Wildfire Recovery

PROTECTING YOUR PROPERTY FROM SOIL EROSION

WILDFIRE RECOVERY: PROTECTING YOUR PROPERTY FROM SOIL EROSION

The environmental impacts of a wildfire go far beyond burnt trees. The potential for severe soil erosion and accelerated water runoff also exists after a wildfire due to the lack of vegetation and ground cover to stabilize the soil.

The trees, shrubs, grasses, and ground cover that comprise a healthy forest function to keep soil in place on the land. The forest canopy intercepts raindrops and reduces their impact on the soil. Rain that makes it through the canopy is intercepted by the litter layer which covers the forest floor. Together, the canopy and litter layer protect the soil by preventing raindrops from detaching soil particles.

Without this protection, detached soil particles can wash down denuded slopes, enter stream channels, reduce water quality, and alter or degrade aquatic habitat. In addition to protecting soil from the impact force of raindrops, a litter layer functions to help the soil absorb rainwater. In the absence of litter, rain is more likely to hit the soil surface and run off than infiltrate into the soil, reducing aquifer recharge and increasing sediment loads delivered to nearby surface water bodies.

Erosion robs land of its soil and its ability to grow trees. Losing nutrient-rich topsoil diminishes productivity and hinders the re-establishment of natural vegetation in burned-over areas following a fire. Soil and ash eroding off the land can wash into surface water bodies like ponds, wetlands, creeks and rivers (a process called sedimentation) causing negative impacts on water quality and aquatic habitat that can span from hours to years. Severe erosion can result in tremendous environmental and economic consequences by filling reservoirs and reducing their water storage capacity, deteriorating water quality, increasing treatment costs for drinking water, destroying aquatic ecosystems, and reducing biodiversity.

Your property is at increased risk for soil erosion if:

- The forest litter layer has burned off, exposing bare soil
- The forest canopy has burned away, reducing rainfall interception
- The fire was of high intensity causing soil to repel water
- Slopes are steep
- Rain falls in large amounts over a short period of time

Fortunately, there are a number of practical measures landowners can take to mitigate soil erosion caused by wildfire and to prevent sedimentation of ponds, creeks, streams, wetlands, and other surface water bodies.

Most erosion control practices are designed to hold soil in place and protect it from washing away until permanent vegetation is re-established. There are a vast number of practices that can be applied across the landscape. Selecting the right one will depend on the objectives of the treatment, economics, and the specific site conditions. Technical specifications for proper implementation are available for each practice.

AFTER THE FIRE: PREVENTING SOIL EROSION
WHAT SHOULD YOU DO FIRST?

The following are some simple precautions you should take immediately following a wildfire to prevent from provoking soil erosion and sedimentation on your property:

- **Plan for erosion control**

  Recovery efforts such as land clearing, debris removal, and salvage logging should include plans for controlling erosion and sedimentation. Seek technical assistance from qualified professionals when necessary.

- **Preserve existing vegetation**

  Whether burned or unburned, the roots of vegetation hold the soil together and promote water infiltration. It is especially important to protect green trees and other vegetation adjacent to stream channels and surface waters. However, trees or shrubs that pose an imminent hazard to health and safety should be removed.

- **Minimize soil disturbance**

  When conducting any recovery efforts that involve soil disturbance, such as land clearing or road construction, attempt to minimize the footprint of the disturbance as much as possible. Be especially careful to minimize any disturbances in sensitive areas such as steep slopes, severely burned areas, erodible soils, and areas directly adjacent to wetlands, streams or other water bodies.

- **Reduce the impact of livestock**

  After a wildfire, some areas may need to be deferred until plant growth has re-established and is adequate to support grazing.

- **Utilize forestry best management practices when salvaging trees**

  Forestry Best Management Practices (BMPs) are conservation practices that help protect your soil and water resources during forestry operations. BMPs include practices like leaving a buffer of trees next to a stream, keeping slash and other debris out of stream channels, minimizing the number of vehicular stream crossings used to access a property, or re-establishing vegetation on temporary roads to prevent erosion.

