

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD**

**FOREST SITE PREPARATION**

(Ac.)

**CODE 490**

**DEFINITION**

This practice consists of treating areas to improve site conditions for establishing trees and/or shrubs.

**PURPOSE**

This practice is used to achieve one or more of the following purpose(s):

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

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies on all lands needing treatment to establish trees or shrubs.

**CRITERIA**

Use the following criteria in planning and applying this practice. The general criteria apply to all tree/shrub site preparation, while additional listed criteria may apply based on the intended purpose(s) of the practice.

**General Criteria Applicable to All Purposes**

The method, intensity and timing of site preparation will match the limitations of the site, equipment, and the requirements (seedbed and light) of the desired woody species.

An appropriate site preparation method or combination of methods (mechanical, chemical and/or fire) will be chosen to protect any desirable vegetation. See Table 1 for suitable site preparation guidelines. In general, select

the method(s) which accomplishes optimum site preparation with minimal soil disturbance.

Remaining slash and debris shall not create habitat for or harbor harmful levels of pests, hinder needed equipment operations, or create hazardous fire conditions. Refer to PRESCRIBED BURNING – Practice Standard 338 where slash and debris will be burned.

Measures, including the use and treatment of equipment, will be used to control or protect against locally invasive and noxious species. If pesticides are used, refer to PEST MANAGEMENT – Practice Standard 595.

Soil compaction and displacement will be minimized. Erosion and/or runoff will be controlled. Sites with slopes greater than 8% should not be prepared with a bulldozer blade or root rake due to potential erosion potential. Critically eroded areas with severe sheet-rill erosion or active gullies should be stabilized prior to or during site preparation. Refer to CRITICAL AREA TREATMENT – Practice Standard 342.

Plan to maintain necessary filter strips and/or riparian forest buffers along all streams (perennial, intermittent or headwaters) and water bodies (lakes, ponds, wetlands, etc.). Refer to FILTER STRIP – Practice Standard 393, RIPARIAN FOREST BUFFER – Practice Standard 391; NC Forest Practice Guidelines; NC Forestry BMP Manual; NC Watershed buffer rules; and, local ordinances. Recommended widths of streamside management zones (SMZ's) set forth in NC Forestry Best Management Practices Manual (9/89) are summarized below.

**Recommended Minimum Forested SMZ Widths**

Type of Stream or Waterbody	% Slope of Adjacent Lands				
	0-5	6-10	11-20	21-45	46+
SMZ Width Each Side (feet)					
Intermittent	50	50	50	50	50
Perennial	50	50	50	50	50
Perennial, Trout waters	50	66	75	100	125
Public water supplies (streams / reservoirs)	50	100	150	150	200

**Important: Read footnote to this table!**

NOTE: SMZ width is measured horizontally from the stream or water body along the slope toward a disturbed or harvested area. These are recommended minimum widths which can be expanded or contracted depending on site conditions. Check FILTER STRIP – Practice Standard 393 requirements based on site conditions.

**Applicable state and local laws/rules regarding buffers supercede any recommended widths herein!**

Piles and windrows (when needed) should be raked (not bladed), kept as narrow as possible, and be as close to the contour as possible. Leave breaks (20 feet wide minimum) in windrows at least every 300 feet. The distance between windrows can be determined by slope below.

**Windrow Spacing**

Slope (%)	Max. Distance between Windrows (feet)
10	200
20	150
30	100
40	60

For sites with a high water table and/or surface water problems, water control measures should maintain water table at an optimum level for the species being planted and keep seedlings out of standing water. Bedding can create a suitably dry microenvironment for establishing woody plant seedlings (see Table 3 - Bedding).

All chemicals will be applied in accordance with label guidelines.

Comply with applicable federal, state and local laws and regulations during the installation, operation and maintenance of this practice, including NC Forest Practices Guidelines.

