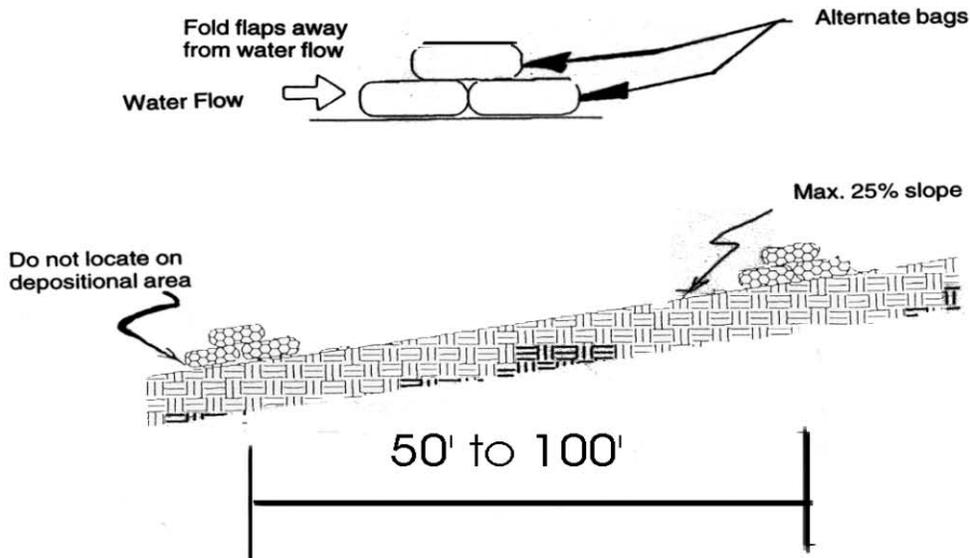
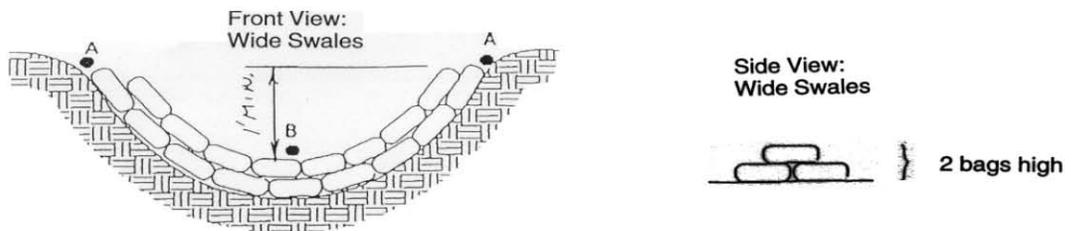


Burlap Bag Check Dams

Gravel-filled bags can be used to construct sediment barriers, diversions, and basins on slopes up to 25%.

Bags should be made of burlap material. Fill material can be coarse sand or gravel.

Place the bags in layers, with each layer overlapping the joints in the previous layer, and packed tightly. Fill the bags one-half full. Tie or fold down the top of the filled bag. If folded, place the bags with the folded top in the upstream or uphill direction, facing the flow of water. Limit placement to 2 layers high.



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DRAINAGE TIPS

Hillside lots that have been damaged by fire or are located in a fire-damaged watershed can be susceptible to erosion drainage and runoff/erosion problems. Torrential or prolonged rains cause the most damage.

To treat surface drainage problems, you will first need to identify the sources of surface water (runoff) flowing onto or over your property. First, walk outside and around your home. As you walk, observe the "lay" of your lot and the surrounding properties. Also, observe your roof and driveway. Is your home on top of a hill where all surface waters drain away from your home? If so, you will be concerned with holding topsoil on your property. Few homeowners live on top of a hill. So, it is more likely that water will flow onto your property from an adjacent hillside. Where will the water concentrate and how can you control the sediment that is carried with the water?

Gutters and downspouts direct roof runoff

Be sure that your roof is properly fitted with gutters and downspouts (1), that will release water onto a non-erodible surface such as a paved driveway (2). Or you can connect downspouts firmly to solid plastic pipe (3) that will carry water downslope away from your home to a place where it will be released safely such as a paved roadside or storm drain ditch (4). Because twigs, pine needles and leaves can clog gutters and downspouts, the use of gutter guards of 1/4 to 1/2-inch hardware cloth screen is highly recommended. Clear your gutters regularly and inspect them to insure your roof runoff system is working properly. Most homes in New Mexico have foundations situated on sand or silt soils that can settle irregularly when they become saturated and lead

to cracking or jamming of windows or doors. It is therefore usually very important to keep runoff from gutter down spouts well away from your house foundation.