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REHABILITAING FIREBREAKS AND TEMPORARY ROADS FOR WATER RESOURCE PROTECTION

During wildfire suppression, it is often necessary to mechanically create breaks within the vegetation or other combustible materials to stop or slow the progress of a fire, and to push new temporary roads to facilitate the movement of firefighting equipment. These activities expose soils to erosion and increase the risk of sediment delivery to adjacent surface waters, especially on steep slopes, erodible soils, and in close proximity to water bodies. However, practices that prevent soil erosion can slow containment efforts and must take a lower priority than fire suppression as the first and foremost concern in wildfire control is to prevent damage to people and property. Best Management Practices (BMPs) for firelines should be used to address potential problems as soon as possible and whenever practical. The following BMPs can be used to rehabilitate firebreaks and temporary roads created during fire suppression activities:

- **Firebreaks and temporary roads should have water control structures, such as waterbars and wing ditches (see Soil Erosion Appendix), installed to minimize soil erosion. These structures should not discharge within 50 feet of a stream bed or channel.** Without providing drainage, roads and firebreaks can collect runoff water from the surrounding landscape and create a gully that funnels sediment long distances, potentially discharging them into streams or other water bodies.
- **Stabilize and re-vegetate temporary roads and firebreaks, if needed, on grades in excess of 5% or areas subject to accelerated erosion or within known sensitive areas.** Exposed soil subject to excessive erosion, especially erodible soils on steep slopes, should be re-vegetated or otherwise stabilized if natural re-vegetation will not suffice (see Soil Erosion Appendix). Roads that are no longer needed should be closed.
- **Stream crossings and tie-ins should be rehabilitated whenever practical.** Firebreaks and roads must sometimes cross through or connect to a stream or other water body. It is important to remove any dirt that is pushed into the stream that will obstruct the natural flow of the channel, and to reshape and stabilize the banks to ensure that no sediment can wash off the road or firebreak into the stream.
- **Firebreaks and roads on highly erodible sites or other problem areas should be inspected periodically to correct erosion problems.** Periodic inspections can help ensure that protective measures that have been taken are still functioning correctly, and that new problems have not arisen. Detecting problems while they are still small can save a lot of time, effort, and cost.

WILDFIRE SALVAGE BEST MANAGEMENT PRACTICES
FOR WATER RESOURCE PROTECTION IN BASTROP COUNTY

The destruction caused by the 2011 Texas wildfire season has left many forest landowners searching for answers about what to do with all the burned timber. Salvaging this timber quickly and starting over may be the only option for many. Generally, burned timber must be salvaged within approximately 2 months in order to utilize it for most wood products (biomass being one exception). While there is a sense of urgency to harvest the damaged timber, it is important to remember the long term benefits of using Best Management Practices (BMPs). Here are some things to keep in mind during these operations:

- **Seek assistance from a professional forester.** Trained professionals are familiar with BMPs necessary for protecting water quality, and data collected by Texas Forest Service shows that these individuals are more likely to implement BMPs during forestry operations.
- **Special care should be taken when operating in the Water Management Zone (WMZ) to minimize ground disturbance.** WMZs for the Lost Pines region are defined by the LPHCP (2008) as the minimum buffer necessary to protect habitat sites that might be used by Houston toads for breeding or dispersal. These zones extend a minimum of 150 feet[*] from surface waters such as ponds, creeks, streams, rivers, and wetlands. These areas also act as the final filter before any sediment or debris reaches the water body. Haul roads, skid trails, and landings should be located outside of these areas and kept to the minimum size and number necessary. Harvesting within these areas should be conducted using manual felling and cable skidding only. Stream crossings should be avoided or minimized. Trees and tops should not be felled across or pushed into streams.
- **Every effort should be made to protect and leave trees not severely damaged in the WMZ.** This is critical to prevent destroying the filtering and stream shading effects of WMZs. A residual density of 50 square feet of basal area per acre should be left wherever possible (for basal area calculation refer to the Texas Forestry Best Management practices handbook). Tree survival can be determined using the Texas Forest Service debris assessment guidelines[†]. A professional arborist can be consulted if it is unclear if particular trees may or may not survive and should be removed.
- **Evaluate the regeneration potential of the WMZ.** If artificial regeneration is necessary, site preparation and machine planting should be avoided within the WMZ.
- **Follow BMP protocols for the rest of the tract and use common sense.** Despite the necessity to facilitate a quick harvest, BMPs should still be followed. Refer to the Texas Forestry Best Management Practices handbook[‡] for a complete list of BMPs applicable to forestry operations. Common sense will go a long way in keeping operators safe and preventing excessive damage to the site.

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[*] Depending on the circumstances, WMZ widths can be adjusted by consulting with the administrator for the Lost Pines Habitat Conservation Plan.