**Note:** Specific pesticide recommendations will be obtained from personnel who are licensed by the NC Department of Agriculture and Consumer Services in specialty area Agricultural Pest Plant Category O

(agricultural, plant) or G ( forest) - in accordance with North Carolina Pesticide Laws and Regulations. All pesticides must be registered for use by North Carolina and approved for use by the U. S. Environmental Protection Agency (EPA). Refer to the current issue of “North Carolina Agricultural Chemicals Manual” for guidelines, rules and regulations regarding use of pesticides. Users must **always** follow instructions and safety precautions on the container label when handling, applying, or storing pesticides.

**Additional Criteria for Natural Regeneration of Desirable Woody Plants**

An existing, desirable woody tree/shrub species seed source or coppice must be present on site and have potential for successful natural regeneration to acceptable stocking levels. Refer to WOODLAND SUITABILITY, WILDLIFE SUITABILITY -NC, FOTG Section II; and, TREE/SHRUB ESTABLISHMENT – Practice Standard 612. Site preparation should remove existing cull, undesirable, and un-merchantable trees down to 2 inches size. Planning prior to tree harvest is extremely important for successful natural regeneration. Refer to FOREST STAND IMPROVEMENT – Practice Standard 666.

*Natural Seeding* - Natural Regeneration from seed applies to light-seeded, intolerant species with wind disseminated seed. Example species include native pines, cottonwood, and yellow poplar. Refer to FOREST STAND IMPROVEMENT – Practice Standard 666, for information on managing a stand for natural regeneration. Site preparation must expose sufficient mineral soil for good soil-seed contact without damaging seed trees.

*Coppice Regeneration* – Most heavy-seeded, tolerant, hardwoods can reproduce satisfactorily from coppice (existing root stock/stumps). Example species include oak and hickory. Sites naturally regenerated from coppice should not be burned and should be protected from livestock grazing. Cut low stumps in winter for best results. Release of desirable species may be needed.

**Additional Criteria to Permit Artificial Establishment of Woody Plants**

*Forest Land - Appropriate planning prior to tree harvest can significantly reduce the need for expensive site preparation. Soil productivity must also be considered---highly*

productive soils sustain more and faster growing competing vegetation which generally requires more intensive site preparation and/or additional tree release practices (refer to FOREST STAND IMPROVEMENT – Practice Standard 666).

**Table 1. Suitable site preparation guidelines**

Land Use	Site Preparation Method Criteria for Use	Recommended Establishment Method
Depending on planting/establishment methods and selected species being established, site preparation may <u>not</u> be needed if weed competition is not expected to hinder woody plant establishment. Post-plant chemical spraying or strip mowing may be needed when no site preparation is used. <u>Apply sound judgment, based on site conditions, when using these guidelines to choose one or more (a combination of) site preparation alternatives!</u>		
<p>Idle Land Forestland</p> <p>(Generally not suited to grassland in NC, can be used on cropland but other methods are generally more effective)</p>	<p><b>Prescribed Burning</b></p> <p>Fire is the often the simplest and least expensive method of site preparation. Burning must be supervised by a qualified and trained individual. Refer to PRESCRIBED BURNING (338) - NC, FOTG Section IV. Site preparation burns should be done as soon after logging or chopping as weather permits. Best site preparation results are obtained with a hot fire in summer or early fall. Fire is often used in concert with other mechanical or chemical site preparation treatments to reduce debris and heavy litter.</p> <p><u>Potential issues with fire for site preparation include:</u></p> <ul style="list-style-type: none"> <li>-Planning requires appropriate NRCS job approval authority</li> <li>-Local or state ordinances/ laws may prevent burning during all or part of the year</li> <li>- Burn may not be uniform depending on weather and fuel load</li> <li>- Burning solely for site preparation is highly dependent on timing and intensity of the fire.</li> </ul>	<p>Direct Seeding Seedlings</p> <p>Natural Regeneration (limited use for beginning succession to native vegetation)</p>
<p>Cropland Idle Land Grassland Forestland</p>	<p><b>Chemical (herbicide)</b></p> <p>Chemicals are generally applied for site preparation as a foliar spray. Stem treatment and limited granular applications may also be used. Best site preparation results are obtained when applying chemical in the early spring or fall prior to planting. Sprays can be applied over the whole field or in 3-4 foot bands over the projected planting rows. Chemical treatment is often used in concert with other mechanical site preparation treatment and prescribed burning.</p> <p><i>Open Land</i> - agricultural sprayers can be used on cropland and grassland. Some weeds/grasses may require a combination of mowing/disking and chemical treatment to achieve good site preparation results.</p> <p><i>Forest Land</i> - chemicals are generally applied by aerial (generally helicopter) or over ground equipment sprayers. Over ground sprayers are mounted on forest harvest equipment, such as a skidder. If sprays are banded, each band treatment (row) must be marked with a highly visible, durable marker. Individual <u>stem treatment</u> by chemical injection can also be used in specific situations to eliminate scattered large trees; this method is labor intensive and generally too costly for site preparation over a large area.</p> <p><b>NOTE: Carefully review general criteria related to chemicals and pesticide recommendations (NCDA Category G license is required for forestry related chemicals) in this standard</b></p>	<p>Direct Seeding Natural Regeneration Seedlings</p>

