm/pubs_other/wo_AgricHandbook674_7.pdf (verified 25 Jan 2016). Agriculture Handbook 674. USDA-Forest Service. Washington, DC. 200 p.

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Organic Materials Review Institute. OMRI Products List. Available athttp://www.omri.org/omri-lists/download (verified 25 Jan 2016).

Southern Organic Resource Guide. Sources of Organic and Untreated Non-GMO Seeds. Available at http://attra.ncat.org/sorg/seeds.html (verified 25 Jan 2016).

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USDA-Forest Service. 2002. Silvicultural Practices Handbook, Chapter 2 - Reforestation. Southwestern Region (Region 3). Albuquerque, New Mexico. Available at http://www.fs.fed.us/im/directives/field/r3/fsh/2409.17/2409.17_2.01_2.5.doc (verified 25 Jan 2016). FSH 2409.17. (Note: State FOTGs may substitute this citation with one specific to their USDA-Forest Service region.)

USDA-NRCS. Woodlands and Forestlands. Available at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/plantmaterials/technical/publications/?cid=stelprdb1044053 (verified 25 Jan 2016).

Keys to Successfully Planting Longleaf Pine

Order seedlings ASAP. Due to a resurgence of interest in longleaf pine, the supply of longleaf seedlings has also increased. However, longleaf seedling supply will probably not be sufficient to meet demand during the 1998-99 planting season. Those waiting till mid-summer to order, will have difficulty finding seedlings. For a comprehensive list of longleaf nurseries, call the Longleaf Alliance, at 334-222-7779, and ask for a complimentary copy of *The Longleaf Nursery List.*

Container or bareroot? Cost conscious consumers may blanche at containerized seedling prices. However, cost incentive programs and increased survivability make this option very feasible. From a 1995 region-wide survey conducted by the North Carolina Division of Forest Resources, containerized seedling survival averaged 85% and bareroot survival averaged 65%. Keep in mind, some planters consistently average 90% survival with bareroot seedlings, while others consistently average less than 50%.

There are several factors that come into play when making the containerized/bareroot decision. Do you want the seedlings planted in very straight rows with exact spacing? If so, you probably want your seedlings machine planted. Bareroot seedlings are well suited for machine planting on intensively site prepared land. On most sites, machine planting bareroot will yield better depth control and better survival than hand-planting bareroot seedlings.

Will you accept less than exact spacing and rows that are not quite as neat and straight? If so, hand planting containerized seedlings may be the best route for you. Hand-planted containerized stock tends to have better survival rates than machine planted containerized seedlings.

Longleaf pine can be successfully planted using either bareroot or containerized seedlings if the proper care and techniques are applied. Repeated planting failures are generally the results of planting mistakes. Two common reasons for longleaf planting failures are: 1) Incorrect planting depth (too deep or too shallow), and 2) Planting in established grasses (especially bermudagrass or bahiagrass).

Seedling Selection: Most seed sources are from Coastal Plains stands located in lower Alabama, the Florida Panhandle, and South Georgia. These sources are appropriate for the southern half of Alabama. When planting north of Montgomery, use a north Alabama seed source commonly referred to as ‘mountain or montane’ longleaf. Check the Longleaf Alliance's *The Longleaf Nursery List* for nurseries that use these seed sources.

When purchasing <u>bareroot</u> seedlings consider the following:

· Seedlings should have been undercut and laterally root-pruned at least once in nursery beds.
· Should have at least six primary lateral roots and a highly fibrous root system with numerous feeder roots.
· Seedlings should be 0.4-inch in root collar diameter or larger.

· Roots should be moist but not too wet. A dry root system means a dead seedling.
· Seedlings should have healthy foliage and no evidence of disease problems.

Choosing a Tree Planting Contractor. This is one of the most important decisions you will make. Many planting failures can be traced to improper seedling handling and planting procedures by the planting crews. Make sure you pick the right contractor for the job. Choose one that has experience in successfully planting longleaf pine. Ask for references. Do not make your decision based upon per/acre cost of planting the seedlings. Paying $5-10.00 per acre more for a good, reputable contractor may mean the difference between a successful planting, or buying more seedlings and replanting the following year. Make sure your contractor and seedlings are compatible. If you line up a contractor whose only experience is planting containerized seedlings, don't buy bareroot. If you purchase bareroot, find a contractor who has been successful with bareroot.

Maintain Oversight of the Planting Operation. You or your representative should be on site with the planting crew to ensure that the operation meets your quality standards. You may want to hire a forestry consultant to manage or procure the contractor and planting job. Some foresters are knowledgeable about longleaf. Some are not. For assistance in this matter, contact your local forester with the Alabama Forest Commission. Or, to acquire a list of forestry consultants who work with Ion leaf pine in your area, call the Longleaf Alliance and request this information. Also, some of the larger timber corporations have landowner-assistance foresters that can help you.

Rules of Thumb for Best Results:

• Plant early in the season; trees planted before Christmas tend to have better survival and growth rates than late planted seedlings. I
• Do not plant in dry soils. Wait for adequate rain to wet at least the rooting zone (upper 6 inches of soil). You may plant as early as October provided the soil is moist.
• Do not plant if soils are frozen.
• High winds and low humidity associated high pressure-cold fronts may dry out exposed bareroot seedling roots, potentially leading to high mortality rates if extra care is not taken.
• Plant seedlings soon after delivery. Try to have all bareroot planted within one week of lifting from the nursery. Don't waste your money buying leftover bareroot from other planting jobs. Containerized seedlings will store better, but the sooner they are planted after lifting, the better.
• Always protect bareroot seedling bundles and boxes of container seedlings from freezing, excess heat, and exposure to the sun and wind.
• Bareroot seedling roots should be exposed to the sun and air for as little time as is absolutely necessary. Never wash or prune the roots of bareroot seedlings as these procedures will reduce survival.

Planting longleaf on sites with bermudagrass or bahiagrass. It is critical to kill bermudagrass or bahiagrass prior to planting. These grasses are much more difficult to control after planting and chemical control options are severely restricted. For best survival in pastures, broadcast spray grasses in September prior to planting with one of the following either A) 5-6 qt. of Accord®/acre, or B) 3 quarts Accord & 2 oz Oust®/acre. Note: you may not receive cost-share assistance on a pre-planting chemical application. As and additional step, scalping sites just prior

to, or during planting has increased survival in Florida pastures. For information on herbicide applications, contact the Longleaf Alliance.

To Rip or Not to Rip. Many agricultural fields and pastures have a hard, restrictive soil layer referred to as a ‘plowpan or hard pan’. In such cases, "ripping" or "subsoiling" will fracture the hardpan resulting in better planting conditions. Seedling root growth will also be greater resulting in better seedling growth. Ripping should be done several months prior to planting, as several rain events are necessary to settle the soil to eliminate air pockets. Rip with the contour of the land to avoid unnecessary erosion. Seedlings should be planted about 6" to the side of the rip. Do not plant directly in the rip because water will frequently use the rip as a channel, uncovering some seedlings and burying others. The taproot of the longleaf will find the rip and allow the seedling to root deeper, thus minimizing the chance of wind-throw and increasing water availability to the tree.

Planting Hints: When planting pastures or areas that will not erode, plant seedlings so that the root collar is directly at the soil surface. When planting cropland or other areas that have been heavily site-prepared, plant seedlings so that the root collar is about 1/4-1/2" beneath the soil surface. Try to anticipate how much the soil will erode so that the root collar will end up at the soil surface. Planting too shallow will result in a seedling that dies quickly. Planting too deep will result in a seedling that dies slowly. Good compaction is needed to eliminate air pockets around seedling roots. Heavy duty machines do a better job of packing than the typical hand planting crew.

Hand Planting Tools: Use the correct too] when hand-planting. Do not use hoe-dads to plant longleaf seedlings! As bareroot seedling roots are very large, planting shovels work best in opening a planting hole large enough to accommodate the root system. Many containerized seedlings have tools designed especially for their plug size. Using the correct tool will result in less root deformation, better survival, and better long-term growth.

Be sure your planting contractor understands your CRP or WHIP contract. If you are contractually mandated to plant less than 500 tree/per/acre, the crew should know this. If not, they may do you a "favor" by planting leftover seedlings between previously planted seedlings. This would result in more than 500 trees/per/acre and could cause you to lose your funding.

Join the Longleaf Alliance and receive current information on the management* of *longleaf pine.

The Longleaf Alliance

Route 7, Box 131

Solon Dixon Forestry Education Center

Andalusia, AL 36420

334-222-7779

United States Department of Agriculture

612 – Tree/Shrub Establishment Implementation Requirements

Producer:		**Project or Contract:**	
Location:		**County:**	
Farm Name:		**Tract Number:**	

Practice Location Map (see attached)

Index

Utility Safety/
One-Call System
Information

South Carolina 811
Call 811 Before You Dig

Description of work:

Producer Signature: _____ **Date:** _____

NRCS Review Only

Designed By:		**ESJAA Level:**	**Date**
Checked By:		**ESJAA Level:**	**Date**
Approved By:		**ESJAA Level:**	**Date**

612 – Tree/Shrub Establishment
Implementation Requirements

Practice Purpose(s): (check all that apply)

- ☐ Maintain or improve desirable plant diversity, productivity, and health by establishing woody plants.
- ☐ Create or improve habitat for desired wildlife species compatible with ecological characteristics of the site.
- ☐ Control erosion.
- ☐ Improve water quality. Reduce excess nutrients and other pollutants in runoff and groundwater.
- ☐ Sequester and store carbon.
- ☐ Restore or maintain native plant communities.
- ☐ Develop renewable energy systems.
- ☐ Conserve energy.
- ☐ Provide for beneficial organisms and pollinators.
- ☐ CSP Enhancement No. _____

- **See attached location and soils maps.**

Field Number	Acres	Plant species	Planting Stock	Total lbs of seed or plants for planned acreage	Planting Date

Site preparation:	See Tree/Shrub Site Preparation, Code 490, Implementation Requirements.
Planting method and arrangement:	Dormant planting stock may be stored temporarily in a cooler or protected area. **Please note that planting stock that has not reached 400 chilling hours can not be stored for long periods.** For container or bare root stock of all trees or shrubs except longleaf pine, plant stock to a depth even with root collar in holes deep and wide enough to fully extend roots. For longleaf seedlings or tublings proper planting depth is specified below. Additional Planting Information:
Mitigation measures to prevent wildfire or disease/pest hazards:	

Operation and Maintenance: (check all that apply)

- ☐ Burn or mow the area periodically, if needed to maintain the health of the plant community. Do not conduct maintenance practices and activities during the primary reproductive period of wildlife. Exceptions can be considered to maintain the health of the vegetative community if such exceptions do not conflict with agency requirements.
- ☐ Control access by vehicles and/or equipment during or after tree/shrub establishment to protect new plants and minimize erosion, compaction and other site impacts.
- ☐ Inspect the site at an appropriate time following planting, seeding, and/or natural regeneration to determine whether the survival rate for tree and shrubs meets practice and client objectives. Replant or provide supplemental planting when survival is not adequate.
- ☐ Inspect the trees and shrubs periodically, and protect them from adverse impacts of insects, diseases, competing vegetation, fire, livestock, wildlife, non-functioning tree shelters and/or weed barriers, etc.
- ☐ If needed, control competing vegetation until the desired trees/shrubs are established. Control plant species on the Federal or State invasive species and noxious weed lists.
- ☐ If needed, apply nutrients to maintain vigor of desirable trees/shrubs.
- ☐ Other: _____

Certification Statement:
I certify that implementation of this conservation practice is complete, meets criteria for the stated purpose(s), and meets the NRCS conservation practice standard and specifications.

X _____
Planner/Technical Service Provider

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

612 – Tree/Shrub Establishment For Wildlife Implementation Requirements

Producer:_____ **Project:** _____

Location:_____ **County:**_____

Farm No.:_____ **Tract No.:** _____

Description of Work:

The Practice Purpose(s):

- ☐ Maintain or improve desirable plant diversity, productivity, and health by establishing woody plants
- ☐ Create or improve habitat for desired wildlife species compatible with ecological characteristics of the site
- ☐ Control erosion
- ☐ Reduce excess nutrients and other pollutants in runoff and groundwater
- ☐ Sequester and store carbon
- ☐ Restore or maintain native plant communities
- ☐ Develop renewable energy systems
- ☐ Conserve energy
- ☐ Provide for beneficial organisms and pollinators

Field Number/Location:_____ **Acres Installed:**_____ **Planting Date:**_____

Site Preparation: _____

Planting Method:_____

Has a NRCS/Partner Biologist developed a wildlife plan?_____ **Date:**_____

WHEG Assessment:_____ **Before:**_____ **After:** _____

Describe the pre and post treatment cover/diversity for the target species and desired effects from the treatment:

Client Signature:_____ **Date:**_____

Designed By:_____ **ESJAA Level:**_____ **Date:**_____

Planting Specifications:

For Species Selection see - 612_SC_OTH_Tree_Shrub_Establishment_Native_Plant_List_2023

For Site Prep and Planting Guidance see - 612_SC_OTH_Tree_Shrub_Establishment_for_Wildlife_Planting_Guide_2023

Layout		Planting 1	Planting 2	Planting 3	Planting4
Planting width (feet)					
Planting length (feet)					
Area (acres)					
Species # 1	# plants-				
Species # 2	# plants-				
Species # 3	# plants-				
Species # 4	# plants-				
Species # 5	# plants-				
Species # 6	# plants-				
P_2O_5 (lbs/acre)					
K_2O (lbs/acre					

Temporary Storage Instructions

Planting stock that is dormant may be stored temporarily in a cooler or protected area. For stock that is expected to begin growth before planting, dig a V-shaped trench (heeling-in bed) sufficiently deep and bury seedlings so that all roots are covered by soil. Pack the soil firmly and water thoroughly.