[†] Document available from the Bastrop County disaster relief website: http://www.co.bastrop.tx.us/bcdisaster/

‡ Document available from the Texas Forest Service website: http://txforestservice.tamu.edu/water

SOIL EROSION APPENDIX

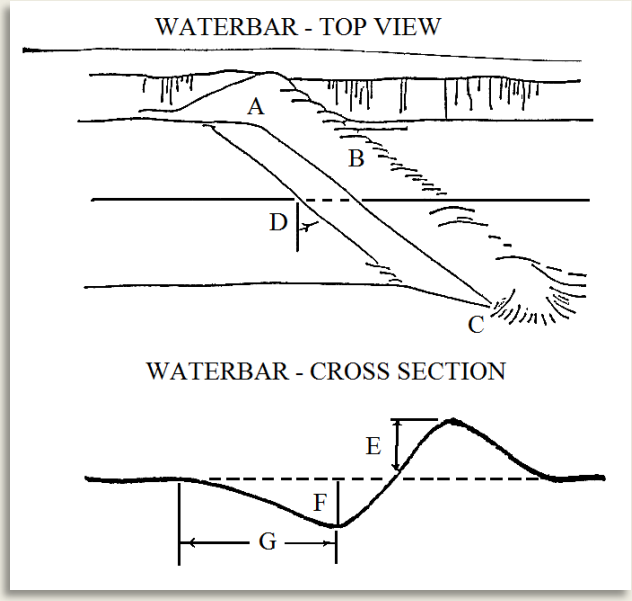
TECHNICAL GUIDENCE

- **WATER CONTROL STRUCTURES**
  - Waterbar Specification
  - Wing ditch Specifications
- **SILT FENCE SPECIFICATIONS**
- **NRCS PRACTICE SUMMARIES**

WATER CONTROL STRUCTURES

WATERBAR – a constructed berm of dirt used to collect and divert runoff water from a firebreak, dirt road, or other disturbed area to facilitate drainage and minimize erosion.

- Construct at a 30-45 degree angle (should not function as a dam)
- 1-2 feet in height (pull dirt pushed out of firebreak back in to build the waterbar)
- Uphill end tied into bank to capture water across full length of surface
- Outflow end must be open
- Outflow should discharge into stable vegetation when possible. In heavily burned areas the outflow may need to be controlled using slash, weed-free straw bales, silt fence, or other erosion control measures to prevent further erosion
- Avoid constructing in WMZs



A – Bank tie-in point, cut 1 – 2 feet into the surface

B – Cross drain berm height is 1 – 2 feet above surface

C – Drain outlet cut 1 – 3 feet into surface

D – Angle drain 30 – 45 degrees downgrade with surface centerline

E – Approximately 2 feet in height

F – Depth 1 – 2 feet

G – 3 - 4 feet

Figure reprinted from the Texas Forestry Best Management Practices Handbook, Pg 36.

Properly constructed waterbar and outlet for dispersing water.

WATERBAR SPACING FACTORS

- **Slope**
  - The steeper the slope, the more waterbars will be needed
  - Percent Slope = (Rise/Run) * 100%
- **Soil Texture**
  - 3 major soil textures
    - Sand – Coarse particles, best drainage, high erodibility – more WB
    - Silt – Medium sized particles, drainage, erodibility
    - Clay – Fine particles, poor drainage, low erodibility – less WB
- **Distance (Run)**
  - Even relatively flat slopes will need water control structures if they cover long distances.

WATERBAR SPACING

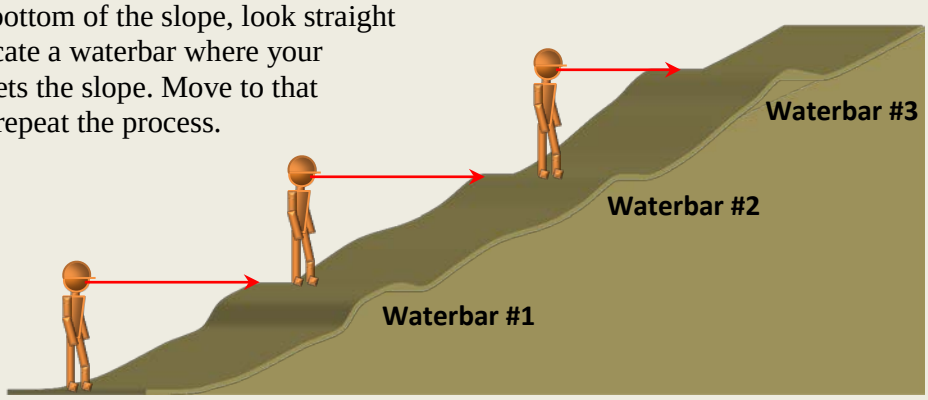
Spacing based on a known grade:

Table reprinted from the Texas Forestry Best Management Practices Handbook, Pg 35.