Table 1 continued on the next page

<b>Table 1. Suitable site preparation guidelines (continued)</b>		
<b>Land Use</b>	<b>Site Preparation Method Criteria for Use</b>	<b>Recommended Establishment Method</b>
Cropland Idle Land Grassland Forestland	<b>Rotary Brush Cutters</b>  Weeds, briars, and small brush vegetation up to 2 inches diameter can be controlled with a heavy duty rotary cutter. August and September are generally the preferred months for mowing and cutting. (Large trees can be left standing and eliminated using chemical stem treatment – see Chemicals above).	Direct Seeding Natural Regeneration Seedlings
Cropland Idle Land Grassland  (Limited forest land situations)	<b>Scalping, furrowing, V-blading and subsoiling</b>  <i>Scalping and furrowing</i> - are generally used to remove dense grass, legume or weed cover in an area 15-20 inches wide and 2-4 inches deep where woody plants will be planted. Furrows can be 'plowed' with a moldboard, middle-buster or fire-line plow 2 to 3 months prior to planting. Hand scalping with a mattock or hoe can be used where individual woody plants will be established.  <i>V-blading</i> – may be used where small trees, brush or sod hinder mechanical tree planting. V-blades are often attached to small crawler tractors. They are commonly used with mechanical planting on sites that have been chemically treated to kill small hardwoods.  <i>Subsoiling</i> – is used on compacted soils or highly trafficked sites to improve the depth and quality of the potential rooting zone.  <b>NOTE: Sometimes site preparation - with a scalper, v-blade or subsoiler, and planting are completed in a one-pass operation with a mechanical tree planter. A v-blade or subsoiler can be pulled ahead of the planter. A scalper can be attached directly to the planter.</b>	Seedlings (particularly machine planting)  Direct Seeding (where seeds are individually planted or machine planted in rows)
Forestland	<b>Lopping with hand tools</b>  Lopping is the use of hand tools and chain saws to fell residual woody competition. It is cost effective where scattered, large-diameter stems are present. Lopping is a good choice for areas where fragile soils, steep slopes or special site conditions preclude other more intense site preparation methods; this method is labor intensive and generally too costly for site preparation over a large area.	Seedlings Direct Seeding  Natural Regeneration (limited to special need areas)
Forestland	<b>Drum Chopping</b>  Rolling drum choppers or cutters are generally pulled by a crawler type tractor in single, tandem or offset tandem setups. Drum chopping is effective where dense brush of small diameter (generally less than 4 inches) is present. Drum chopping will fell, sever, chop and compact brush. Prescribed burning is often used along with drum chopping. Best results are achieved when chopping is done late spring through summer when brush is in full leaf. Chopped sites will cure quickly and can be burned 4-6 weeks after chopping.  <b>NOTE: Drum chopper blades must be kept sharp for optimum site preparation. Chopper size and weight must be matched to the size and density of brush on site. Chopper weight can be adjusted by adding to, or removing water from the drum.</b>	Seedlings Direct Seeding