Site Preparation

Remove debris and control competing vegetation to allow enough spots or sites for planting and planting equipment. Soil should be prepared by conventional disking methods; or by herbicide treatments when a prevalence of exotic sod-forming grass competition like fescue, bahiagrass, or Bermuda grass exists on site. After planting, pack soil firmly around roots and protect plants from damage by traffic, fire, livestock, wildlife and weed competition. Fertilizer may be used to increase productivity of fruit-bearing species. For container and bare root stock, plant stock to a depth even with the root collar in holes deep and wide enough to fully extend the roots. Pack the soil firmly around each plant. Cuttings are inserted in moist soil with at least 2 to 3 buds showing above ground.
Additional requirements:

Planting Method

A minimum of 3 native woody plant species should be planted to promote greater species diversity. Tees and shrubs must be inspected periodically and protected from damage so proper function is maintained. Replace dead or dying tree and shrub stock and continue control of competing vegetation to allow proper establishment. Periodic harvesting of trees and shrubs may be necessary to maintain the health and vigor of mature stands. Planting will be successful if > 75% of planting survives into 3rd year after planting.
Additional requirements: Trees should be planted at 12 ft. by 12 ft. spacing, shrubs at 6 ft. by 6ft. spacing (or all plants at 10 ft. by 10 ft. or 12 ft. by 12 ft. spacing). Use tree and shrub shelters to protect against deer and small mammal browse.

Operation and Maintenance

Maintain original purpose of planting. Competing vegetation shall be controlled until the trees and shrubs becomes established by mowing in between rows or spot herbicide treatment until established. Shut off pesticide sprayers when turning near trees and shrubs. Noxious weeds in established plantings will be controlled by mowing, fire, tillage, or herbicides as appropriate.
Additional Requirements:

CERTIFICATION OF PRACTICE

Description of the vegetation at the time of checkout (e.g. percentage of desirable species, height, and condition).

Plant Species	Percent coverage	Height and Condition

☐ Photos (preferable before/after) as necessary to determine success of treatment.

Practice performed, to the extent shown above, meets practice standards and specifications.

Certified By:_____ **ESJAA Level:**_____ **Date:**_____

United States Department of Agriculture
Natural Resources Conservation Service

612 Tree/Shrub Establishment
For Wildlife
Planting Guide

SCOPE:

This work will consist of establishing adapted and compatible native trees and shrubs for forest products, wildlife habitat, erosion control and water quality, treating waste, storing carbon, energy conservation, improving or restoring natural diversity, and enhancing aesthetics.

GENERAL SPECIFICATIONS APPLICABLE TO ALL PURPOSES:

Planting Plan

The planting plan will be recorded on the approved SC NRCS 612 Implementation Requirements sheet or other acceptable format and will include the natural community type if applicable, species and sizes, numbers to be planted, spacing, locations and specifications for protection if applicable.

Locally developed, native South Carolina plant materials or seeds should be considered for planting. Do not order or plant species developed outside of South Carolina which are uncommon or rare in the State. This will maintain the genetic integrity of these species.

Plant Material Descriptions

Bare-root Stock – woody plant seedlings lifted from the nursery soil and delivered with their roots bare of soil. Readily available and commonly planted throughout South Carolina. Various sizes.

Tubelings – woody plant seedling grown in plastic "plug" containers with small amount of soil. While a type of 'container grown' plant material they are unique enough to be treated separately.

Container Grown/Balled-Burlapped - woody plant seedlings and saplings grown and delivered in soil; either plastic container or wrapped in burlap. Generally larger sizes.

Live stakes - living woody plant cuttings capable of quickly rooting in moist soils; generally, ½ - 2 inches in diameter and 1-3 feet long and large enough to be tamped-in as stakes. Typically used for bioengineering but may be used in other moist soil conditions.

Whips – living woody plant cuttings capable of rooting in moist soils and usually assembled into bundles called wattles or fascines; generally, ¼ - 1 inch diameter and 3-4 feet in length. Typically used for bioengineering but may be used in other moist soil conditions.

Wattles - bundles of whip cuttings bound together into sausage-like structures capable of rooting in moist soils; generally, wattles are at least 3-4 feet long. Typically used for bioengineering by placing in trenches and securing with live stakes.

Fascines - bundles of whip cuttings bound together into sausage-like structures capable of rooting in moist soils; generally, fascines are 5-20 feet long. Typically used for bioengineering by placing in trenches and securing with live stakes.

Site Preparation/Weed Control for Establishment

Determine the level of preparation and weed control based upon the site conditions and plant materials. In prior crop fields weed control or mats may not be necessary but in prior hayfield it may be necessary due to the tall grass; particularly if planting small bare root stock. If planting tall trees (4 feet or more) weed mats are likely unnecessary. Soil should be prepared by conventional disking methods; or by herbicide treatments when a prevalence of exotic sod-forming grass competition like fescue, bahia, or bermuda exists on site.

- Eliminate all competing vegetation in all seedbed areas to be direct seeded prior to planting.

- If fabric weed barriers are used, the following shall apply:
    - Barrier must be a minimum of 9 sq.ft/plant.
    - Barrier must be permeable to water and be guaranteed by manufacturer to last a minimum of 3 years.
    - Barrier shall be capable of inhibiting all underlying plant growth.
    - Barrier must be pinned and otherwise installed according to manufacturer's specifications.
- If tillage is used for weed control, take care not to damage plant stems. Keep tillage depths shallow to avoid root damage.
- Mowing or cutting of weeds or grass is not an acceptable means of weed control around woody plantings.
- Herbicide may be used and applied according to label instructions.

Planting Dates

- Bare-rooted stock and tubelings shall be planted during the dormant season in winter as soil moisture and local weather conditions permit. Care should be taken to plant leafed-out tubelings in March after danger of frost has passed.
- Balled and burlapped or container-grown stock shall be planted October 1 to March 31 as local soil moisture and weather conditions permit.
- Cuttings, including live stakes, wattles and fascines, shall be planted during the dormant season; generally, from November 15th through March 31st. The spring planting date may be extended to end of April if cuttings have been in cold storage.
- Direct seeding shall be completed from October 1 through March 31 depending on local soil moisture, target species dispersal date and as weather conditions permit. Spring seeding of some heavy seeded species may reduce rodent and insect damage. Fall seeding may eliminate the need for seed stratification and seed storage but may increase loss to rodents and other pests.

Minimum Planting Stock Size

Bare root stock should be 12 inches or more in total length. Generally, this will be size '1-0' which is one year old. Seedlings are often described as 1-0, 2-0 and 3-0. The first number refers to the number of years grown in a nursery seedling bed and the second to the number of years in a transplant nursery bed. Transplants are commonly designated as 2-1, 2-2, and 3-2. The total age of the plant is the sum of the two numbers. For example, 1-0 refers to a 1-year-old seedling and 2-2 to a 4-year-old transplant.

Cuttings:

- "Whips" for wattles and fascines should be ¼ to 1 inch diameter and 3-4 feet in length.
- Live stake size should be ½ to 2 inch diameter and 12-24 inch length. Use longer lengths to increase chance of success.

Storage, Care and Handling of Woody Planting Stock

- Planting stock roots will be protected from desiccation (drying) during temporary storage and handling prior to and during planting. Stock will be kept in a cool environment out of direct sunlight and wind.
- Keep seedlings in shipping container and place in cold storage at 35 degrees to 45 degrees F. If cold storage is not feasible, heel in planting stock (see figure 1) for a period not to exceed 2 weeks. Follow supplier's direction which may include "sweating" or forcing some species out of dormancy and into bud break before planting.
- Roots of bare-rooted stock shall be kept moist and protected from freezing during planting operations by placing in a water-soil (mud) slurry, peat moss, sphagnum moss, superabsorbent (e.g., polyacrylamide) slurry or other equivalent material. (Note: Do not soak trees in water for more than 8 hours.).
- Rooting medium of containerized and balled and burlapped stock shall be protected from excessive heat and freezing and kept moist at all times by periodic watering.

- Whips and live stakes can be sprayed with water to help keep them moist prior to bagging for storage. Bags should be made of fairly rugged plastic. Addition of moist peat moss to the bag prior to tying the top is desirable. Cuttings should fit comfortably inside the bags. Bags should be heavy enough to prevent punctures which tend to occur when handling bagged cuttings. Bags should be able to retain moisture around the cuttings. Cuttings can be stored in the dark, at temperatures approximately 33-40 F for 3-4 months without any significant reduction in establishment success. Whether cuttings are kept in a cooler, root cellar, or snowbank, make sure the storage area is dark, moist and cool at all times.

Plant Material Collection - Cuttings

Landowner permission shall be obtained prior to plant material harvest. Only one third to half of available plant material from a natural site should be harvested. It may be beneficial to identify potential harvest sites during the growing season to aid with plant identification.

Cuttings - Live Stakes and Whips

The best cuttings are those which are fairly straight and have few branches which necessitates trimming. The best wood is 2-7 year old with smooth bark that is not split or furrowed. Use sharp hand tools to make clean cuts and limit damage to bark. Side branches should be removed. Live stake tops should be cut square so they can be tamped or pushed into the soil. Live stake basal ends (lower portion cut from tree or shrub) should be cut angled to allow for easy insertion in soil. Cutting the live stakes in this fashion will eliminate confusion as to which end is up for planting.

Emphasis should be placed on obtaining quality materials with no obvious insect or disease problems. Plant material should be cut from shrub willows, red osier and silky dogwood, black willow, or cottonwood.

Cuttings should be collected in the dormant season. The dormant season is after the first hard frost and leaf drop in fall and before bud swell in spring (roughly November 15th through March 31st). Keep the cuttings cool and moist until planting (see storage and handling section above). To minimize storage time, harvest cuttings in late winter to early spring and plant immediately when possible.

Length and Thickness of Cuttings: Basal diameter for whips should be a minimum of ¼ - 1 inch in diameter and 3-4 feet in length. Basal diameter for live stakes should be ½ -2 inch diameter and 12-24 inches long. Generally, larger diameter cuttings are better as they ensure a large supply of stored energy in the stem which improves establishment success. Also, longer cuttings (~4 feet) usually experience greater rooting success then shorter (2 foot) cuttings. The longer length allows cuttings to be planted deeper and into the mid-summer moisture zone. Cuttings planted into soil which dries out below the cutting and its developing roots have poor survival rates. Plant materials center trials have shown that large poles from 3-8 inch diameter have been very successful.

Planting Requirements for Woody Planting Stock

- Stock shall not be planted when the soil is frozen or dry. Rooted stock will be planted in a vertical position with the root collars approximately level with or slightly below (0.5 inch or less) the existing ground line. Planting depth should mimic the depth grown at the nursery.
- **Seedlings:** The planting trench or hole must be deep and wide enough to permit roots to spread out and down without doubling, J-rooting or L-rooting. If the roots are too long for the planting equipment, minimal pruning of small end roots may be needed. Do not prune back into the main root system or more than 25% of the total root length. Prune out any diseased root branches. Pack soil around each plant firmly to eliminate air pockets after planting.
- **Cuttings (Whips and Live Stakes):** Using cuttings of willow and other woody shrubs and trees that root from the stem is a successful and inexpensive treatment in moist soil conditions. Planting of hardwood cuttings will be limited to shrub and black willow, red osier and silky dogwood, or cottonwood. Willow and dogwood are the typical species planted and available in South Carolina. Plant cuttings within 2 days of collection or shipping arrival in the spring through March 31st. Planting may be done as late as the end of April if cuttings have been in cold storage.
- **Containerized trees**: Dig a hole slightly larger than the container diameter. Gently remove plants from containers before placing in the ground and firmly pack soil around roots to eliminate air pockets. Before planting, loosen any spiraling or compacted roots. Water should be applied generously.

- **Balled and burlapped trees:** When handling stock, never lift a tree at the stems or trunk. Handle stock at the root ball. Dig a hole 1 1/2 times as wide as the root ball and about the same depth as the root ball. Remove any rope, wire, or plastic twine from the tree. Pull back burlap around trunk and fold down once in the hole. Carefully place the tree in the hole and firmly pack soil around roots to eliminate air pockets. Water should be applied generously.

Planting Techniques

Small Seedlings

The two primary methods of planting smaller seedlings and bare root stock are slit method and side-hole method. These techniques are suitable when the root system is small enough so that it is not doubled over in the hole created by the tools. Figure 2 (below) shows some tree planting tools such as planting/dibble bars and shovels.

Slit Method: This method (See Figure 3) consists of making a slit in the ground with a planting bar, shovel or other suitable tool. This technique is much more rapid than side-hole method. After planting the tree in the slit, the bar is re-inserted several inches away, rocked away from the plant to kick in the soil at the bottom of the roots, and then rocked toward the plant to compress the soil around the base of the plant. The planter will then firm the soil around the plant with their feet.

Side-Hole Method: This method consists of digging a hole with a mattock or grub hoe deep enough to hold the roots of the tree (see Figure 4). This approach can work on larger seedlings and most bare root stock. Drive the tool into the ground and rock it to create a wedge-shaped hole and place the plant at the proper depth. Be sure to hold the plant at the proper depth when backfilling and compacting the soil so as to prevent plant settling below the root collar. If the roots are too long, then deepen the hole rather than bending roots into a "J" shape. Firm the soil around the plant with the feet.

Large Seedlings/Small Saplings

The primary methods of planting large seedlings and small saplings are with planting tools such as a tile spade or light mechanical equipment such as a gas-powered auger or light excavation equipment. These techniques are used when the plant material is too large for smaller planting equipment and a larger hole is necessary to accommodate large root systems. Follow the guidelines under the previous section *Planting Requirements for Woody Planting Stock*. Cultural resource review is required when digging below the plow zone (8-12 inches).

Cuttings – Whips and Live Stakes

It is strongly recommended to soak cuttings in water for 1-2 days before planting. Soaking has been shown to significantly increase the survival rate of the cuttings. They should also be kept cool and moist in water during the planting operation. Cuttings will be hand planted under optimum moisture conditions.

Live stakes will be planted vertically with the buds pointing upward.

Live stakes will be inserted into the soil (angled basal end down) for approximately 75% of the stake length (a 24 inch stake should be in the ground 18 inches). Depending upon the soil, stakes may be pushed, inserted in hole/slit or pounded into the ground. Use of a pilot hole is recommended using rebar, soil auger, planting shovel or other (see figure 5). When using a pilot hole, it is important to ensure adequate soil/stake contact and to eliminate air by firming soil around stake. If the top of the stake is damaged (split) from pounding it should be pruned downed to an undamaged area on the stake or replaced; ideally, two buds and/or bud scars should be above the ground after planting.