Grade (Percent)	Distance between Waterbars (Feet)
2	250
5	135
10	80
15	60
20	45
30	35

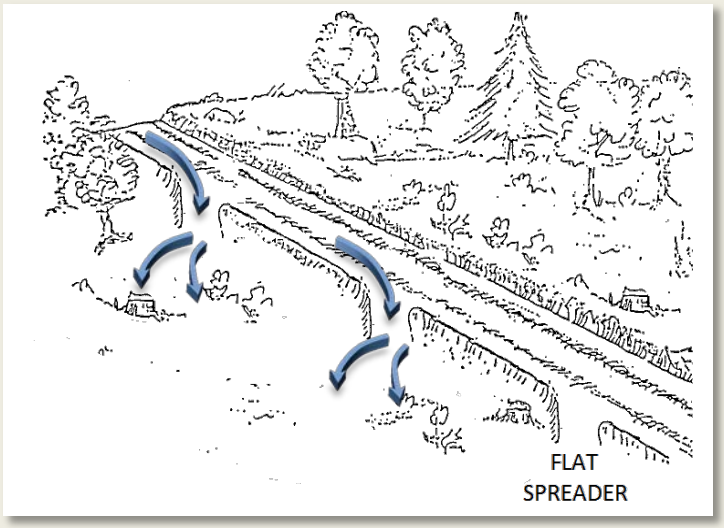
Spacing based on "Eye Level" approximation:

Stand at the bottom of the slope, look straight ahead and locate a waterbar where your sight line meets the slope. Move to that location and repeat the process.



WING DITCH / TURNOUT – a diversion ditch constructed to collect and disperse runoff water away from the firebreak or road into stabilized areas.

- Usually connected to the outlet of a waterbar
- Construct at a 30-45 degree angle, then follow the natural contour
- Has a slight uphill hook to slow water velocity
- Flattens at opening to spread water out and slow velocity
- Outflow should discharge into stable vegetation when possible. In heavily burned areas the outflow may need to be controlled using slash, weed-free straw bales, silt fence, or other erosion control measures to prevent further erosion
- Should not discharge into streams, wetlands or other waterbodies



Example of a water turnout. A flat spreader spreads runoff water out, reducing its velocity so that sediment falls out prior to discharging into a stable vegetated area. Figure reprinted from Texas Forestry Best Management Practices Handbook, Pg. 39.

Turnout used in conjunction with a waterbar to disperse runoff water

WING DITCH / TURNOUT SPACING

Table reprinted from the Texas Forestry Best Management Practices Handbook, Pg 38

Grade (Percent)	Distance between Wing Ditches (Feet)
2 - 5	200
5 -10	100
10+	75

EPA RECCOMENDATIONS FOR SILT FENCE INSTALLATION

If a standard-strength fabric is used, it can be reinforced with wire mesh behind the filter fabric. This increases the effective life of the fence. The maximum life expectancy for synthetic fabric silt fences is about 6 months, depending on the amount of rainfall and runoff.

The stakes used to anchor the filter fabric should be wood or metal. Wooden stakes should be at least 5 feet long and have a minimum diameter of 2 inches if a hardwood like oak is used. Stakes from soft woods like pine should be at least 4 inches in diameter. When using metal posts in place of wooden stakes, they should weigh at least 1.00 to 1.33 lb/linear foot. If metal posts are used, attachment points are needed for fastening the filter fabric with wire ties. Filter fence can be attached to wooden posts using heavy duty staples or hog rings.

Erect silt fence in a continuous fashion from a single roll of fabric to eliminate gaps in the fence. If a continuous roll of fabric is not available, overlap the fabric from both directions only at stakes or posts. Overlap at least 6 inches. Excavate a trench to bury the bottom of the fabric fence at least 6 inches below the ground surface. This helps to prevent gaps from forming near the ground surface.

The height of a silt fence should be a minimum of 16 inches above the original ground surface and should not exceed 34 inches above ground elevation. If standard-strength fabric is used with wire mesh, space the posts no more than 10 feet apart. If extra-strength fabric is used without wire mesh reinforcement, space the posts no more than 6 feet apart.

If a silt fence is to be constructed across a ditch line or swale, the measure should be of sufficient length to eliminate endflow, and the plan configuration should resemble an arc or horseshoe with the ends oriented upslope. Extra-strength filter fabric with a maximum 3-foot spacing of posts should be used for this application.

Silt fences should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

Key Points

- ✓ Position the silt fence at a right-angle (perpendicular) to the direction of surface runoff flow.
- ✓ Make sure the stakes supporting the silt fence are on the down-slope (back) side of the fence.
- ✓ Dig a trench at least 4 to 6 inches deep on the upslope side to bury the bottom portion of the silt fence.
- ✓ Bury the bottom portion of the silt fence with soil to make sure no runoff can seep underneath.
- ✓ Keep the silt fence upright and tightly-stretched while installing.
- ✓ Install additional staking or straw bales behind the silt fence as necessary to prevent the silt fence from blowing-out.
- ✓ Silt fences should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

CRITICAL AREA PLANTING

(Ac.)