**Table 1 continued on the next page**

**Table 1. Suitable site preparation guidelines (continued)**

<b>Land Use</b>	<b>Site Preparation Method Criteria for Use</b>	<b>Recommended Establishment Method</b>
Forestland	<p><b>K/G Blade</b></p> <p>A K/G or shearing blade is generally preferred on sites with fairly large tree stems (5-8 inch diameter). K/G blades have a flat sole to allow 'floating' over the ground surface; they are angled or U-shaped with a sharpened lower edge and have a 'stinger' for splitting larger trees and stumps. Trees are felled by shearing at ground level. Felled trees are often piled into windrows.</p> <p><b>NOTE: Shearing with a typical straight bulldozer blade is not acceptable and will result in uprooted stumps and excessive soil disturbance.</b></p>	Seedlings Direct Seeding Natural Regeneration (requires care working around seed trees)
Cropland Idle Land Grassland Forestland	<p><b>Disking</b></p> <p>Best results are obtained in the hot months of late summer and early fall. Root systems of existing vegetation need to be exposed to dry. Disk across the dominate slope where possible, preferably in strips along projected planting rows. Disking alone may serve as adequate site preparation or may be used in concert with other mechanical treatment.</p> <p><i>Open Land</i> - disking can be accomplished with a farm tractor and agricultural disk.</p> <p><i>Forest Land</i> - disking is accomplished with a large, heavy, offset disk pulled by a bulldozer or crawler-type tractor. Disking is usually an additional treatment to an area that has already been chopped, burned, or bulldozed. (Disking is also used to create beds – see bedding).</p> <p><b>NOTE: Disking is not recommended where soil erosion is a potential problem. Disking will tend to destroy natural soil biota.</b></p>	Direct Seeding Natural Regeneration Seedlings
Cropland Idle Land Grassland Forestland	<p><b>Bedding</b></p> <p>Bedding is generally used on wet sites (flat, moderately well drained to poorly drained soils) to improve/modify drainage and improve survival and growth of planted seedlings. The following criteria apply to bedding for tree/shrub site preparation:</p> <ul style="list-style-type: none"> <li>- The area bedded must be sufficiently free of large debris so that a well shaped bed can be formed without air pockets.</li> <li>- Beds should channel water toward stable vegetated areas and not drain directly into ditches or watercourses.</li> <li>- Beds should be sufficient to provide needed micro drainage for tree establishment (generally 5 inches above the original ground level after settling).</li> <li>- Bed width will vary according to equipment used; distance between centers of beds should be the planned planting distance between rows.</li> <li>- Special equipment such as a Bracke scarifier, can be used to create mounded beds instead of beds in rows.</li> <li>- Bedding for tree/shrub site preparation must comply with wetland best management practices.</li> </ul> <p><b>Consider planting/establishing tree/shrub species adapted to site conditions in lieu of bedding!</b></p>	Seedlings Direct Seeding (where seeds are individually planted or planted in rows)

## CONSIDERATIONS

The site preparation method should be cost effective and protect cultural resources, wildlife habitat, threatened and endangered species, water resources, and identified unique areas.

Impacts on wildlife species, habitat, and aesthetics should be considered when selecting site preparation methods.

Site preparation using fire can produce particulates, smoke, and other air pollutants that may have on-site and off-site effects on air quality.

Visual quality objectives should be considered when selecting site preparation methods.

Anticipate possible off-site effects and modify the site preparation design accordingly.