Curbs and berms protect sensitive slopes

An asphalt curb, a compacted earth berm, K-Rails, concrete blocks, or other similar structure on the outside edge of a driveway or building pad (5) can direct runoff away from sensitive slopes to an area where it can be released safely. The recommended height of the berm is a minimum of 12-18 inches. (A sandbag berm may be used as a temporary measure.)* A pipe drop (6) may be used to carry runoff downslope to a place where it can be released safely, such as a lined roadside ditch or storm drain.

Lined ditches handle road and driveway runoff

Roads and driveways can be graded toward a lined ditch or streetside gutter designed to handle sheet flow water from paved surfaces and uphill slopes (7 & 8). As shown in the diagram, water from the driveway ditch is released safely into the drainage ditch or storm drain of the main road. At specific intervals along the main road, water may be transported under the road through a culvert (9a) and released safely onto a non-erodible surface. An energy dissipator (9b), such as a rocklined outlet, can serve this purpose where slope is minimal. In steeper areas or where large volumes of water may accumulate, other precautions may be needed to prevent washouts or localized flooding.

Proper grading promotes good drainage

Proper grading of your land helps prevent water from pooling around foundations, flooding basements or below grade structural components, and concentrating water into destructive volumes. In general, grade surfaces flow away from foundations at a minimum grade of 1-2 feet for every 100 feet (10). Grade and compact surfaces evenly since water can collect in depressions or channelize into destructive flows.

Drainage for retaining walls

Good drainage must be provided for solid construction retaining walls (11). Properly placed weepholes and perforated pipe with a gravel backfill behind the wall work well. The small openings between wood boards or non-grouted brick, stone or concrete block retaining walls serve this purpose. Many walls are not designed for saturated soils or ponded water behind them and can break, tipover or slide if this is not prevented with good drainage behind them.

Diversion ditches

A diversion ditch may be needed to handle surface runoff flowing onto your property from upslope. For slopes steeper than 5%, or where large amounts of water are expected, line the ditch with concrete or hand-placed rock underlain with filter fabric or other appropriate measures. Direct water to a safe, non-erodible surface -- never directly onto the downstream slope itself. Always consult a qualified engineer to design water diversion measures.