CODE 342

DEFINITION

Establishing permanent vegetation on sites that have, or are expected to have, high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices.

PURPOSE

Stabilize stream and channel banks, and shorelines.

Stabilize areas with existing or expected high rates of soil erosion by wind or water.

Rehabilitate and re-vegetate degraded sites that cannot be stabilized using normal establishment techniques.

Stabilize coastal areas, such as sand dunes and riparian areas.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to highly disturbed areas such as:

- active or abandoned mined lands;
- urban conservation sites;
- road construction areas;
- conservation practice construction sites;
- areas needing stabilization before or after natural disasters such as floods, hurricanes, tornados and wildfires;
- eroded banks of natural channels, banks of newly constructed channels, and lake shorelines;

FORNATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

FORAGE AND BIOMASS PLANTING

(Ac.)

CODE 512

DEFINITION

Establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, hay, or biomass production.

PURPOSE

- Improve or maintain livestock nutrition and/or health.
- Provide or increase forage supply during periods of low forage production.
- Reduce soil erosion.
- Improve soil and water quality.
- Produce feedstock for Biofuel or energy production.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands suitable to the establishment of annual, biennial, or perennial species for forage or biomass production. This practice does not apply to the establishment of annually planted and harvested food, fiber, or oilseed crops. Forage and biomass planting is generally not recommended in MRLA 42 (Texas MLRA Map), unless irrigation is available to insure establishment and production.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

FOREST STAND IMPROVEMENT

(Ac.)

CODE 666

DEFINITION

The manipulation of species composition, stand structure and stocking by cutting or killing selected trees and understory vegetation.

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 by 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.

CONDITIONS WHERE PRACTICE APPLIES

All forest land.

NRCS, TX
December 2006

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

FOREST TRAILS AND LANDINGS

(Ac.)

CODE 655

DEFINITION

A temporary or infrequently used route, path or cleared area within a forest.

PURPOSE

- Provide infrequent access to forest stands for management activities including fire suppression.
- Provide periodic access for removal and collection of forest products.

CONDITIONS WHERE PRACTICE APPLIES

Trails and landings are applicable on forested areas. Refer to the standard Access Roads, 560, for travel-ways that will be designed and used frequently or repeatedly for vehicular traffic.

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

GRADE STABILIZATION STRUCTURE

(No.)

CODE 410

DEFINITION

A structure used to control the grade and head cutting in natural or artificial channels.

SCOPE

This standard applies to all types of grade stabilization structures, including a combination of earth embankments and mechanical spillways and full-flow or detention-type structures. This standard also applies to channel side-inlet structures installed to lower the water from a field elevation, a surface drain, or a waterway to a deeper outlet channel. It does not apply to structures designed to control the rate of flow or to regulate the water level in channels (587).

PURPOSE

To stabilize the grade and control erosion in natural or artificial channels, to prevent the formation or advance of gullies, and to enhance environmental quality and reduce pollution hazards.

CONDITIONS WHERE PRACTICE APPLIES

In areas where the concentration and flow velocity of water require structures to stabilize the grade in channels or to control gully erosion. Special attention shall be given to maintaining or improving habitat for fish and wildlife where applicable.

NRCS, Texas
APRIL, 2002

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

HILLSIDE DITCH

(Ft.)

CODE 423

DEFINITION

A channel that has a supporting ridge on the lower side constructed across the slope at defined vertical interval and gradient, with or without a vegetative barrier.

PURPOSE

To safely control the flow of water by diverting runoff into a protected outlet.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to sloping sites where surface flow is damaging sloping upland, and there is sufficient soil depth for constructing a hillside ditch system.

NRCS, Texas
April 2003

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
MULCHING

(Ac.)

CODE 484

DEFINITION

Applying plant residues or other suitable materials produced off site, to the land surface.

PURPOSE

- Conserve soil moisture
- Reduce energy use associated with irrigation
- Moderate soil temperature
- Provide erosion control
- Suppress weed growth
- Facilitate the establishment of vegetative cover
- Improve soil quality
- Reduce airborne particulates

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where mulches are needed. This practice may be used alone or in combination with other practices.

NRCS, TEXAS
JUNE 2011

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

OBSTRUCTION REMOVAL

(Ac.)

CODE 500

DEFINITION

Removal and disposal of unwanted, unsightly or hazardous buildings, structures, vegetation, landscape features, and other materials.