Space the individual willow cuttings about 3-5 feet apart for shrubs and about 6-12 feet apart for trees. In those areas where erosive action is expected, plant the larger plant materials (3-8 inch diameter) at least 3-4 feet in the ground with a more dense spacing.

Wattles and Fascines

Assembly: To assemble wattles/fascines use whips from desired species. Typically, this will be shrubs. Orient the basal ends of branches in opposite directions to create a wattle or fascine with a uniform diameter (See figure 6). Tie wattles with twine at both ends and every 2-3 feet for longer fascines.

Finished bundle should be compressed to 4-8 inch diameter.

Installation: Dig a shallow trench slightly wider than the size of the wattle or fascine. The depth of the trench should be approximately 75% of the diameter of the bundle. Lay the bundle flat in the trench and cover with soil being sure to pack soil in to eliminate air pockets. Do not cover the entire bundle. The top part of the bundle and stems must be visible for the length of the bundle.

Where flowing water and erosion is a concern, overlapping multiple wattles/fascines (~12 inches) and staking may be necessary. Live stakes or wooden stakes may be driven through the bundle and into the soil for 75% of the stake's length. Install stakes every 4 feet at alternating angles on each side of and through the bundle. Stakes should be a minimum of 12 inches or greater. Follow the specifications in Chapter 16 of the Engineering Field Handbook if the intent of installation is stream bank protection. The above specifications are for moist soil vegetative establishment.

Protection

Tree shelters can help with the establishment of trees in many situations. They physically protect the plant from browsing by deer and girdling by rodents. They have also been shown to increase growth rates by creating a favorable microclimate with increased moisture and CO2. Finally, managing competing vegetation will be much easier with the plant protected by the shelter (e.g., herbicide, etc). The use of shelters is probably the most important protective measure a landowner can use to help with planting. To provide these benefits, correct installation is critical.

Because of the relative absence of moisture stress, sheltered seedlings can grow later into the season, making them susceptible to die-back in cold winters. This is a temporary effect; re-growth in the following year will usually harden off properly.

In areas where high deer numbers may lead to substantial browsing, four-foot tree tubes will be used. Two to three foot tubes will be used where rodents or rabbits are a cause of concern but deer browse is not.

The base of a tree shelter must be placed at least an inch into the soil to avoid a chimney effect, which increases moisture loss and also allows entry by rodents. Tree shelters are then secured to a rot resistant stake. Tree shelters will be assembled and installed according to manufacturer instructions.

Most tree shelters do not decompose and should be removed 2 to 3 years after plants emerge from them or when the trunk diameter grows beyond 2 inches. When the bark begins to grow against the shelter, the tree can develop cankers and fungus that threaten the health of the tree.

Evaluate the appropriateness of the site for tree shelters. Frequently flooded riparian areas may lead to maintenance problems with the shelter and or contribute to plant damage.

Beaver Protection

If beavers are damaging an excessive amount of plant materials, tree seedlings can be protected with wire fencing with a nine-inch or smaller mesh, installed around the tree to a height of 3 feet. This fencing should be anchored at the bottom to keep the beaver from working its way under the fence. Another method to prevent beaver gnawing is to paint the lower bark of the tree seedlings with a mixture of latex paint and mason sand. The ratio is approximately 5 ounces of sand to one quart of paint. The mixture results in an unappetizing cover for the beaver to gnaw through.

Natural Regeneration

Natural regeneration can be a cost-effective way to allow tree and shrub establishment and plant succession to occur on site. Most natural plant communities in South Carolina are dominated by trees and or shrubs. However, natural regeneration may not provide desired or uniform stem density as would be afforded through planting.

Determine if natural regeneration can successfully meet objectives. Where closed canopy conditions on the land unit are desired in a short period of time; natural regeneration may not be the best choice.

Once some woody stems have been established it should lead to further regeneration through changes in the site condition (shading favoring trees and shrubs), seed dispersal by birds and mammals and root suckering.

When considering potential establishment through natural regeneration, consider the site conditions and potential for establishment. Dense sod in old hayfields will likely need to be harrowed while idle crop fields or pastures may be well suited. Often pastures have some woody component that has been suppressed by browsing.

Consider the surrounding forest areas for seed sources. Natural regeneration is not a good option if the land unit is surrounded by agricultural land with no favorable seed sources or potential for vegetative reproduction. Where there are perches for birds (e.g. fence posts, trees on site, etc.) there is a better likelihood of colonization for some woody species; in particular, shrubs whose fruits are fed upon by birds will be seeded into these areas.

When planning for natural regeneration to occur, consider mode of dispersal, distance between seed source and target area, seed source strength (number and size of mature seed-bearing specimens) and seed size. Generally, heavy seeded species can disperse short distances of 150 feet or less while wind and bird dispersed seeds may travel 450 feet or less. Obviously, all seeds can travel greater distances depending on the site and seed dispersers present but the probabilities become increasingly smaller. See Table 1.

Wind and bird dispersed seeds will be most likely to colonize a site with some stems present. Where there are no perching sites on the land unit, wind dispersed seeds will be the primary form of regeneration. Heavy seeded species such as oak and hickory will take longer to naturally establish, particularly over longer distances. Consider planting species such as oak and hickory in regenerating areas to aid in establishment where they are a component of the targeted natural community.

Areas that are not planted may persist in an early successional state. This may provide good habitat for certain species of concern in the Southeast (e.g., scrub shrub birds) but it can also provide favorable conditions for invasive plants such as privet and honeysuckle. Monitoring is important to prevent their initial establishment.

TABLE 1 (from Hewitt and Kellman 2003)

Species	Dispersal[1]	Seed Size[2]
Ash (white and green)	Wind	2
Basswood	Unspec.	2
Beech	Bird	2
Birches	Wind	1
Cherry	Bird	2
Dogwoods	Bird	2
Elms (American and slippery)	Wind	2
Hickory (bitternut and shagbark)	Rodent	3
Ironwood (Ostrya virginiana)	Unspec.	2
Maples (boxelder, red, silver and sugar)	Wind	2
Musclewood (Carpinus caroliniana)	Unspec.	2
Oaks (black, white, red)	Bird/Rodent	3
Oak, Bur	Rodent	4
Poplar (cottonwood, bigtooth and trembling aspen)	Wind	1
Serviceberry	Bird	2
Walnut/Butternut	Rodent	4

[1]-Dispersal is primary mechanism – 'unspec.' (unspecialized) Lacks adaptations for wind or animal dispersal.

[2]-Seed size 1=<0.01gram, 2=0.01-0.99g, 3=1-5g and 4=>5g

Direct Seeding Guidelines

General Guidelines

- Direct seeding may be used as an alternative to planting cuttings or rooted woody plants. Direct seeding may be less likely to establish woody plants than planting seedlings because seed germination and survival is less predictable and seed loss from rodents, insects and other predators can be high.
- Seed may be obtained from commercial seed sources or collected from wild plants. If purchased seed is to be used, acquire locally adapted seeds and plan shipping of seed to coincide with planting.
- Site preparation generally requires greater control of grass and forbs.
- Seeds should be inspected for damage prior to planting.

- Acorns of most species in the white oak group have little or no dormancy and should be planted as soon as possible after collection in the fall.
- If possible, seed should be planted immediately after collection. Spring seedings (before March 31) will be less susceptible to rodent damage than fall seedings (after November 1) but may need stratification and dormancy period depending on species (see Silvics of North America below).
- Techniques and specifications for South Carolina have not been established and tested. This is a viable alternative to tree planting and should be experimented with where possible. Direct seeding is a well-established process in the south and Midwest and there are many useful resources with extensive information available.

Resources:

- Michigan and Illinois Tree and Shrub Establishment Standard/Specification 612.
- Illinois Direct Seeding Handbook – A Reforestation Guide, 2003. http://www.il.nrcs.usda.gov/technical/forestry/dshndbk.html
- Silvics of North America Manual http://www.na.fs.fed.us/spfo/pubs/silvics_manual/table_of_contents.htm
- Numerous USFS General Technical Reports.

ADDITIONAL SPECIFICATIONS APPLICABLE TO IMPROVING WILDLIFE HABITAT:

In general, there is no set species mix, planting density or configuration for improving wildlife habitat due to the varied needs of different wildlife. The wildlife habitat plan will specify the target species or group and the desired future habitat condition that will be met with this practice. The plan will outline species, density and configuration of the tree and shrub establishment. As a general rule, native species and species with high wildlife value will be planted. See the document '612_SC_OTH_Tree_Shrub_Establishment_Native_Plant_List_2023'.

ADDITIONAL SPECIFICATIONS APPLICABLE FOR EROSION CONTROL/STREAMBANK PROTECTION:

See the NRCS Engineering Field Handbook, Chapter 16 for specifications, layout and installation of live stakes and fascines for streambank protection and erosion control.

ADDITIONAL SPECIFICATIONS APPLICABLE FOR WATER QUALITY:

- Select species that have rapid growth characteristics and extensive root systems where excess nutrients are a concern.
- Where high stream temperatures are a concern, select species with rapid growth and large canopy cover.
- Refer to the Riparian Forest Buffer (#391) CPS and Technical Guide for additional criteria and specifications.

ADDITONAL SPECIFICATIONS APPLICABLE FOR NATURAL COMMUNITY/FOREST RESTORATION:

Natural community restoration will be designed to meet the intended purpose of the practice. Generally, when reforesting a site, it is most effective to mimic natural communities native to the site and soils. The specific species that make up the natural community are the most likely to thrive under those site conditions.

The primary reference for determining natural community and species composition is the Nelson document the Natural Communities of South Carolina https://www.dnr.sc.gov/wildlife/publications/pdf/natcomm.pdf.

It is also important for the planner to evaluate nearby plant communities on similar site conditions to determine what is appropriate or typical for the specific site. Finally, the planting plan will also need to account for the availability of plant materials. Some species are difficult to grow locally and may be better established through natural regeneration on site.

Note: Be aware of pathogens or pests known to be associated with plant materials that may be ordered from outside South Carolina.

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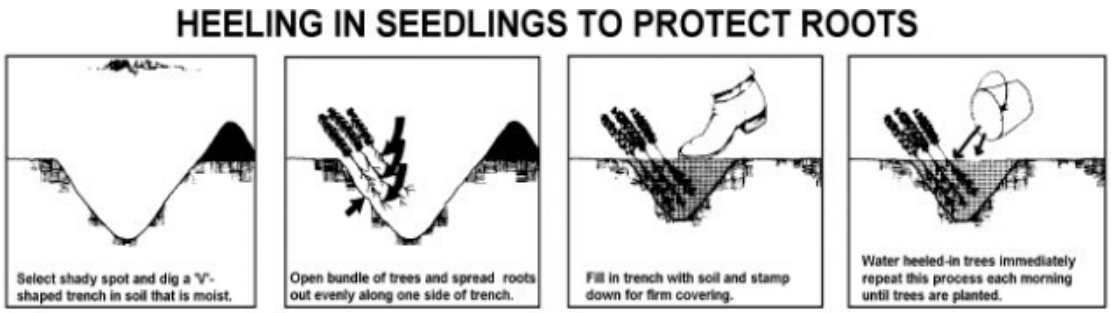

Figure 1. Heeling In Method. (Source: Tree Planting Notes, Minnesota Department of Natural Resources, Division of Forestry.)

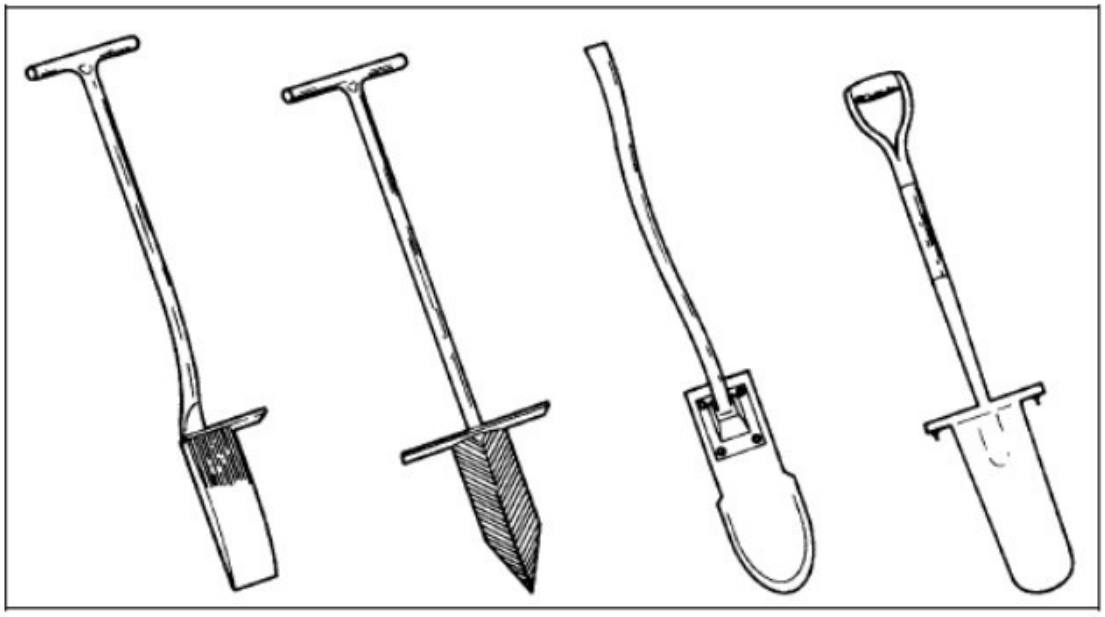

Figure 2. Four tree-planting tools (left to right): planting bar, a pointed planting bar useful in stony soils, the Rindi grub-hoe (L-shaped) for making straight-sided planting holes, and a tile spade planting shovel for digging deep holes for large planting stock. (Source: The Practice of Silviculture, Smith, 1986.)