Consider personnel safety during site preparation activities.

Consider selection of plants that have higher carbon sequestration rates (natural regeneration).

For full forestry water quality guidelines for North Carolina, see NC FORESTRY BEST MANAGEMENT PRACTICES MANUAL - NC, FOTG Technical Reference File.

For complex situations, consult a professional for site preparation assistance.

If in doubt, always consult US Army Corps of Engineers Field Office or NC Division of Environmental Management Regional Office for specific legal guidance on site preparation limitations where jurisdictional wetlands are, or may be, involved.

Check cropland and pasture fields (especially where sandy soils occur) for a traffic pan. Utilize in-row subsoiling as a site preparation treatment where needed to break compacted pans and promote healthy root systems.

Consider leaving wildlife friendly cavity or mast producing trees; and, some downed woody debris during site preparation.

Consider using SA-TF 11, A Guide to Predicting Sheet and Rill Erosion on Forest Land to help calculate soil loss from site prepared areas.

Soil tests may be needed on sites with expected phosphorus deficiency (such as poorly drained savannas-flatwoods-organics of the NC Coastal Plain). Fertilize as part of site preparation to improve phosphorus levels where soil tests indicate. Soil testing should be considered where significant capital outlays are involved.

*This practice has the potential to affect National Register listed, or eligible, significant cultural resources (CULTURAL RESOURCES INFORMATION - NC, FOTG Section II). Follow NRCS state policy for considering cultural resources during planning.*

## PLANS AND SPECIFICATIONS

Plans will address method of site preparation, species, and protection required for desirable woody plants.

Specifications for applying this practice and protection of the site shall be prepared and recorded using approved specification sheets, job sheets, technical notes, narrative statements in the conservation plan (including references to plans prepared by other agencies or consultants), or other acceptable documentation.

Minimum documentation will include:

- map showing fields or areas where site preparation will be done; additionally the map should delineate:
  - streams and water bodies
  - required filter strips/SMZ's
  - additional sensitive areas such as critical areas or cultural resources that need to be considered during site preparation activities
- plant material or species to be planted
- method(s) of site preparation and equipment to be used; and, expected timetable of site preparation activities.
- forest management plan (including site preparation details) prepared by a registered forester.
- statement requiring compliance with all federal, state and local laws.
- required operation and maintenance instructions

## OPERATION AND MAINTENANCE

Generally site preparation is a temporal practice. When woody plants are established, site preparation functions are considered complete. The following actions shall be carried out to insure that this practice functions as intended. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance) until trees or shrubs are established.

- Repair erosion control measures as necessary to insure proper function.
- Control locally invasive and noxious plants as necessary. If pesticides are used, refer to PEST MANAGEMENT – Practice Standard 595.
- Control vehicle access during site preparation and after (i.e., before adequate tree and shrub establishment occurs) to minimize compaction, erosion, and other site impacts. Refer to USE EXCLUSION – Practice Standard 472.
- **IMPORTANT:** Site preparation activity involving heavy rubber tired equipment should be done under dry to moist soil-site conditions. *Stop operation of this type equipment under wet conditions; soil compaction and rutting under wet conditions **will** have significant negative impacts on site productivity.*

## REFERENCES

- NCCES, 1996. *Site Preparation Methods and and Contracts-WOODLAND OWNER NOTES.*
- NCDFR – DEHNR, 1989. *Forestry Best Management Practices Manual*
- NCDFR – DEHNR, 1989. *Forestry Practices Guidelines Related to Water Quality*
- NCDFR – DEHNR, 1990. *Laws of North Carolina Relating to Forestry*
- NCDFR – DEHNR, 2003. *Pocket Guide to the Forest Practices Guidelines Related to Water Quality.*
- USDA – US Forest Service. 1988. *A Guide for Predicting Sheet and Rill Erosion on Forest Land; SA-TP 11.*