PURPOSE

To safely remove and dispose of unwanted obstructions and materials in order to apply conservation practices or facilitate planned use of abandoned mine lands, farms, ranches, construction sites, and recreation areas.

CONDITIONS WHERE PRACTICE APPLIES

On land where existing obstructions interfere with planned use and development.

NRCS, Texas

June, 2002

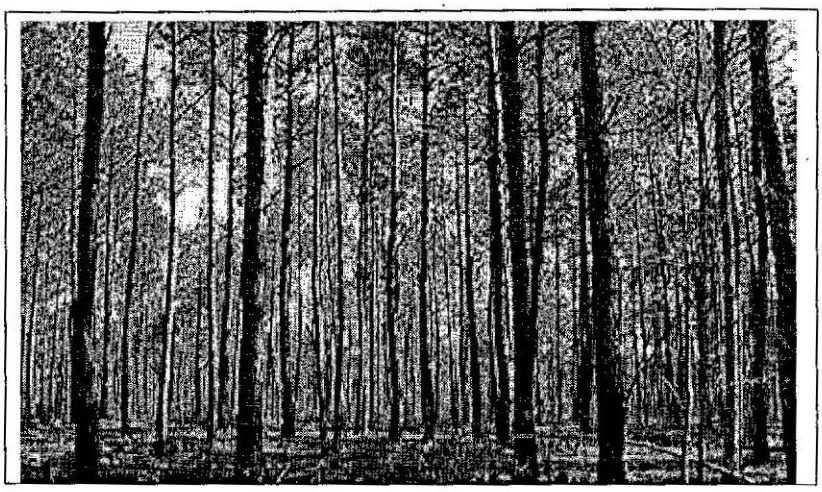
USDA NRCS

Natural Resources Conservation Service

Conservation Across America

Pine Thinning

Bryan Zone Job Sheet - 666A



Definition

Thinning, as opposed to total harvesting or clear-cutting, is the partial removal of trees in a stand for the purpose of improving the general quality, health, and growth of the stand. The overriding principle of thinning is the improvement of the stand.

What Thinning is Not

A common method of partial harvests in the woods is called "diameter-limit" cutting. This method usually means removing all trees of a certain diameter and larger measured at a given height above the ground. For example, a diameter-limit cut of 12/1 would result in the removal of all trees 12" and larger in diameter measured at a 1' stump height. The effect would be removing the best quality trees and retaining the lower quality, suppressed trees.

Thinning Principles

Pines are intolerant of shade meaning they grow best when they are in full sunlight. As trees grow and their crowns expand, they tend to start competing against each other for light. As a result some trees that are better competitors dominate the stand while some become suppressed. Eventually these suppressed trees begin to die. A good thinning will harvest these potential casualties and put them to use while giving room for the better trees to expand their crowns and continue growing. Depending of the quality of the site, each acre has the potential to grow a certain amount of wood. Thinning is a means of directing this growth potential to selected future crop trees.

Determining the Need

The need for thinning in a stand will show in several ways

- Over stocked - Stocking that exceeds the numbers listed in the table below
- Small, weak crowns
- Uneven canopy layer with many suppressed trees
- Slow growth - Growth rings that are narrow and closely spaced

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

PRESCRIBED FORESTRY

(Ac.)

CODE 409

DEFINITION

Manage forested areas for forest health, wood and/or fiber, water, recreation, aesthetics, wildlife habitat and plant biodiversity.

PURPOSE

- Maintain or improve forest health
- Protect soil quality and condition
- Maintain or enhance water quality and quantity
- Maintain or improve forest productivity
- Maintain or improve plant diversity
- Improve aesthetic and recreational values
- Improve wildlife habitat
- Achieve or maintain a desired understory plant community for forest products, grazing, and browsing.

CONDITIONS WHERE PRACTICE APPLIES

- On all forest land
- On land capable and suited to growing trees.

NRCS, TX
December 2006

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

PRESCRIBED GRAZING

(Ac.)

CODE 528

DEFINITION

Managing the controlled harvest of vegetation with grazing and/or browsing animals.

PURPOSE

This practice may be applied as part of a conservation management system to accomplish one or more of the following purposes.

- Improve or maintain the desires species composition and vigor of plant communities.
- Improve or maintain quantity and quality of forage for grazing and browsing animals' health and productivity.
- Improve or maintain surface and/or subsurface water quality and quantity.
- Improve or maintain riparian and watershed function.
- Reduce accelerated soil erosion, and maintain or improve soil condition.
- Improve or maintain the quantity and quality of food and/or cover available for wildlife.
- Management of fine fuel load to achieve desired conditions.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where grazing and/or /browsing animals are managed.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

RANGE PLANTING
(Acre)
CODE 550

DEFINITION

Establishing adapted plants by seeding on native grazing land (does not include pasture and hayland planting).