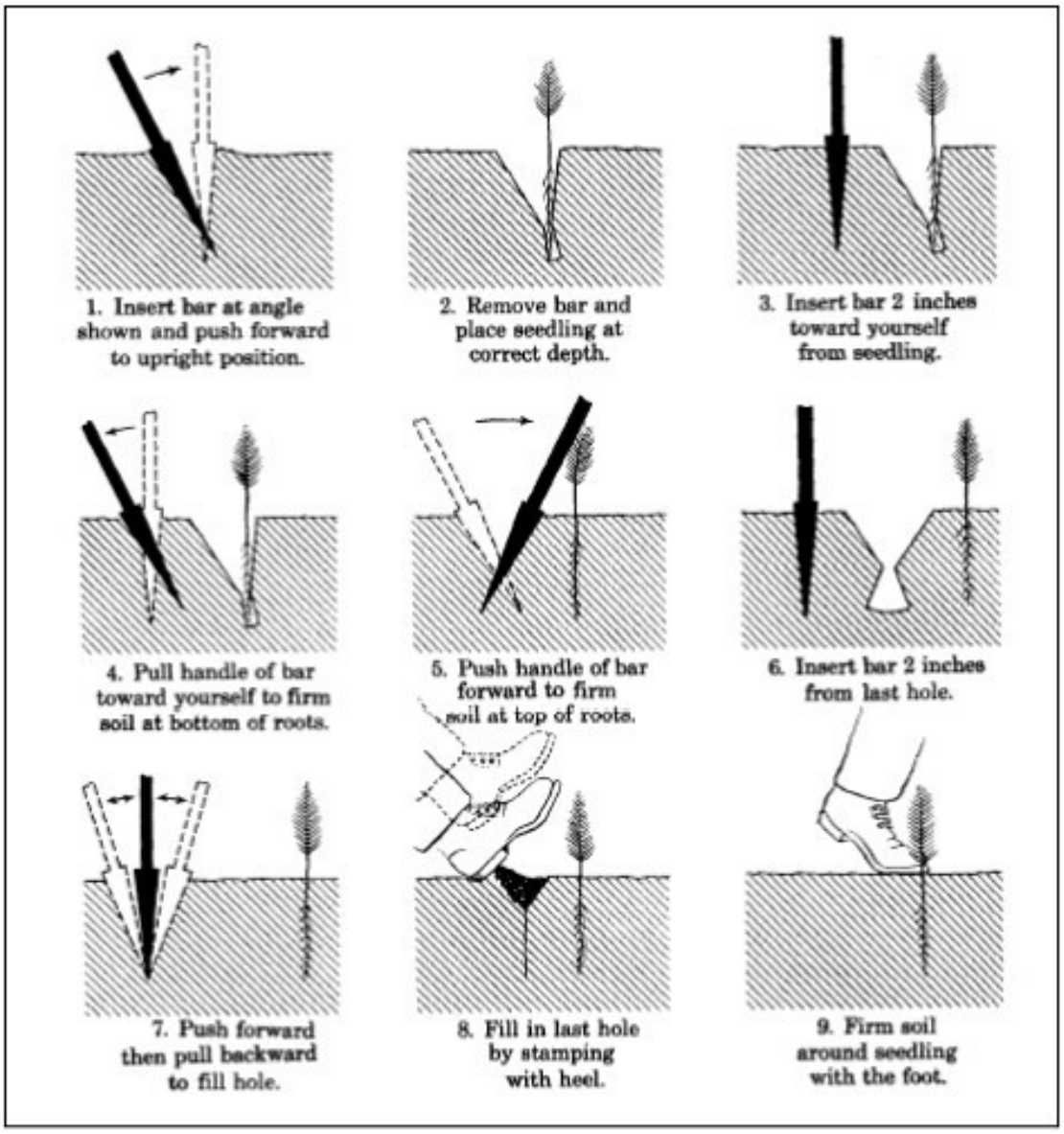

Figure 3. Slit Method. Steps in the use of the slit method of planting seedlings. (Sketch by U.S. Forest Service.)

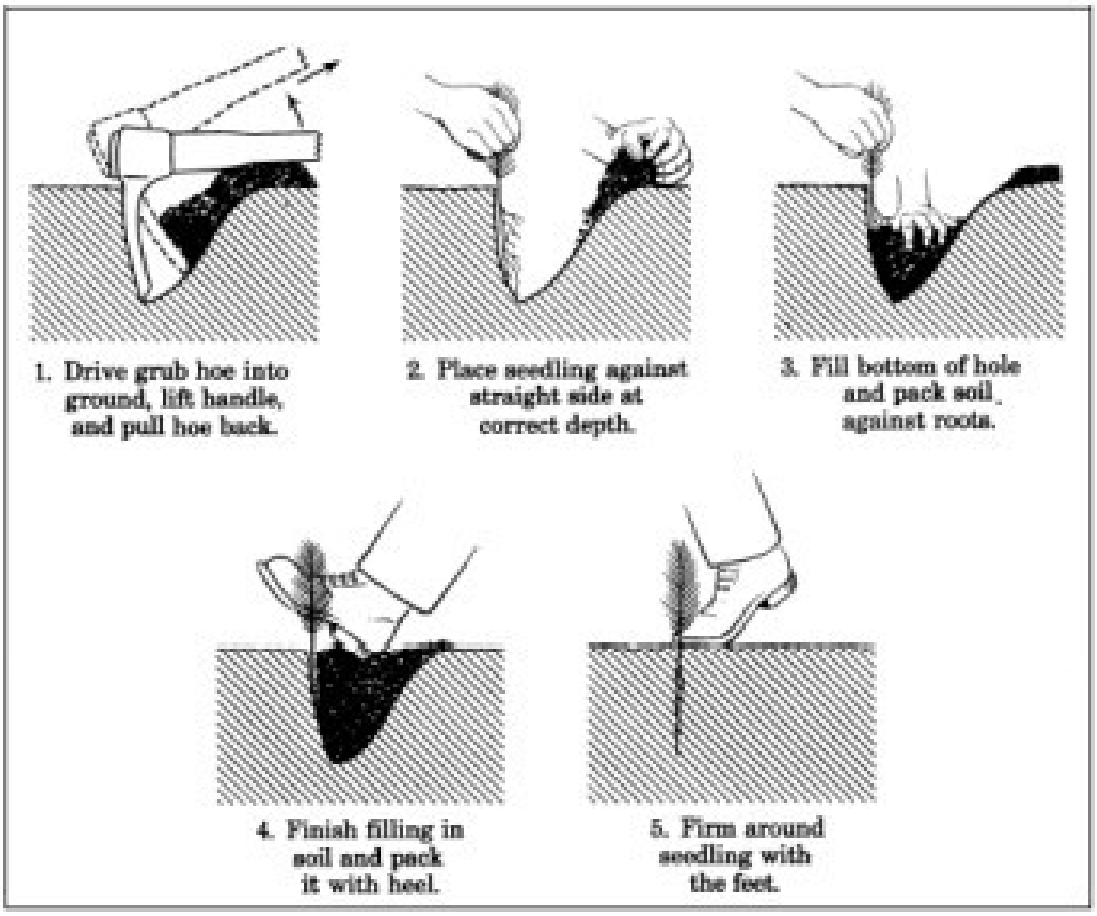

Figure 4. The Side-Hole Method of Planting. (Sketch adapted from U.S. Forest Service and The Practice of Silviculture, Smith, 1986.)

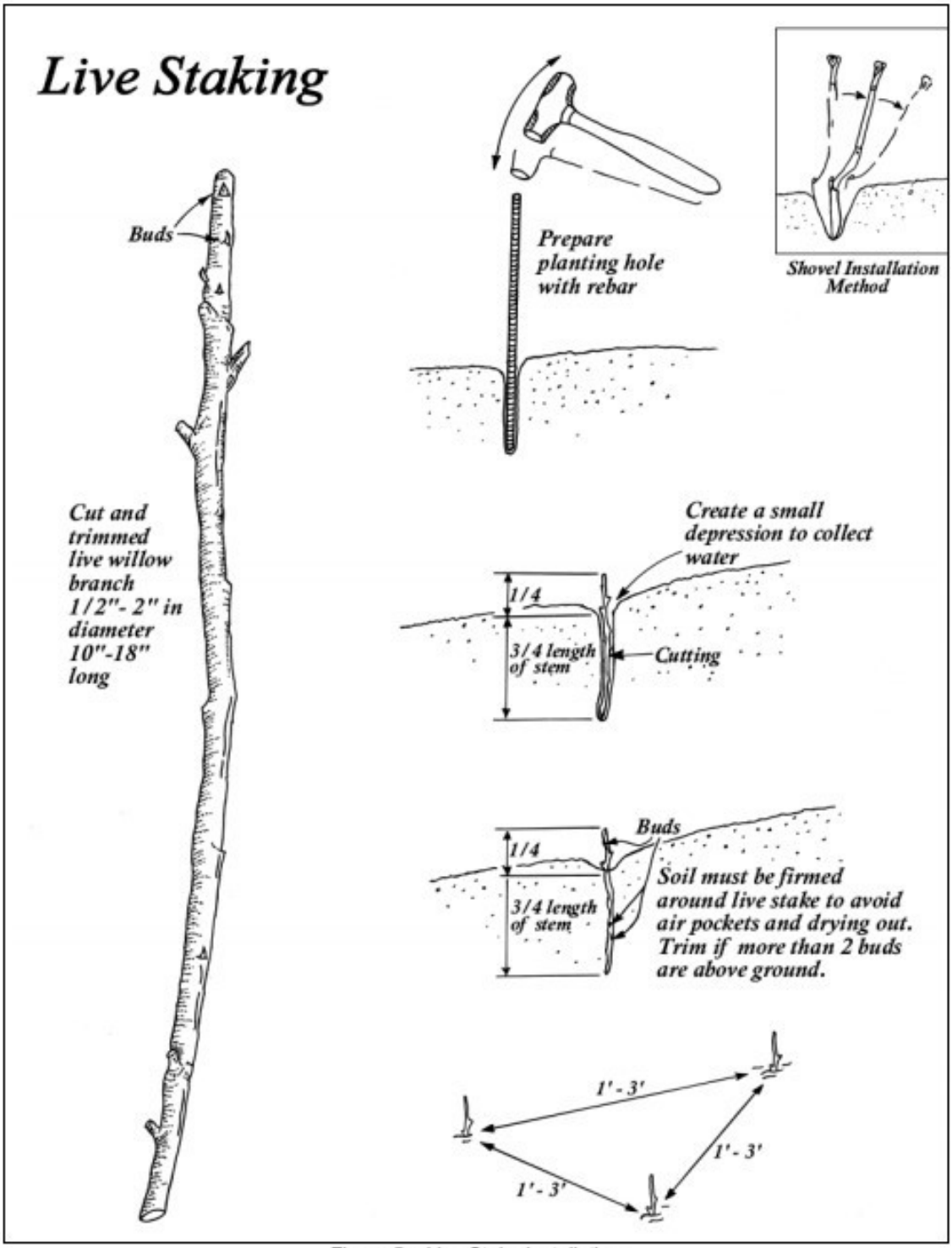

Figure 5 – Live Stake Installation

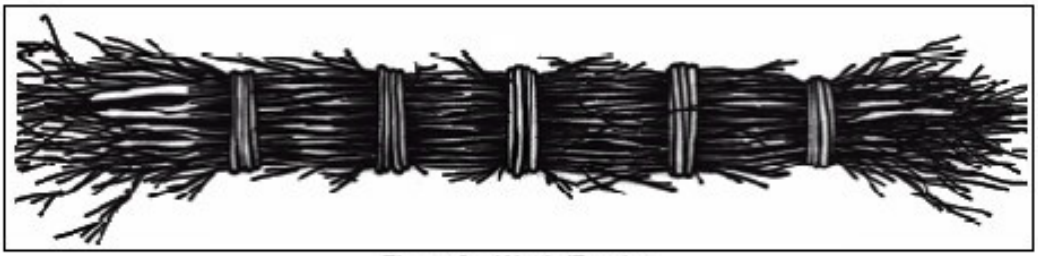

Figure 6 – Wattle/Fascine

Specific Site Requirements

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

612 Tree/Shrub Establishment For Wildlife Technical Guide

Definition:

Selection of native woody vegetation that can be planted to improve wildlife habitat. Tree and shrub plantings that provide quality wildlife habitat are composed of a diverse array of native woody and herbaceous plants planted in a linear or clump plantings.

Purpose:

- Provide food, cover, habitat corridors for terrestrial wildlife
- Provide food and cover for aquatic organisms
- Living fences
- Boundary delineation
- Screens and barriers to noise, odor, and dust
- Reduce soil erosion and sedimentation

Highbush Blueberry *(V. corymbosum)*

Native woody trees and shrubs provide valuable cover and food for game and non-game wildlife species. When used in hedgerows within cropfields, hayfields, or pastures, native woody plants can facilitate travel and escape from predators for northern bobwhite (quail), songbirds, and small mammals; while also providing nest sites for shrubland birds. Typical woody plants used in hedgerows are small trees and shrubs that reach heights of up to 20 feet. Oaks and other larger trees can be added for species and structural diversity as well as for food (acorns and nuts). Larger species can be used for hardwood community restoration (wetlands or uplands). Countless wildlife species including wild turkey, quail, and white-tailed deer forage on the fruits and seeds of native woody plants like persimmon, blueberries, blackberries, sumacs, and hawthorns. The insects attracted by flowering woody plants are an important diet component of shrubland and grassland bird species like quail, field sparrow, eastern kingbird, eastern towhee, and eastern bluebird. Native fruit bearing plants also provide nectar when in bloom and act as larval hosts for a wide variety of pollinators including butterflies, moths, and bees and would therefore be beneficial to adjacent crops needing pollination. Crops that require these pollinators include apple, asparagus, broccoli, carrot, cauliflower, celery, cucumber, onion, legume seeds, pumpkin, squash, sunflower, citrus fruits, peanut, cotton, and soybean. Native grasses, legumes and forbs can be planted alongside woody plants or can be allowed to grow naturally. These plants will provide additional food and ground cover as well as nectar and host plant sources. Any management of planted areas should be delayed until late winter or early spring. Standing dead stems will provide needed winter cover and seeds for a variety of wintering and resident songbirds. **The requirements in this guide are set for the maximum wildlife benefit.**

General Criteria and Specifications:

Planting

A minimum of **3 native woody plant species** should be planted. To promote higher diversity, additional species of woody trees and shrubs, native grasses, forbs, and legumes can be planted. This greatly enhances habitat for songbirds, northern bobwhite (quail), wild turkey, and pollinators. The species selected shall be chosen from the approved lists in eFOTG 612_SC_OTH_Tree_Shrub_Establishment_Native_Plant_List_2023.