Maintenance

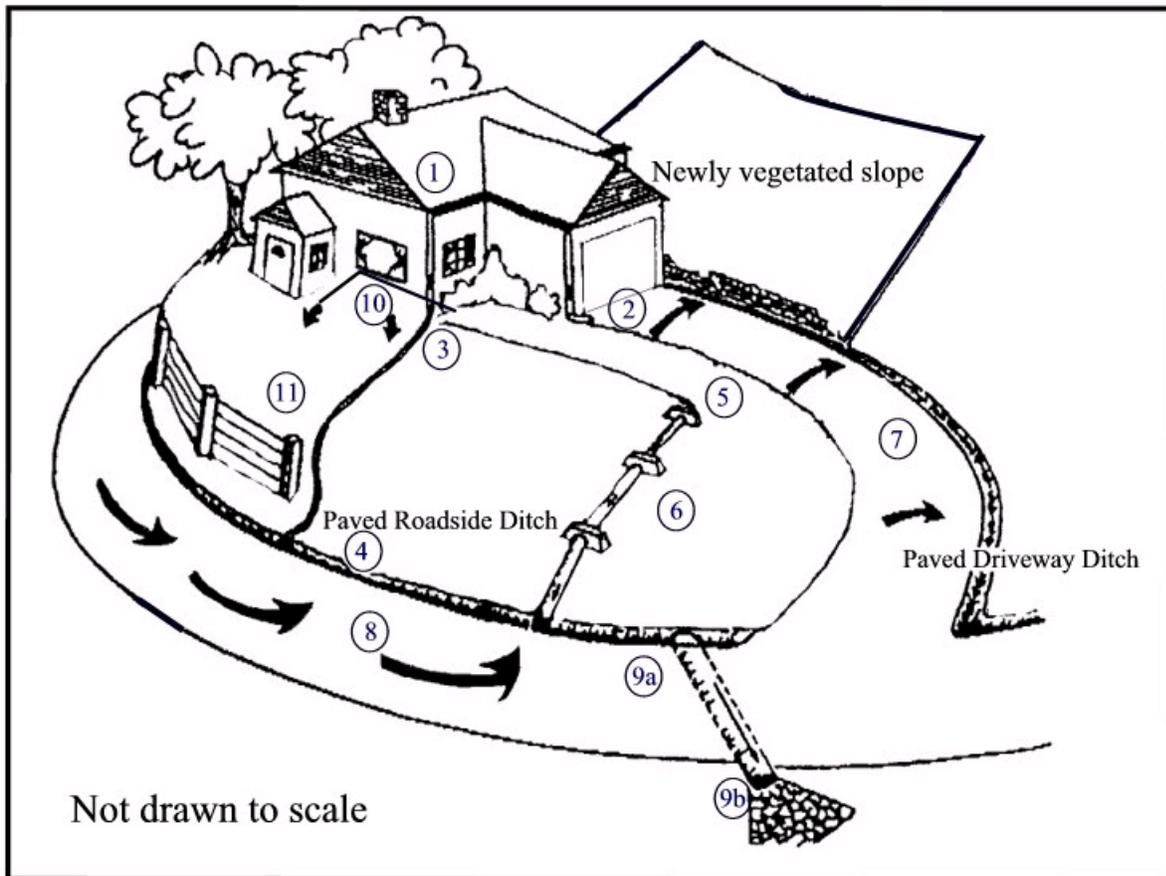
- Regular maintenance of drainage systems will keep your drainage problems to a minimum. Never direct water onto adjoining property without consulting the owners. Observe your system during the rain when you can watch runoff patterns that affect your property or affect downslope properties.
- Check gutters, downspouts and pipes during and after storms and remove debris that might cause clogging.
- Regularly inspect, clean, and repair berms and ditches as necessary. Signs of over-topping may mean that redesign is necessary or that modifications should be made to handle larger quantities of water. Check for and repair any damage caused by burrowing animals.
- Seed and mulch or otherwise vegetate all bare areas, especially on slopes.
- Regular maintenance saves time and money in the long run.

Safety measures

- Do not start any work until you are assured that both above-ground and underground utility lines will not be affected by your work. Information on the location of underground utility lines can be obtained by calling 1-800-321-ALERT.
- Do not release runoff onto septic leach fields or at the base of structural foundations.

** A fact sheet on constructing temporary sandbag berms is available from the USDA-NRCS office in your area.*

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RESEEDING & ESTABLISHING GRASSES AND/OR LEGUMES

Site Preparations

If necessary, divert offsite water away from the critical area. This may require a permanent diversion, or in other instances, a temporary measure that will be effective during the period of vegetative establishment.

Protect the area from strong erosive winds, if necessary, to provide protection for the temporary cover. This may require the use of barrier, such as snow fence, or material such as nylon or plastic netting to hold protective mulch in place.

On areas with a 3:1 slope or flatter, and where practical, grade the area to facilitate the use of conventional equipment for seedbed preparation, seeding, and mulching application. Cabling of equipment may be necessary on steeper slopes, such as on newly constructed cut-and-fill areas.

On construction sites or critical areas where the existing surface material is either physically or chemically unsuited to support adequate vegetation, the best available soil material will be evenly spread on the surface in sufficient depths to maintain plant growth. Required depths of suitable surface material should be determined for each site.

Soil amendments that alter soil acidity or alkalinity (lime, sulfur, gypsum) or organic materials may be needed and practical on some sites.

Seedbed Preparation

The seedbed should be relatively firm but not too compact. Tillage implements or other means may be used to provide a firm but friable soil that is free of large clods. (Note- on sites with

"hydrophobic" soil conditions due to fire, the soil should be raked or tilled as needed to break up the hydrophobic soil layer.)

Seed and Seeding

Species-an on-site determination of site conditions such as soil, slope, exposure, and climate should be made to select species best adapted to the site.

Quality-certified seed of named varieties shall be used when available. Otherwise, seed of natural ecotypes that are adapted to the soil and climate of the area should be chosen.

For alternative seeding mixes, refer to the USDA-NRCS Fact Sheet on '*Alternatives for Revegetation on Burned Areas.*'

Seeding Methods

The proper amount of the appropriate seed mix must be evenly distributed and placed at the proper soil depth of one inch or less. The seedbed should be firmed to insure that the seed is in contact with the soil. The following seeding methods may be used.