PURPOSES

This practice serves to:

- Prevent excessive soil and water loss and improve water quality.
- Produce more forage for livestock.
- Improve the visual quality of rangeland.
- Provide or improve forage, browse, cover for wildlife and/or pollinators.
- Restore historic plant communities.

CONDITIONS WHERE THIS PRACTICE APPLIES

This practice applies to land where the planned use is rangeland, native pasture, grazable forest, and grazed wildlife land. Generally, seeding will not be done when 15% composition by weight of the desirable plants are present, are well distributed over the treated area, and can be managed to a stand within an acceptable time frame.

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

ROCK BARRIER

(Ft.)

CODE 555

DEFINITION

A rock retaining wall constructed across the slope to form and support a bench terrace that will control the flow of water and check erosion on sloping land.

PURPOSE

Stabilize steeply sloping land so that it can be farmed with a minimum of soil loss.

CONDITIONS WHERE PRACTICE APPLIES

Rock barriers are applicable to land suitable for cultivation where soil depth is adequate for benching and where the effectiveness of less intensive measures for soil and water conservation would be questionable. This standard applies to all rock barriers 6 feet or less in height on land slopes as much as 70 percent. Suitable natural outlets or satisfactory sites for constructing outlets must be available.

NRCS, Texas

April 2003

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

RUNOFF MANAGEMENT SYSTEM

(No. and acre)
CODE 570

DEFINITION

A system for controlling excess runoff caused by construction operations at development sites, changes in land use, or other land disturbances.

SCOPE

This standard applies to the planning, design, installation, operation, and maintenance of runoff management systems, including adequate outlet facilities and components required for adequate management of storm runoff, as determined by site conditions.

PURPOSE

Mainly to regulate the rate and amount of runoff and sediment from development sites during and after construction operations to minimize such undesirable effects as flooding, erosion, and sedimentation.

CONDITIONS WHERE PRACTICE APPLIES

The practice applies if there is a need to control runoff, erosion, and sedimentation to compensate for increased peak discharges and erosion resulting from construction operations at development sites or from other changes in land use. The discharges may be caused by such factors as increased runoff, reduced time of concentration, reduced natural storage.

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

STRUCTURE FOR WATER CONTROL

(No.)

CODE 587

DEFINITION

A structure in a water management system that conveys water, controls the direction or rate of flow, maintains a desired water surface elevation or measures water.

PURPOSE

The practice may be applied as a management component of a water management system to control the stage, discharge, distribution, delivery or direction of water flow.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies wherever a permanent structure is needed as an integral part of a water-control system to serve one or more of the following functions:

- Convey water from one elevation to a lower elevation within, to or from a water conveyance system such as a ditch, channel, canal or pipeline designed to operate under open channel conditions. Typical structures: drops, chutes, turnouts, surface water inlets, head gates, pump boxes and stilling basins.
- Control the elevation of water in drainage or irrigation ditches. Typical structures: checks, flashboard risers and check dams.
- Control the division or measurement of irrigation water. Typical structures: division boxes and water measurement devices.
- Keep trash, debris or weed seeds from entering pipelines. Typical structure: debris screen.
- Control the direction of channel flow resulting from tides and high water or back-flow from flooding. Typical structures: tide and water management gates.
- Control the water table level, remove surface or subsurface water from adjoining land, flood land for frost protection or manage water levels for wildlife or recreation. Typical structures: water level control structures, flashboard risers, pipe drop inlets and box inlets.
- Convey water over, under or along a ditch, canal, road, railroad or other barriers. Typical structures: bridges, culverts, flumes, inverted siphons and long span pipes.
- Modify water flow to provide habitat for fish, wildlife and other aquatic animals. Typical structures: chutes, cold water release structures and flashboard risers.
- Provide silt management in ditches or canals. Typical structure: sluice.
- Supplement a resource management system on land where organic waste or commercial fertilizer is applied.
- Create, restore or enhance wetland hydrology.

NRCS, TEXAS

MARCH 2006

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

TREE/SHRUB ESTABLISHMENT

(Ac.)

CODE 612

DEFINITION

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

PURPOSE

Establish woody plants for:

- forest products such as timber, pulpwood, and energy biomass
- wildlife habitat
- long-term erosion control and improvement of water quality
- treating waste
- storing carbon in biomass
- energy conservation
- improving or restoring natural diversity
- enhancing aesthetics.