Use the 2 Habitat Categories to guide species selection based on the site conditions

1. Upland fields and/or buffers and/or within or around cropfields, hayfields, or pastures **(Table 1).**

2. Riparian buffers, wetland edges, streambanks **(Table 2)**.

Requirements

- For planting guidance, see eFOTG 612_SC_OTH_Tree_Shrub_Establishment_for_Wildlife_Planting_Guide_2023
- Minimum width for wildlife benefit is **30 feet**. Generally, wider corridors accommodate more wildlife use and better songbird nest success.
- **Native species** must be used. Chose species suited and adapted to the soils, climate and conservation purpose on the site.
- If planning in linear fashion, plantings should be made in multiple rows with spacing to accommodate growth for species used.

Yaupon Holly *(Ilex vomitoria)*

- Plant woody bare-root or potted shrubs and trees during the dormant season (November through March). **Spacing: Trees - 12 feet apart, Shrubs - 6 feet apart; or to simplify, all plants 10 to 12 feet apart.**
- Tree and shrub shelters must be used where deer and small mammal browse is problematic.
- If linear as with a hedgerow, the center row should consist of the tallest growing species and the average height of the vegetation should decrease toward the outer edges of the hedgerow. If native grasses and/or forbs are planting or allowed to grow naturally, they should be at the outer edges of the rows, between the cropfield and the woody shrubs and trees.
- If native grasses and/or forbs are to be planted, please refer to the **SC NRCS Tech Guide 420** for species

selection, site preparation, planting and maintenance information.

- **No plant listed in Table 3; or by the State as a Noxious Weed; or listed by the SC Exotic Pest Plant Council shall be established in a tree and shrub planting.** See these websites for official exotic plants lists: South Carolina State Noxious Weeds List | USDA PLANTS, SCEPPC_LIST2014finalOct.pdf (se-eppc.org)
- On pastureland, protect plants from livestock grazing and trampling.

Habitat quality and food supply can be improved by allowing **wild blackberries** to grow within hedgerow

Considerations

- **Make sure all site prep or planting equipment is cleaned prior to use to prevent seeds, rhizomes or other material from invasive exotic plants from being brought to site.**
- Linking fragmented habitats may increase wildlife use.
- In plantings adjacent to small watercourses, the plantings shall be site-adapted, large enough at maturity and installed close enough to shade the watercourse.
- In grassland ecosystems, trees and shrubs may adversely affect area-sensitive nesting birds by fragmenting grassland habitat patches and increasing the risk of predation. Consult an NRCS Biologist when planning on larger grassland tracts.

Hawthorn *(Crataegus sp.)*

Maintenance

- Competing vegetation shall be controlled until the trees and shrubs become established by mowing in between rows or spot herbicide treatment until plantings is fully established. Control shall continue beyond the establishment period, if necessary.
- Noxious weeds will be controlled by mowing, fire, tillage, or herbicides as appropriate. If using fire, slow burning winter fires are best for hardwoods.
- Herbicides are recommended as the best alterative because of long lasting effects. Spot treat as necessary.
-
- Planting will be determined successful if **75%** of the planting survives to the 3rd year after planting.

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

612 Tree/Shrub Establishment
For Wildlife
Native Plant List

TABLE 1: Native Woody Plants for Uplands				
Common Name	Scientific Name	Form	where to plant	Region best suited
Mockernut Hickory	*Carya tomentosa*	tree	dry woods	statewide
Pignut Hickory	*Cayra glabra*	tree	dry to moist woods	statewide
Persimmon	*Diospyros virginiana*	tree	uplands, old fields	statewide
Black Walnut	*Juglans nigra*	tree	moist woods	statewide
Eastern Red Cedar	*Juniperus virginiana*	tree	uplands	statewide
Black Gum	*Nyssa sylvatica*	tree	uplands and low woods	statewide
Shortleaf Pine	*Pinus echinata*	tree	old fields and uplands	statewide
Longleaf Pine	*Pinus palustris*	tree	sandy soil	coastal plain, piedmont
White Oak	*Quercus alba*	tree	uplands, slopes	statewide
Scarlett Oak	*Quercus coccinea*	tree	poor soil, dry uplands	piedmont, mtns
Southern Red Oak	*Quercus falcata*	tree	dry woods	coastal plain, piedmont
Northern Red Oak	*Quercus rubra*	tree	moist soil, slopes	piedmont, mtns
Post Oak	*Quercus stellata*	tree	dry, poor, or rich soil	statewide
Black Oak	*Quercus velutina*	tree	dry, well drained soil	statewide
Live Oak	*Quercus virginiana*	tree	sandy, dry soils	coastal plain, piedmont
Redbud	*Cercis canadensis*	medium tree	uplands, dry to moist	statewide
Flowering Dogwood	*Cornus florida*	medium tree	moist uplands, slopes	statewide
American Holly	*Ilex opaca*	medium tree	well drained, moist soil	statewide
Wild Black Cherry	*Prunus serotina*	medium tree	anywhere, dry to moist soil	statewide
Shadblow Serviceberry	*Amelanchier canadensis*	small tree	sandy uplands	coastal plain, piedmont
Coastal Plain Serviceberry	*Amelanchier obovalis*	small tree	moist soil	coastal plain, piedmont
Paw Paw	*Asimina triloba*	small tree	moist soil, slopes	piedmont, mtns
Silky Dogwood	*Cornus amomum*	small tree	moist soil	statewide
Swamp/Stiff Dogwood	*Cornus stricta, Cornus foemina*	small tree	moist soil	statewide
Deciduous Holly, Possumhaw	*Ilex decidua (keeps berries in winter)*	small tree	moist soil	coastal plain, piedmont
Winterberry	*Ilex verticillata*	small tree	moist soil	statewide
Southern Crabapple	*Malus angustifolia*	small tree	well-drained, moist soil	statewide
Red Mulberry	*Morus rubra*	small tree	moist soil	statewide
Sassafras	*Sassafras albidum*	small tree	moist, well-drained sandy loams	statewide
Chinquapin	*Castanea pumila*	large shrub	dry woods, old fields	statewide
Mayhaw	*Crataegus aestivalis*	large shrub	moist	coastal plain
Cockspur Hawthorn	*Crataegus crus-galli*	large shrub	dry to moist	statewide
One flower Hawthorn	*Crataegus uniflora*	large shrub	dry	statewide
Dahoon Holly	*Ilex cassine*	large shrub	anywhere	coastal plain

TABLE 1 (cont.): Native Woody Plants for Uplands				
Common Name	Scientific Name	Form	where to plant	Region best suited
Lead Plant/False Indigobush	*Amorpha herbacea*	shrub	dry upland	statewide
Beautyberry	*Callicarpa americana*	shrub	dry to wet	statewide
New Jersey Tea	*Ceanothus americanus*	shrub	well drained, open, sandy soils	statewide
Strawberry Bush	*Euonymus americana*	shrub	moist, shady	statewide
Yaupon Holly	*Ilex vomitoria*	shrub	well drained to wet	coastal plain, piedmont
Wax Myrtle/Southern Bayberry	*Morella cerifera or Myrica cerifera*	shrub	wet to dry	coastal plain, piedmont
Ninebark	*Physocarpus opulifoilus*	shrub	bogs, stream banks, moist bluffs	statewide
American Plum	*Prunus americana*	shrub	moist to dry	coastal plain, piedmont
Chickasaw Plum	*Prunus angustifolia*	shrub	moist to dry	statewide
Carolina Laurel Cherry (evergreen)	*Prunus caroliniana*	shrub	well-drained moist soil	coastal plain, piedmont
Hog Plum, Flatwoods Plum	*Prunus umbellata*	shrub	moist to dry	statewide
Carolina Rose	*Rosa carolina*	shrub	moist to dry	statewide
Sparkleberry	*Vaccinium arboreum*	shrub	dry to moist	statewide
Highbush Blueberry	*Vaccinium corymbosum*	shrub	moist soil	statewide
Black-berried Highbush Blueberry	*Vaccinium fuscatum (atrococcum)*	shrub	dry to wet	statewide
Squaw Huckleberry, Deerberry	*Vaccinium stamineum*	shrub	moist to dry	statewide
Small Black Blueberry	*Vaccinium tenellum*	shrub	dry upland	coastal plain, piedmont
Arrowwood	*Viburnum dentatum*	shrub	dry to wet	statewide
Blue Haw, Rusty Black Haw	*Viburnum rufidulum*	shrub	dry soils	statewide
Coral Honeysuckle	*Lonicera sempervirens*	vine	moist to dry	statewide
Virginia Creeper	*Parthenocissus quinquefolia*	vine	moist uplands, shade tolerant	statewide

TABLE 2: Native Woody Plants for Wetlands and Riparian Areas				
Common Name	***Scientific Name***	**Form**	**area to plant**	**Region best suited**
Box Elder	***Acer negundo***	**tree**	semi- wet/ edges, swamp forests, streams	statewide
Red Maple	***Acer rubrum***	**tree**	semi- wet/ edges, swamp forests, streams	statewide
Sweet or Black Birch	***Betula lenta***	**tree**	streambanks, rich woods, north facing slopes	Mtns (Greenville, Pickens)
River Birch	***Betula nigra***	**tree**	semi- wet/ edges, river and stream banks	statewide
Ironwood, Am. Hornbeam	***Carpinus caroliniana***	**tree**	streambanks, low or rich woods	statewide
Shagbark Hickory	***Carya ovata***	**tree**	low woods	piemont, mtns
Hackberry/Sugarberry	***Celtis laevigata***	**tree**	alluvial woods	statewide
Atlantic White Cedar	***Chamaecyparis thyoides***	**tree**	acid swamps, bogs, wet sands	Coastal Plain, piedmont
Persimmon	***Diospyros virginiana***	**tree**	surrounding uplands	statewide
Green Ash	***Fraxinus pennsylvanica***	**tree**	semi- wet/ edges, swamp forests, streams	statewide
Black Walnut	***Juglans nigra***	**tree**	rich woods, stream margins	statewide
Sweetgum	***Liquidambar styraciflua***	**tree**	low, rich woods	statewide
Tulip Poplar	***Lirodendron tulipifera***	**tree**	semi- wet/ edges, swamp forests, streams	statewide
Sycamore	***Platanus occidentalis***	**tree**	low woods	statewide
Eastern Cottonwood	***Populus deltoides***	**tree**	streambanks, swamp forests	Piedmont, inner coastal plain
Swamp Cottonwood	***Populus heterophylla***	**tree**	swamp forests, streambanks	Coastal Plain
Swamp Laurel Oak	***Quercus laurifolia***	**tree**	moist soils	Piedmont, Coastal Plain
Overcup Oak	***Quercus lyrata***	**tree**	swamp forests, poorly drained lowlands	Piedmont, Coastal Plain
Swamp Chestnut Oak	***Quercus michauxii***	**tree**	moist, well-drained alluvial floodplains	Piedmont, Coastal Plain
Water Oak	***Quercus nigra***	**tree**	wet lowlands to moist uplands	statewide
Cherrybark Oak	***Quercus pagoda***	**tree**	bottomland hardwood, well-drained lowlands	statewide
Willow Oak	***Quercus phellos***	**tree**	moist alluvial soils along streams and rivers	statewide
Shumard Oak	***Quercus shumardii***	**tree**	well drained soils along streams and rivers	Piedmont, Coastal Plain
Shawblow Serviceberry	***Alamanchier arborea***	**small tree**	bluffs, stream banks	statewide
Devil's Walking Stick	***Aralia spinosa***	**small tree**	upland and low woods	statewide
Paw Paw	***Asimina trioloba***	**small tree**	stream banks, low woods, floodplains	mtns, piedmont, inner CP
Silky/Swamp Dogwood	***Cornus amomum***	**small tree**	semi- wet/ edges, swamp forests, streams	statewide
Swamp/Stiff Dogwood	***Cornus stricta, Cornus foemina***	**small tree**	stream banks, alluvial woods, swamp forests	statewide
Deciduous Holly	***Ilex decidua***	**small tree**	upland and alluvial forests	Piedmont, Coastal Plain
Winterberry	***Ilex verticillata***	**small tree**	floodplains, bogs, along streams, low woods	statewide
Red Mulberry	***Morus rubra***	**small tree**	alluvial woods and adjacent lower slope	statewide
Red Chokeberry	***Photinia pyrifolia (Aronia arbutifolia)***	**small tree**	moist woods, swamps, bogs, bluffs	statewide