Broadcasting: Broadcast seeding is the preferred method and should be used when possible. Distribute the seed evenly by using something like a cyclone seeder. Cover the seed by harrowing or raking by hand. If at all possible, the area should then be firmed by rolling or culti-packing.

Drilling: Drills must be equipped with seed hoppers that will properly meter out the specific kind of seed being planted. This may require a special drill for fluffy seeds. The drill should obtain the proper seed depth and should be equipped with packer wheels to firm the seed.

Mulching

Where to use: Mulch should be used on all critical areas where the goal is to establish vegetation as soon as possible and where there is danger of erosion during the period of establishment.

Kind: The best vegetative mulch in order of preference is clean, weed free, unweathered, long stemmed materials consisting of any of the following types: (a) native grass hay; (b) meadow hay; (c) introduced grass hay; (d) small grain straw; (e) fine

stemmed sorghums.

On some critical areas, such as on slopes steeper than 2:1 or in areas of concentrated water flow, jute netting or erosion control blankets may be used instead of vegetative mulch.

Manure also makes a suitable mulch providing it contains enough bedding material (vegetative matter) to bind the manure and hold it in place.

Rate: Mulch should be applied uniformly over the entire seeded area.

Hay or straw: Two to 2 ½ tons of hay or straw should be applied per acre.

Manure: Five to ten tons of manure, depending on straw content and type of manure, should be applied per acre.

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STRAW MULCHING

What is it?

The application of straw as a protective cover over seeded areas to reduce erosion and aid in revegetation or over bare soils that will be landscaped later to reduce erosion.

When is it used?

This method is used on slopes which have been seeded and have high potential for erosion. It requires some type of anchoring by matting, crimping or other methods to prevent blowing or washing away.

Straw mulch forms a loose layer when applied over a loose soil surface. To protect the mulch from wind drifting and being moved by water, it must be covered with a netting such as plastic or punched into the soil with a spade or roller, or by spraying it with a tacking agent. The mulch should cover the entire seed or bare area. The mulch should extend into existing vegetation or be stabilized on all sides to prevent wind or water damage which may start at the edges.

Methods and Materials:

On gentle to moderate slopes, straw mulch can be applied by hand broadcasting to a uniform depth of 2 - 3 inches. On steep slopes, the straw should be blown onto the slope to achieve the same degree of cover. When applied properly, approximately 20-40 percent of the original ground surface can be seen. The application rate per acre should be about 2 tons (or one 74 pound bale per 800 square feet). Straw should be clean rice, barley, or wheat straw.

Anchoring of straw mulch can be accomplished using the following methods:

Hand Punching:

A spade or shovel is used to punch straw into the slope until all areas have straw standing perpendicularly to the slope and embedded at least 4 inches into the slope. It should be punched about 12 inches apart.

Roller Punching:

A roller equipped with straight studs not less than 6 inches long, from 4 - 6 inches wide and approximately one inch thick is rolled over the slope.

Crimper Punching:

Like roller punching, the crimper has serrated disk blades about 4 - 8 inches apart which force straw mulch into the soil. Crimping should be done in two directions with the final pass across the slope.

Matting:

Matting is used on large, steep areas which cannot be punched with a roller or by hand. Jute, wood excelsior or plastic netting is applied over unpunched straw.

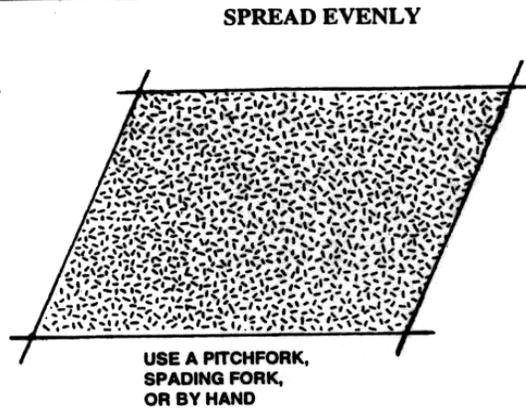
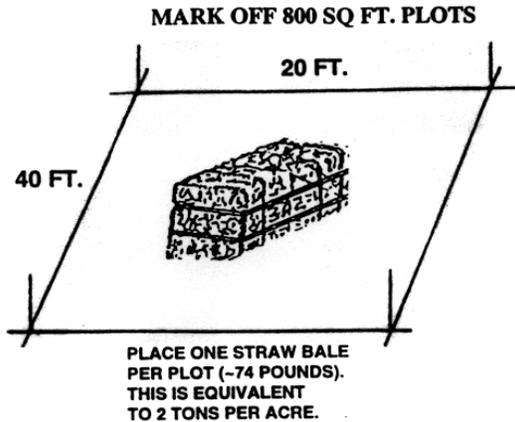
Where to Get Help:

Technical Assistance is available from your local USDA Natural Resources Conservation Service office or your local Resource Conservation District regarding this practice and other treatments.