CONDITIONS WHERE PRACTICE APPLIES

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

Utilize other practice standards for specialized tree/shrub establishment situations, e.g., Riparian Forest Buffer, 391; Alley Cropping, 311; Windbreak/Shelterbelt Establishment, 380; Critical Area Planting, 342; Hedgerow Planting, 422.

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

TREE/SHRUB SITE PREPARATION

(Ac.)

CODE 490

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.

CONDITIONS WHERE PRACTICE APPLIES

On all lands needing treatment to establish trees and/or shrubs.

CRITERIA

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 for establishing the desired woody species. Refer to sources such as a published soil survey, Web Soil Survey, Soil Data Mart, etc. to determine any site limitations for mechanical and chemical site preparation and choose the appropriate method(s).

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.

Slash and debris shall be removed, treated or eliminated as appropriate.

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

Remaining slash and debris shall not hinder needed equipment operations or create an undue fire hazard.

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.

Anticipate possible off-site effects and modify the site preparation design accordingly. Do not plan mechanical, broadcast chemical or burning within 50 feet of a perennial or intermittent stream.

All methods will comply with the Texas Forestry Best Management Practices.

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

VEGETATIVE BARRIER

(Ft.)

CODE 601

DEFINITION

Permanent strips of stiff, dense vegetation along the general contour of slopes or across concentrated flow areas.

PURPOSE

- Reduce sheet and rill erosion.
- Reduce ephemeral gully erosion.
- Manage water flow.
- Stabilize steep slopes.
- Trap sediment.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all eroding areas, including but not limited to: cropland, pastureland, rangeland, forestland, farmsteads, mined land and construction sites.

This practice applies only when used in conjunction with other conservation practices as part of a conservation management system.

NRCS, Texas

January 2007

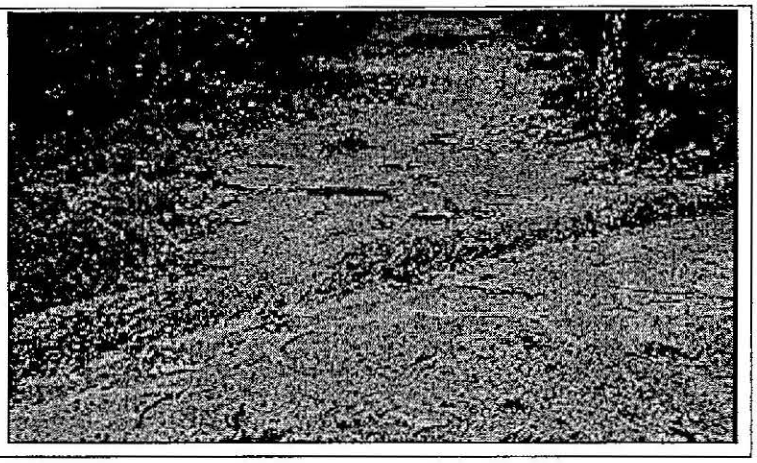
USDA NRCS

Natural Resources Conservation Service

Conservation Across America

Water Bars

Bryan Zone Job Sheet - 655A



What are Water Bars?

Water bars are a combination of a cross drain and diversion dam constructed across a road, trail, or firebreak for the purpose of gathering and shedding surface water.

Where Suitable

These water control devices can be used on roads and trails that will have limited or no traffic as well as on firebreaks that are constructed on sloping land. They should also be constructed on abandoned or retired roads and trails. Water bars are not well suited for roads and trails that will have frequent use. Rolling or broad-based dips are better choices in this case.

Purpose

When the slope of the road, trail, or firebreak cannot be regulated, water bars can be used to limit the length of slope over which the surface run off water will travel.

Construction Guidelines

- Water bars can be constructed either with equipment or by hand. Skidder blades are not suitable for water bar construction.
- Use the soil from the ditch to construct the bar height.
- Angle the water bar across the road, trail, or firebreak in the downgrade direction. The device should turn the runoff water and not dam it. It should also be placed so that the water will not return back to the road further down hill.
- When inside ditches are present, tie the upper end of the water bar into the ditch.
- The outflow end of the device should extend far enough beyond the road or trail surface to safely disperse the runoff water onto a stable outlet and protect the road from erosion.

Distance Guidelines

Water bars should be spaced according to the slope of the road, trails or firebreak.

Slope Range	Distance between Bars
Flat (<4%)	160 - 250 feet
Moderate (5% - 12%)	80 - 135 feet
Steep (>12%)	60 - 75 feet

In addition to distance alone, consider taking advantage of factors such as slope changes, curves, and the presence of stable outlets.

Maintenance

- Inspect water bars after major rain storms for damage or breeches and correct.
- When possible, vegetate water bars with perennial grasses.