TABLE 2 (cont.): Native Woody Plants for Wetlands and Riparian Areas				
Common Name	***Scientific Name***	**Form**	**area to plant**	**Region best suited**
Alternate Leaved Dogwood	***Cornus alternifolia***	**large shrub**	moist woodlands, stream and swamp borders	Piedmont, Mountains
Hawthorn	***Crataegus viridis, C. spathulata, C. marshallii***	**large shrub**	alluvial woods, swamp forests	Piedmont, Coastal Plain
Witch Hazel	***Hamamelis virginiana***	**large shrub**	rich or dry woods, surrounding slopes	statewide
Mockorange	***Philadelphus inodorus***	**large shrub**	rich woods, floodplains	Piedmont, Mountains
Common Ninebark	***Physocarpus opulifolius***	**large shrub**	bogs, streambanks, moist cliffs,	Piedmont, Mountains
Coastal Plain Willow	***Salix caroliniana***	**large shrub**	streambanks, low, moist areas	Coastal Plain, Piedmont
Black Willow	***Salix nigra***	**large shrub**	streambanks, low, moist areas	statewide
Silky Willow	***Salix sericea***	**large shrub**	marshes, ditches, low woods	statewide
Tag Alder	***Alnus serrulata***	**shrub**	streambanks, swamp edge, wet meadow	statewide
False Indigo/River Locust	***Amorpha fruticosa***	**shrub**	dry to moist	statewide
Dwarf Paw Paw	***Asimina parviflora***	**shrub**	drier edges, surrounding uplands	statewide
Groundsel	***Baccharis halimifolia***	**shrub**	open wet edges	Piedmont, Mountains
Buttonbush	***Cephalanthus occidentalis***	**shrub**	wet shorelines, swamps	statewide
Sweet Pepperbush	***Clethera alnifolia***	**shrub**	semi- wet/ edges, pocosins, bays	Coastal Plain, Piedmont
Hazel-nut	***Corylus americana***	**shrub**	rich woods	statewide
Titi	***Cyrilla racemeflora***	**shrub**	semi- wet/ edges, bays, poccosins	Piedmont, Coastal Plain
Virginia Willow	***Itea virginica***	**shrub**	semi-wet/ wet, low woods	statewide
Coastal Doghobble	***Leucothoe axillaris***	**shrub**	along streams, bays, pocosins, swamp forest	Coastal Plain, Piedmont
Highland Doghobble	***Leucothoe fontainissima***	**shrub**	along streams	mountains
Dog Hobble/Fetterbush	***Leucothoe racemosa***	**shrub**	swamps, bogs, streambanks, savannahs	Coastal Plain, Piedmont
Spicebush	***Lindera benzoin***	**shrub**	stream margins, alluvial woods	statewide
Fetterbush	***Lyonia lucida***	**shrub**	semi- wet/ edges, pocosins, low woods	Coastal Plain, Piedmont
Wax Myrtle	***Morella/Myrica cerifera***	**shrub**	low woods, marshes	Piedmont, Coastal Plain
Common Elderberry	***Sambucus canadensis***	**shrub**	rich soils along riverbanks and forest edges	statewide
Highbush Blueberry	***Vaccinium corymbosum***	**shrub**	moist bays, swamps, steamsides	Piedmont, Coastal Plain
Arrowwood Viburnum	***Viburnum dentatum***	**shrub**	alluvial woods, swamp forests	statewide

Table 3: Invasive exotic plants or noxious weeds that **should NOT be planted or encouraged:**					
Common Name	**Scientific Name**	**form**	**Common Name**	***Scientific Name***	**Form**
Autumn Olive	*Eleaegnus umbellata*	**Shrub**	**White Mulberry**	*Morus alba*	**Tree**
Russian Olive	*Eleaegnus angustifolia*	**Shrub**	**Camphortree**	*Cinnamomum camphora*	**Tree**
Thorny Olive/Silverthorn	*Eleaegnus pungens*	**Shrub**	**White Poplar**	*Populus alba*	**Tree**
Bush/Amur Honeysuckle	*Lonicera maackii*	**Shrub**	**Japanese Climbing Fern**	*Lygodium japonicum*	**Vine**
Sweet Breath of Spring	*Lonicera fragrantissima*	**Shrub**	**Wintercreeper**	*Euonymous fortunei*	**Vine**
Chinese Privit	*Ligustrum sinense*	**Shrub**	**Common Periwinkle**	*Vinca minor*	**Vine**
Japanese/Glossy Privit	*Ligustrum japonica*	**Shrub**	**Bigleaf Periwinkle**	*Vinca major*	**Vine**
Multiflora Rose	*Rosa multiflora*	**Shrub**	**Japanese Honeysuckle**	*Lonicera japonica*	**Vine**
Cherokee Rose	*Rosa laevigata*	**Shrub**	**English Ivy**	*Hedera helix*	**Vine**
Macartney Rose	*Rosa bacteata*	**Shrub**	**Kudzu**	*Pueraria montana*	**Vine**
Winged Burning Bush	*Euonymus alata*	**Shrub**	**Chinese or Japanese Wisteria**	*Wisteria sinensis, Wisteria floribunda*	**Vine**
Sacred Bamboo, Nandina	*Nandina domestica*	**Shrub**	**Beach Vitex**	*Vitex rotundifolia*	**Vine**
Tropical Soda Apple	*Solanum viarum*	**Shrub**	**Cogongrass**	*Imperata cylindrica*	**Grass**
Leatherleaf Mahonia	*Mahonia bealii*	**Shrub**	**Crabgrass**	*Digitaria sanguinalis*	**Grass**
Cascade Oregon Grape	*Mahonia nervosa*	**Shrub**	**Johnson Grass**	*Sorghum halapense*	**Grass**
Scotch Broom	*Cytisus scoparius*	**Shrub**	**Bermuda Grass**	*Cynodon dactylon*	**Grass**
Trifoliate Orange	*Poncirus trifoliata*	**Shrub**	**Tall Fescue**	*Lolium arundinaceum/ Festuca arundinacea*	**Grass**
Chinese Tallow Tree	*Triadica sebifera*	**Tree**	**Bahiagrass**	*Paspalum nototum*	**Grass**
Chinaberry	*Melia azedarach*	**Tree**	**Giant Reed**	*Arundo donax*	**Grass**
Mimosa	*Albizia julibrissin*	**Tree**	**Nepalese Browntop**	*Microstegium vimineum*	**Grass**
Sawtooth Oak	*Quercus acutissima*	**Tree**	**Chinese Silvergrass**	*Miscanthus sinensis*	**Grass**
Tree of Heaven	*Ailanthus altissima*	**Tree**	**Golden Bamboo**	*Phyllostachys aurea*	**Grass**
Callery Pear/Bradford Pear	*Pyrus calleryana*	**Tree**	**Chinese Lespedeza or Sericea**	*Lespedeza cuneata*	**Forb**
Princess Tree/Royal Paulownia	*Paulownia tomentosa*	**Tree**	**Shrubby or Bicolor Lespedeza**	*Lespedeza bicolor*	**Forb**

STATEMENT OF WORK
Tree/Shrub Establishment (612)
South Carolina

These deliverables apply to this individual practice. For deliverables for other planned practices, refer to those specific Statements of Work.

DESIGN

Deliverables

1. Design documents that demonstrate criteria in NRCS practice standard have been met and are compatible with planned and applied practices.
   a. Practice purpose(s) as identified in the conservation plan
   b. List of required permits to be obtained by the client
   c. Practice standard criteria-related computations and analyses to develop plans and specifications including but not limited to:
      i. Determination of adapted species of woody plants to be planted and/or naturally reestablished
      ii. Protective measures for planted stock including supplemental water, cultural treatments to enhance survival and health, and use exclusion
      iii. Additional provisions, as required, for improving or restoring natural diversity and increasing carbon storage in biomass and soils
2. Written plans and specifications including sketches and drawings shall be provided to the client that adequately describes the requirements to install the practice and obtain necessary permits.
3. Documentation of needed operation and maintenance.
4. Certification that the design meets practice standard criteria and comply with applicable laws and regulations.
5. Design modifications during installation as required.

Note: ***State-Specific Deliverables may be added as appropriate.***

INSTALLATION

Deliverables

1. Pre-application conference with client.
2. Verification that client has obtained required permits.
3. Staking and layout according to plans and specifications including applicable layout notes.
4. Application guidance as needed.
5. Facilitate and implement required design modifications with client and original designer.
6. Advise client/NRCS on compliance issues with all federal, state, tribal, and local laws, regulations and NRCS policies during installation.
7. Certification that the application process and materials meet design and permit requirements.

Note: ***State-Specific Deliverables may be added as appropriate.***

CHECK OUT

Deliverables

1. Records of application.
   a. Extent of practice units applied
   b. Actual plant materials used and protective measures
2. Certification that the application meets NRCS standards and specifications and is in compliance with permits.
3. Progress reporting.

Note: ***State-Specific Deliverables may be added as appropriate.***

REFERENCES

- NRCS Field Office Technical Guide (eFOTG), Section IV, Conservation Practice Standard – Tree/Shrub Establishment, 612
- NRCS National Forestry Handbook (NFH), Part 636.4
- NRCS National Environmental Compliance Handbook
- NRCS Cultural Resources Handbook

Note: ***State-Specific Deliverables may be added as appropriate.***

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

FOREST STAND IMPROVEMENT

CODE 666

(ac)

DEFINITION

The manipulation of species composition, stand structure, or stand density by cutting or killing selected trees or understory vegetation to achieve desired forest conditions or obtain ecosystem services.

PURPOSE

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

- Improve and sustain forest health and productivity
- Reduce damage from pests and moisture stress
- Initiate forest stand regeneration
- Reduce fire risk and hazard and facilitate prescribed burning
- Restore or maintain natural plant communities
- Improve wildlife and pollinator habitat
- Alter quantity, quality, and timing of water yield
- Increase or maintain carbon storage

CONDITIONS WHERE PRACTICE APPLIES

All land where the quantity and quality of trees can be enhanced.

CRITERIA

General Criteria Applicable to All Purposes

Describe the extent or size and orientation of treatment area(s).

Identify and retain preferred tree and understory species to achieve all planned purposes and landowner objectives.

Use available guidelines for species and species groups to determine spacing, density, size-class distribution, number of trees, and amount of understory species to be retained. Schedule treatments to avoid overstocked conditions using approved silvicultural/ stocking guides.

Describe the current and desired future condition of each stand that will be treated. Include the species, cover type, and size-class distribution. Stocking will be described in terms of crop trees per acre, basal area per acre, trees per acre, between-tree spacing, or by any other appropriate and professionally accepted density or stocking protocol.

Refer to WIN-PST criteria in NRCS Conservation Practice Standard (CPS) Code 595, Integrated Pest Management, and comply with applicable State and local laws if an herbicide will be used.

Time tree felling to avoid buildup of insect or disease populations.

Implement forest stand improvement activities in ways that avoid or minimize soil erosion, compaction, rutting, and damage to remaining vegetation, and that maintain hydrologic conditions. Protect site resources by selecting the method, felling direction and timing of tree felling, and heavy equipment operation. For temporary access use NRCS CPS Code 655, Forest Trails and Landings, to protect soil and site resources from vehicle impacts.

Use NRCS CPS Code 560, Access Road, for more heavily used roads associated with forest stand improvement activities.

Where slash and debris will be generated, use NRCS CPS Code 384, Woody Residue Treatment, to appropriately treat slash and debris, as necessary, to assure that it will not present an unacceptable fire, safety, environmental, or pest hazard. Remaining woody material will be placed so that it does not interfere with the intended purpose or other management activities. Do not burn vegetative residues except where fire hazard or threats from diseases and insects are of concern or when other management objectives are best achieved through burning. When slash and other debris will be burned onsite use NRCS CPS Code 338, Prescribed Burning.

Comply with State best management practices for water quality.

Additional Criteria to Improve and Sustain Forest Health and Productivity

Treatments, including woody biomass removal, will be sustainable and will not compromise soil organic matter, the recruitment and retention of coarse woody debris, or wildlife habitat. If needed, use NRCS CPS 384, Woody Residue Treatment. If applicable, use biomass harvesting guidelines (The Forest Guild, 2010) and/or State guidance.

Manipulate stand characteristics to mitigate risk of insects and disease. Examples of stand manipulations include creating a diversity of tree species and a mosaic of age classes.

Additional Criteria to Reduce Fire Risk and Hazard and Facilitate Prescribed Burning

Reduce stocking rates and alter spatial arrangement of trees to minimize crown-to-crown spread of fire.

Use criteria for wildfire risk and damage reduction, including reduction of ladder fuels, in NRCS CPS Codes 383, Fuel Break; 384, Woody Residue Treatment; or 394, Firebreak, as appropriate.

Additional Criteria to Improve Wildlife and Pollinator Habitat

Manage for specific or a variety of cover types, species, size-classes, and stocking rates at the appropriate scale that meet desired wildlife habitat requirements.

Create, recruit, and maintain sufficient snags, nest, cavity, and den trees, and down woody material to meet requirements of desired species.

Use habitat creation and maintenance criteria in NRCS CPS Codes 647, Early Successional Habitat Development/Management; Code 643, Restoration and Management of Rare and Declining Habitats; Code 645, Upland Wildlife Habitat Management; or Code 644, Wetland Wildlife Habitat Management, as appropriate, to manage wildlife-related activities.

Additional Criteria to Alter Quantity, Quality and Timing of Water Yield

Create a mosaic of age classes to increase water yield and stabilize seasonal water yield from watersheds.

Create openings in the forest canopy to allow more light to reach the ground, stimulating understory vegetation and diversifying plant species composition and vertical structure. These improvements will increase rainfall infiltration and reduce runoff thereby reducing soil erosion and improving water quality.

Additional Criteria to Increase Carbon Storage

Manage for tree species and stocking rates that have higher rates of growth and potential for carbon sequestration.

CONSIDERATIONS

Considerations for Wildlife and Pollinator Habitat

State Wildlife Habitat Guidelines, Wildlife Habitat Evaluation Procedure, and Forestland Assessment Scorecard are useful tools in planning forest stand Improvement.

Consider removing vines from crop trees but retaining vines with wildlife value (e.g., grape and poison ivy) on noncrop trees.

Increase quantity and quality of important mast (seeds, catkins, fruits, and nuts) sources for wildlife through crop tree management and other techniques.

Improve horizontal diversity or patchiness (of different age class units) across the forest for a variety of wildlife.

Improve or maintain vertical structure or vegetative layering in treated stands.

Favor declining wildlife species by providing appropriately sized treatment areas or blocks of habitat.

Time forest stand improvement activities to minimize disturbance of seasonal pollinator and wildlife activities, such as nesting, movement, etc.

Considerations for Improving and Sustaining Forest Health and Productivity

Consider crop tree management (Perkey et al. 1994) when making decisions about which trees to retain and which to cut, kill cut, or kill.

If available use sanitation-salvage and risk-rating criteria to determine trees to remove during forest stand improvement operations (see Thinning and Sanitation in Donaldson and Seybold 1998).

Silvicultural objectives and harvest-regeneration strategies may change over time and may be limited by prior management.

Consider enlisting the assistance of a professional forester when seeking to rehabilitate degraded stands that have been repeatedly subjected to exploitative harvesting (high-grading). Often a complex site-specific treatment plan must be developed to overcome repeated exploitative timber harvest.

Successful regeneration of desirable species is usually dependent upon timely application of forest stand improvement and other practices, such as prescribed burning, site preparation, tree and shrub establishment, prescribed grazing, and access control.

The extent, timing, size of treatment area, or intensity of the practice application, should be adjusted to minimize cumulative effects (onsite and offsite), such as hydrologic and stream alteration, habitat fragmentation, nutrient cycling, biodiversity, and visual resources.

Consider retaining at least 1/4 to 1/3 of the slash, tops, and limbs after harvest to protect site productivity. When using whole-tree harvesting systems minimize the removal of needles or leaves by harvesting in the dormant season, retaining fine woody materials onsite, or leaving felled trees onsite to allow for needle or leaf drop.

Consider controlling invasive plants if they are encountered while conducting forest stand improvement. Use NRCS CPS Codes 314, Brush Management; or 315, Herbaceous Weed control, as appropriate.

When available, report the minimum criteria (diameter at breast height, log length, etc.) for commercial forest products (sawtimber, pulpwood, etc.) in order to know when to direct a client to a professional forester.

Consider advising landowners to secure a written contract with a service provider that specifically describes the extent of activity, duration of activity, liability and responsibilities of each party, and amount and timing of payments for services provided.

Considerations for Increasing Carbon Storage

To increase carbon storage, consider shifting from even-aged to uneven-aged management to increase the retention of carbon onsite. Use regeneration methods that encourage advanced regeneration and retention of mature trees, such as shelterwood, to retain carbon onsite for longer periods. Consider retaining snags and downed woody debris for additional onsite carbon storage, and adopt techniques for maintaining soil quality, including organic carbon retention.

To grow trees that can store carbon in durable manufactured products, consider lengthening rotations to retain mature trees longer and grow to larger sizes; also consider using crop tree management techniques (Perkey et al. 1994) to concentrate growth on suitable long-lived species.

Considerations for Visual Quality

When forest stand improvement is being used to improve visual quality consider leaving trees that are attractive in shape and structure or flower and are appropriate to the site, especially around structures, roads, and home sites.

PLANS AND SPECIFICATIONS

Plans and specifications for applying this practice shall be prepared for each site and recorded using approved specification sheets, implementation requirements (job sheets), technical notes, and narrative statements in the conservation plan, or other acceptable documentation. Clearly state the goals and objectives of the forest stand improvement. Specific stand-stocking guidelines will clearly document both the pre- and post-treatment stand condition.

OPERATION AND MAINTENANCE

Prepare an Operation and Maintenance plan for the site and review it with the operator. The plan will describe actions that must be taken to ensure that the practice is applied correctly during its design life. As a minimum, include periodic inspections for assessment of insects, disease, and other pests, storm damage, and damage by trespass. Use NRCS CPS Code 655, Forest Trails and Landings, to control erosion on forest roads, skid trails, landings, and adjacent areas by installing/maintaining vegetative and structural practices. Treatments needed for pests—see Additional Criteria to Improve and Sustain Forest Health and Productivity section in this document. Treatments needed for storm damage—use NRCS CPS Code 384, Woody Residue Treatment, to appropriately treat slash and debris. Treatments for damage by trespass: use NRCS CPS Code 472, Access Control, to prevent future damage.

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FOREST STAND IMPROVEMEMT COMMERCIAL THINNING

South Carolina Practice IR Sheet-666

Prepared for: _____

Prepared by: _____

Farm: _____ Tract Number: _____ Date: _____

Definition

The manipulation of species composition, stand structure and stocking by cutting/harvesting selected trees.

What is thinning?

Trees compete for light, moisture, and nutrients. If the trees become too crowded, growth slows, they become susceptible to insects, diseases and wildfires, and they may eventually die. Therefore, commercial thinnings or intermediate harvests are made within immature stands to stimulate the growth of the remaining trees and improve the health, yield, and profitability of the stand.

Why thin?

A particular site can only support so many trees per acre of a given diameter. Foresters recommend planting more trees than can mature on an acre with the expectation that periodic thinning will be conducted when the trees begin to compete for nutrients, sunlight, water, and other resources. Thinning redistributes the growth potential of the stand to the trees of highest quality and favors their rapid growth. Pines in overly-dense stands (those in which the basal area exceeds about 120 square feet per acre) grow more slowly and become increasingly susceptible to the southern pine beetle and other bark beetles. Basal area is a measure of stand density and represents the cross-sectional area of all trees at breast height (4.5 feet above ground level) on an acre of land. Average basal area of a stand can be determined using a 10-factor prism, or with 1/20-acre (circular plot with 26.3-

foot radius) sample plots distributed randomly throughout the plantation. Thinning removes trees most likely to die from competition, insects, or diseases and reduces the potential for losses from wildfires. From an economics standpoint, thinning also makes good sense. By promoting vigorous growth, thinning reduces the time required to grow trees from low value pulpwood to higher value poles or chip-n-saw material, and ultimately to valuable sawlogs. Commercial thinning provides the landowner with an intermediate return on his/her investment as trees most likely to die before maturing are harvested and sold.

Purpose

- Increase the quantity and quality of forest products by manipulating stand density and structure.
- Harvest forest products.
- Initiate forest stand regeneration.
- Reduce wildfire hazard.
- Improve forest health reducing the potential of damage from pests and moisture stress.
- Restore natural plant communities.
- Achieve or maintain a desired native understory plant community for special forest products, grazing, and browsing.
- Improve aesthetic and recreation, values.
- Improve wildlife habitat.
- Alter water yield.
- Increase carbon storage in selected trees.
- Develop renewable energy system

Thinning Methods:

Row Thinning

Row thinning is used in pine plantations where trees are planted in rows. Entire rows are removed at designated intervals. Trees may also be removed on a selective basis in the remaining rows. Intervals may be every third, fourth, fifth, or sixth row. ***3rd Row Thinning:*** Removing every third row in thinning operations releases every leave tree on one side and causes the least amount of damage to the residual trees. Accordingly, it allows easy access to the leave rows and is the least costly thinning method. This approach directly reduces basal area by 33 percent and a third of the potential crop trees are eliminated in the downed rows. ***4th Row Thinning:*** Removing every 4th row directly removes 25 percent of the basal area and a quarter of the potential crop trees, allowing the operator to select and remove a greater number of undesirable trees from the leave rows. **5t*h Row Thinning:*** Many foresters recommend this method because only 20 percent of the potential crop trees are eliminated with removal of every 5th row. ***6th Row thinning:*** this method remove about 16.5 percent of the potential crop trees are eliminated. Row thinning is a quick way to reduce the number of stems per acre. Row thinning minimizes equipment damage to residual trees. Unfortunately, it also involves the removal of quality trees as well as trees that need to be removed in a thinning. Row thinning is ideal for a first thinning where you have a large number of stems per acre and machinery access and maneuverability is limited. Feller bunchers with short wheel bases are often used for felling and

bunching trees in row thinning with a prehauler or skidder used to transport trees from the forest to the haul truck. Because row thinning often requires expensive equipment, tracts considered for row thinning must be fairly large.

Strip Thinning

Strip thinning or corridor thinning is used in natural stands or in plantations where it is not possible to follow the rows. In strip thinning, all of the trees in a strip of a certain width are removed. Strips should follow the contour and be wide enough to allow the operation of the necessary machinery. The cut strip should be at least 15 feet wide. Strips of uncut timber between corridors should be about 30 to 40 feet. The width can be varied according to landowner objectives.

Selection Thinning

Selection thinning, also called leave-tree or low thinning is a common method in the South. This type of thinning removes trees that have been overtopped by faster growing trees and trees that are poorly formed or diseased. Selection thinning is usually used in natural stands and plantations that have previously been thinned. It is seldom used in unthinned plantations because of the potential damage to residual trees. Cut or leave trees should be marked before thinning. Another method is to let the timber harvester select the trees to be removed. This method saves the cost of marking but should be closely monitored to make sure that the best trees are retained and that the proper number of trees are left for future growth. It is advisable to have a professional forester to oversee this type of thinning.

CONDITIONS WHERE PRACTICE APPLIES

All forest land where improvement of natural resources associated with forest land is needed.

PLANS AND SPECIFICATIONS

Specifications for applying this practice 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.

OPERATION AND MAINTENANCE

Periodic inspections during and after treatment activities are necessary to ensure that purposes are achieved and resource damage is minimized, e.g., assessment of insects, disease and other pests, storm damage, and damage by trespass. The results of inspections shall determine the need for additional treatment under this practice.

Certification Job Sheet:

Prepared by: _____

Title: _____ Date:_____

Approved by: _____

Title: _____ Date:_____

Installation:

- Forest basal area prior to thinning totals _____square feet per acre.
- Final Basal Area after thinning operation totals _____ square feet per acre.
- What type thinning method was utilized to accomplish this thinning operation _____?

This practice was completed and meets NRCS standards and specifications. Circle YES or NO
Practice Certified By:

Name: _____ **ESJAA Level: _____**

Signature: _____ **Date: _____**

NRCS
Natural Resources
Conservation Service

Forest stand Improvement
(Mechanical Treatment of Understory)

S. C. Practice Job Sheet 666

Prepared for: _____

Prepared by: _____

Farm: _____ Tract: _____ Date: _____

DEFINITION

The manipulation of dense understory woody and select tree competition on forest land to improve wildlife habitat.

PURPOSE

Restore natural plant communities

Improve wildlife habitat

Improve forest health

Achieve a desired native plant community

Ecosystem restoration

CONDITON WHERE PRACTICE APPLIES

On forest land where competing vegetation limits the development of preferred tree and understory species and the restoration of the natural native vegetative community. Typical conditions where this practice is applicable would be dense stands of volunteer pines, sweetgum, over stocked pines or any area that lacks vertical and vegetative diversity.

CRITERIA

This practice addresses mechanized removal of under story and mid story woody vegetation, such as with a roller chopper, or gyro-track or other appropriate mechanical means.

This is typically applied as part of the initial phase of restoring a natural native plant community within the pine savannah type ecosystem.

In pine stands for the improvement of wildlife habitat, the goal for the forest stand must be to bring the basal area to between 30 to 60 square feet per acre.

OPERATIONS

Evaluate the habitat conditions within the forest stand and identify the amount of area in need of treatment.

Ensure that the planned goal for the forest stand is to bring the basal area to between 30 to 60 square feet per acre.

The management of the acres planned must meet the BA requirement listed above by the completion of the Conservation contract.

As part of the restoration of pine savannah habitat, management of the area is best achieved through the application of prescribed burning on a two to three year cycle.

Habitat Elements Improved:

- ☐ Cover
- ☐ Wildlife foraging area
- ☐ Native herbaceous vegetation
- ☐ Fall /winter food sources
- ☐ Control of Invasive Species
- ☐ Nesting habitat
- ☐ Year round food sources

☐ Coordinate this treatment with 314 Brush Management and 315 Herbaceous Weed Control if necessary to control invasive species

Existing Basal Area of Trees prior to treatment: _____

Planned Basal Area of Trees: _____

Target Species of plants for treatment: _____

Existing WHIG Wildlife Habitat Index: _____Planned WHIG Wildlife Habitat Index:_____

Acres of forest habitat improved: _____

Additional Management Activities suggested:

- ☐ Prescribed burning
- ☐ Firebreaks
- ☐ Native Warm season grass seeding
- ☐ Mowing
- ☐ Disking

Certification:

Job Sheet

Prepared by: _____

Title: _____Date:_____

Approved by: _____

Title: _____Date:_____

Installation

Meets NRCS Standards and Specifications? YES NO

Certification by: _____Date:_____

NRCS
Natural Resources
Conservation Service

FOREST STAND IMPROVEMENT

S. C. Practice Job Sheet 666

Prepared for: _____

Prepared by: _____

Farm: _____ Tract: _____ Date: _____

Periodic thinning provides room for tree crowns to expand, resulting in improved growth.

DEFINITION

The manipulation of species composition, stand structure, and stocking by cutting or killing selected trees and understory vegetation.

PURPOSES

- Increase the quantity and quality of forest products, e.g., sawtimber, veneer, wood fiber, poles, pilings, maple syrup, naval stores, nuts and fruits.
- Harvest forest products.
- Initiate forest stand regeneration.
- Restore natural plant communities.
- Improve wildlife habitat.
- Achieve a desired level of crop tree stocking and density.

CRITERIA

The harvest-regeneration strategy should be identified for all planned forest improvement harvesting:

- Uneven-aged management systems (single-tree selection, group selection, coppice selection)
- Even-aged management (clear-cut, seedtree, shelterwood, coppice)

The method, felling direction and timing of tree cutting for harvesting should facilitate efficient and safe tree removal and protect sensitive areas such as vernal pools, riparian zones, cultural resources and structures. Harvest within riparian zones must be directed away from the water so that equipment traffic is eliminated or minimized.

Soil erosion, displacement and compaction, rutting, and damage to remaining vegetation should be minimized.

Practices must comply with applicable federal, state, and local laws and regulations during installation, including South Carolina's Best Management Practices.

Conventional logging skidders and tractors can be used on most sites in the Piedmont and Coastal Plain. Special equipment such as logging mats will be used if needed on extremely wet sites to prevent soil compaction and rutting. Wetland sites should not be logged when the soil is saturated

Locate stream crossings where impacts to the stream are likely to be minimal

Identify and protect sensitive areas such as SMZs, ephemeral streams and erosive soils.

Pre-Commercial Thinning

Pre-commercial thinning is needed where the stand of desirable trees of unmerchantable size is overstocked and is applied to young stands, normally 2 to 4 inches in diameter. It is particularly needed in young, even-aged stands which have seeded thickly in old fields, burns, and cut-over areas.

Spacing and Number of Release Trees

Spacing of remaining crop trees should be wide enough to permit fast growth until they are of sufficient size in diameter and height to yield useable or sellable products and the stand is ready for a commercial thinning. Some room should be left for crown spread; however, the trees should be left close enough to fully utilize the growing space until the first commercial thinning is made.

The released trees should average no farther than 12 feet apart (304 trees per acre) if they are smaller than 4 inches in diameter. Trees 4 to 8 inches in diameter should be released at intervals of 12 to 15 feet (304 to 194 trees per acre).

Methods of Removal or Control

Unwanted trees, shrubs, vines, or weeds may be removed or controlled by any technique shown in Table 1.

1. Cutting: Cutting is the usual method for removal of undesirable elements of a stand such as competing trees, shrubs and vines.
2. Chemical Control of Hardwoods: When hardwoods are cut in pre-commercial thinning operations, sprouting may be reduced or eliminated by treating the stumps with an approved herbicide. However, where single trees of a sprout clump are left in thinning a hardwood stand, a poison or growth regulator (herbicide) cannot be applied to any part of the stump. To do so will result in killing or seriously damaging the single tree left for future harvest.

Species to be Favored

Trees to remain should be selected based on the most desirable species, form, vigor, and crown development. Usually, only dominant and co-dominant trees should be released.

Optimum Seasons for Thinning:

1. Pine Types: Pre-commercial thinnings should be made during the late fall and winter months (October through March) unless wet conditions limit equipment operation. This reduces the possibility of insect infestation, particularly the pine bark beetles.

TABLE 1 - Methods for Woody Plant Control

Hand Crew Methods	Effective Size of Target Stems	Equipment
directed foliar sprays	up to 6 feet tall	backpack sprayer
streamline basal sprays	up to 2 inches DBH	backpack sprayer with handgun
soil spots by grid 4/	up to 10 inches DBH	spotgun or gunjet with straight stream
basal soil spots 4/	all sizes	spotgun or gunjet with straight stream
injection	all sizes greater than 1 inch DBH	tubular tree injector, hypo-hatchet, axe or hatchet with spray bottle
stump sprays1/	all sizes	backpack sprayer
girdling2/	all	axe or mechanical girdler
Ground Machine Methods	**Equipment**	
foliar spray	crawler, skidder, farm tractor, all-terrain vehicle equipped with spray system	
pelleted or granular	crawler, skidder, farm tractor, all-terrain vehicle equipped with spreader with spinning disc or forced-air blower	
Aerial Method	**Equipment**	
foliar spray3/	helicopter	
granular or pelleted	helicopter	

1/ Stump spraying is used to reduce sprouting. Except for species such as red maple, ash, and chestnut oak, stumps large than 12" diameter are not likely to sprout.

2/ Girdling without a herbicide is only effective for easy-to-kill species or trees larger than 12" diameter.

3/ Aerial spraying is used for all sizes of major hardwood species. It is an appropriate method for larger tracts where brush is dense and terrain is difficult. Spray may drift and harm desirable plants downwind of the treated area.

4/ Soil applications are especially effective on sandy soils.

Summer thinning (May-August) is preferable where Fomes annosus is the primary threat.

2. Hardwood Trees: Generally, it is best to make pre-commercial thinnings in hardwood types during mid-summer to reduce sprouting.

3. Pine - Hardwood Types: In stands where hardwoods are mixed with pines, and are cut in thinning, cutting should be done in the late fall and winter months.

Slash Disposal

Generally, disposal of the boles, limbs and tops of trees cut in pre-commercial thinnings is not a problem. The severed trees may be left in the stand where felled. In pine stands where they fall against the bases of selected “leave” trees, severed trees should be pulled away to reduce the possibility of fire losses and, in case of mid-summer droughts, to help avoid insect damage.

Intermediate Cutting (Removal of trees from a stand between the time of establishment and the final harvest cutting)

1. When to Start: Start at the earliest age that the cutting will provide sufficient wood products to make a profitable operation.

2. Species to Favor: Those best suited to the soil and site and which will yield the greatest return and benefit in the shortest time.

3. Trees to Leave: Select trees based on management objectives, the form, condition, and vigor of individual trees.

4. Spacing: Intermediate harvests must provide space for growth of the better trees. Recommended spacing for your stand is shown on this job sheet.

   Always select trees of the poorest quality and the least desirable species for cutting.

Hardwood Stands - Several factors affect the management of hardwood stands. These factors include (1) variety of species within a stand, (2) varying growth rates of each species, (3) relative vigor, and (4) tolerance of each species to shade.

Northern red oak, can only be successfully regenerated when large advance reproduction is present on the forest floor at the time of final harvest. Then any method of harvest is acceptable except single tree removal. A "shelterwood" thinning, including removal of mid-story and understory species allows for advanced oak reproduction requisite to establishing a stand after final harvest.

Harvest Cutting

Harvest cutting is the final major harvest cutting(s) made in a stand at or near the end of a selected rotation age to insure regeneration of a new stand of trees.

Apply harvest cut after the majority of the trees in the stand have reached harvest tree size - one which has reached economic and biological maturity. For example, a loblolly pine harvest tree may be approximately 16" to 18" DBH and 45 to 55 years of age, depending on site.

1. Types of Harvest Cutting — Even-aged Systems:

   Clearcutting - Removal of the entire stand in one cutting.

   Clearcutting is acceptable where adequate advance reproduction is established or tree planting, sprouting (coppice), or direct seeding is planned to establish a new stand.

   Clearcutting can be accomplished in patches, blocks, or strips. This is a regeneration cutting applicable to both pine and hardwood stands. Size of clearcuts should consider economics, aesthetics, and needs of wildlife. At the time of harvest, all hardwood trees larger than 2 inches DBH (or 25 feet tall) should be cut, girdled, or chemically killed. If these trees are left standing, they develop into "wolf" trees

of low quality and shade the surrounding reproduction.

For adequate reproduction of hardwoods, the harvested area should be at least 2 acres in size. Larger areas are preferred to reduce the side shade effect in relation to the size of the clear-cut area, to reduce logging costs, and to create economical management units.

Seed Tree - Removal of the old stand in one cut except for a small number of trees left singly, in small groups, or narrow strips, as a source of seed for natural regeneration. After seedlings are established, seed trees should be removed within 3 years while the young seedlings are still flexible and logging damage will be negligible.

Shelterwood - Removal of the mature timber in a series of cuttings, which extend over a period of years usually equal to not more than one-quarter and often not more than one-tenth of the time required to grow the crop. The establishment of natural reproduction under the partial shelter of seed trees is enhanced. Harvest the seed trees within 3 years after adequate seedlings are established to prevent excess damage from logging.

2. Types of Harvest Cutting — Uneven-aged Systems:

Group Selection - Removal of mature timber in groups or strips, to create openings large enough for natural reproduction to become established and develop normally. Openings created by cutting are usually 1/10 acre or less in size for species tolerant to shade. For species that are moderately tolerant or intolerant to shade, a good opening size is 1.5 to 2 times the height of surrounding trees.

Openings should not exceed five times the height of surrounding trees.

Single Tree Selection - Removal of large individuals within the stand.

Improving Wildlife Habitat

Where an open understory is desired (especially for bobwhite quail), reduce pine stocking to no more than 300 trees per acre during the first thinning to allow for wildlife openings. Wider spacing (for hardwoods) is permissible where mast or fruit production is desired.

Mowing, other mechanical disturbance, or treatment with chemicals that may have a detrimental effect on nesting wildlife should not be conducted during the nesting season (April 15 - September 15).

Specifications (as applicable)

Species to Favor	Desired Spacing
Length of time (cutting cycle) between intermediate harvests (years)	
Number of crop trees per acre	Size of area to be harvested
Method of regeneration	Protective measures for seedling development
Related measures	Other

OPERATION AND MAINTENANCE

Operation and maintenance requirements are not applicable for this practice.

This job sheet was prepared in cooperation with local Soil and Water Conservation Districts and the South Carolina Forestry Commission.

666 Forest Stand Improvement- Thinning for Wildlife and Forest Health

This scenario is applicable on forested lands where participant objective is to improve the health of the stand or increase the wildlife habitat in the stand. After the thinning is complete, prescribed fire is applied and/or undesirable woody understory or midstory vegetation is treated with a targeted herbicide to help achieve the desired structure and savanna-like habitat condition.

666 thinning for Wildlife	
stand age (yrs)	**target Basal Area (BA)**
4 - 15	70 sq. ft. per acre BA or less
16 - 20	60 sq. ft. per acre BA or less
20 +	30-50 sq. ft. per acre BA

666 thinning for Forest Health	
stand age (yrs)	**target Basal Area (BA)/ TPA**
4 - 15	650 trees per acre(precommerical)
16 - 20	70 sq. ft. per acre BA
20 +	70 sq. ft. per acre BA or less

Required Measurements/benchmarks and goals (document here or in table on 2nd page):

1. Target Wildlife species (and/or listed/at risk species) if applicable:
2. Potential for prescribed burning: prescribed burning is possible, OR surroundings essentially prohibit prescribed fire (close proximity to smoke sensitive areas)
3. Measure and document*:*
   - stand dominant species (loblolly, slash, longleaf, mixed, hardwood)
   - existing average DBH (inches), BA (sq. ft. per acre), trees per acre – use BA guide as needed
   - stand age
   - target BA and trees per acre
   - site conditions
     - presence or absence of native herbaceous vegetation
     - Is the canopy closed preventing sunlight from reaching the forest floor?
     - woody species needing control - approx % coverage:
     - presence of invasive exotic pest plants: - approx. % coverage
     - presence of snags:
     - beneficial hardwoods to retain:
     - Is the growth rate of the trees slow or stagnant due to stocking levels?

Required parameters:

1. Under supervision of a consultant forester, the stand is marked to achieve the agreed-to stand density/basal area.
2. As needed depending on site conditions, plan targeted herbicide treatment to reduce woody understory prior to thinning to enhance success. All invasive plants will be dealt with prior to thinning.
3. Preserve/retain snags and large hardwoods/oaks, other beneficial native trees
4. All cut trees and woody debris from harvest shall be removed to prevent hazardous build-up of fire fuels for all stands 15 years old or younger. In older stands, logging slash should be spread evenly across the stand to prevent stock piles of debris.
5. Plan to follow thinning with needed management to attain goal of improving wildlife habitat conditions and forest health by including these practices as appropriate for site conditions on the same acres:
   - prescribed burning and firebreaks as needed on the same acres if site conditions are conducive
   - chemical (woody targeted) and mechanical control of woody competition with Forest Stand Improvement or Brush Management

- control of invasive exotic pest plants as needed with Brush Management and/or Herbaceous Weed Treatment

6. Work with forester to incorporate goals and associated management practices into a Forest Management Plan (FMP).
7. Prescribed burning should be planned for stand in the associated FMP, but if site conditions are not conducive or become so, FMP should include herbicide and mechanical treatment targeting woody competition as an alternative to prescribed burning.
8. Project plan and contract are required to contain thinning and targeted herbicide application OR prescribed burning for woody competition on the same acreage (may contain both herbicide/mechanical and burning if needed).
9. Provide a report from forester on efficacy of herbicide/mechanical and/or prescribed burning treatment.
10. If land is part of the Safe Harbor Program, follow those parameters for listed Red-cockaded woodpecker (BA minimum is 40 sq. ft. per ac BA).
11. Rare/listed species: incorporate measures to accommodate rare and listed species as appropriate (for example, timing outside of the nesting season for birds, limiting ground disturbance where rare herbaceous plant known on site or care when operating machinery around Gopher Tortoise burrows and beneficial snags and stumpholes, etc.)

Consider this scenario carefully with participant before contracting for the following reasons:

1) Timing of thinning may be controlled by the timeframe specified in a timber deed (these deeds can span 12 months or more) if it exists for the stand.

2) Timing of targeted herbicide treatment for woody competition may occur 6-months, or longer, after timber harvest.

3) Project plan and contract are required to contain thinning AND targeted herbicide application for woody competition OR prescribed burning on the same acreage (may contain both herbicide and burning if needed).

Document and Measure	
Target Wildlife species (and/or listed/at risk species) if applicable:	
Potential for prescribed burning: prescribed burning is possible, OR surroundings essentially prohibit prescribed fire (close proximity to smoke sensitive areas)	
stand dominant species (loblolly, slash, longleaf, mixed, hardwood)	
existing average DBH (inches), BA (sq. ft. per acre), trees per acre – use BA guide as needed	
stand age	
target BA and trees per acre	
site conditions	
presence or absence of native herbaceous vegetation	
Is the canopy closed preventing sunlight from reaching the forest floor?	
woody species needing control - approx % coverage:	
presence of invasive exotic pest plants: - approx. % coverage	
presence of snags:	
beneficial hardwoods to retain:	
Is the growth rate of the trees slow or stagnant due to stocking levels?	

STATEMENT OF WORK
Forest Stand Improvement (666)
South Carolina

These deliverables apply to this individual practice. For deliverables for other planned practices, refer to those specific Statements of Work.

DESIGN

Deliverables

1. Design documents that meet criteria in NRCS Conservation Practice Standard (CPS) 666, and that are compatible with planned and applied practices.
   a. Practice purpose(s) as identified in the conservation plan
   b. List of required permits to be obtained by the client
   c. Practice standard criteria-related computations and analyses to develop plans and specifications including but not limited to:
      i. Determination of the harvest-regeneration strategy and the species of tree and understory vegetation to be retained
      ii. Timing and method of removal for trees and understory to be eliminated
      iii. Mitigation of wildfire hazard, erosion, runoff, soil compaction and soil displacement to acceptable levels
2. Written plans and specifications including sketches and drawings will be provided to the client that adequately describe the requirements to install the practice and obtain necessary permits.
3. Documentation of needed operation and maintenance.
4. Certification that the design meets practice standard criteria and complies with applicable laws and regulations.
5. Design modifications may be made during installation as required.

Note: ***State-Specific references may be added as appropriate.***

INSTALLATION

Deliverables

1. Pre-application conference with client.
2. Verification that client has obtained required permits.
3. Layout and, as applicable, sample marking of ‘leave’ trees or ‘take’ trees according to plans and specifications including applicable layout notes.
4. Application guidance as needed.
5. Facilitate and implement required design modifications with client and original designer.
6. Advise client/NRCS on compliance issues with all federal, state, tribal, and local laws, regulations and NRCS policies during installation.
7. Certification that the application process and materials meet design and permit requirements.

Note: ***State-Specific references may be added as appropriate.***

CHECK OUT

Deliverables

1. Records of application.
   a. Extent of practice units applied
   b. Actual mitigation measures used and applied
2. Certification that the application meets NRCS standards and specifications and is in compliance with permits.
3. Progress reporting.

Note: ***State-Specific references may be added as appropriate.***

REFERENCES

- NRCS Field Office Technical Guide (eFOTG), Section IV, Conservation Practice Standard – Forest Stand Improvement, 666
- NRCS National Forestry Handbook (NFH), Part 636.4
- NRCS National Environmental Compliance Handbook
- NRCS Cultural Resources Handbook

Note: ***State-Specific references may be added as appropriate.***