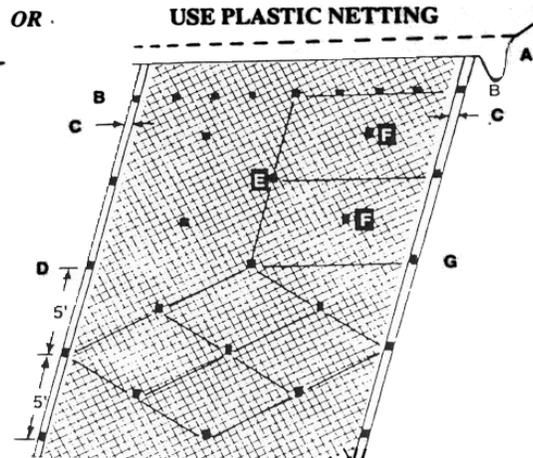
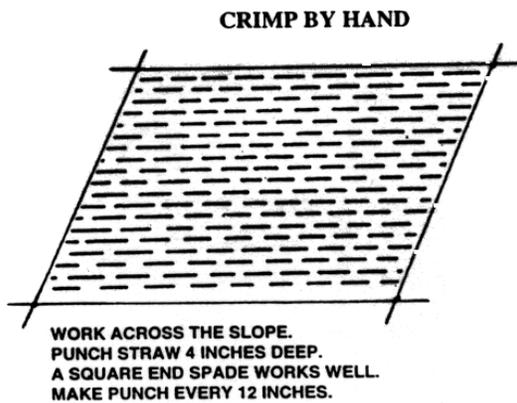
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Straw Mulching

SPREAD THE STRAW



ANCHOR THE STRAW



Construction Notes

1. Lay matting in strips down the slope over the straw. Bury upper end in 6-8 inch deep and wide trench. Most netting comes in 14-17 feet wide rolls.
2. Secure the upper end with stakes every 2 feet.
3. Overlap seams on each side 4-5 inches.
4. Secure seams with stakes every 5 feet.
5. Stake down the center every 5 feet.
6. Stake middles to create diamond pattern that provides stakes spaced 4-5 feet apart.
7. Use pointed 1x2 inch stakes 8-9 inches long. Leave 1-2 inch top above netting or use "U" shaped metal pins at least 9 inches long.
8. When joining 2 strips, overlap upper strip 3 feet over lower strip and secure with stakes every 2 feet like in "B" above.

JUTE NETTING

Netting made of jute can be laid and anchored over straw or other mulch to help protect the soil from wind and water damage. Netting helps reduce soil erosion and provides a good environment for vegetative regrowth.

Jute is a biodegradable material that will eventually decompose and is not a threat to the environment or wildlife.

When to Use

Jute netting can be used on areas that may erode near structures such as homes, roads, and bridges or on small, steep, disturbed areas.

Netting can also be applied alone (without mulch) as an alternative to straw or wood mulches on flat sites for dust control and seed germination enhancement.

It should not be used alone where runoff quantities are expected to be high.

The use of jute netting is not appropriate in all situations. Examples of when it may not be appropriate:

- Steep slopes with sandy soils
- Steep slopes with many rocks on the surface
- Steep slopes with a significant amount of fire burned vegetation remaining

Specifications

The soil surface should be reasonably smooth. Remove rocks and other obstructions that rise above the level of the soil or mulch.

Jute netting should be cloth of a uniform plain weave of undyed and unbleached single jute yam. The materials should weigh about 1.2 pounds per linear yard and have approximately 78 warp ends per width of cloth and 41 weft ends per linear yard.

Most nurseries, hardware stores, and lumber yards can help find netting that meets these recommended specifications.

Individual rolls of jute should be applied up and down the slope--never along the contour.

Bury the upper end of the netting at the top of the disturbed area in a trench at least 6-8 inches deep.

Lay out rolls so edges overlap each other by at least 4 inches.

Extremely important: When more than one roll is required going down slope, the ends going down the slope should overlap by at least 3 feet.

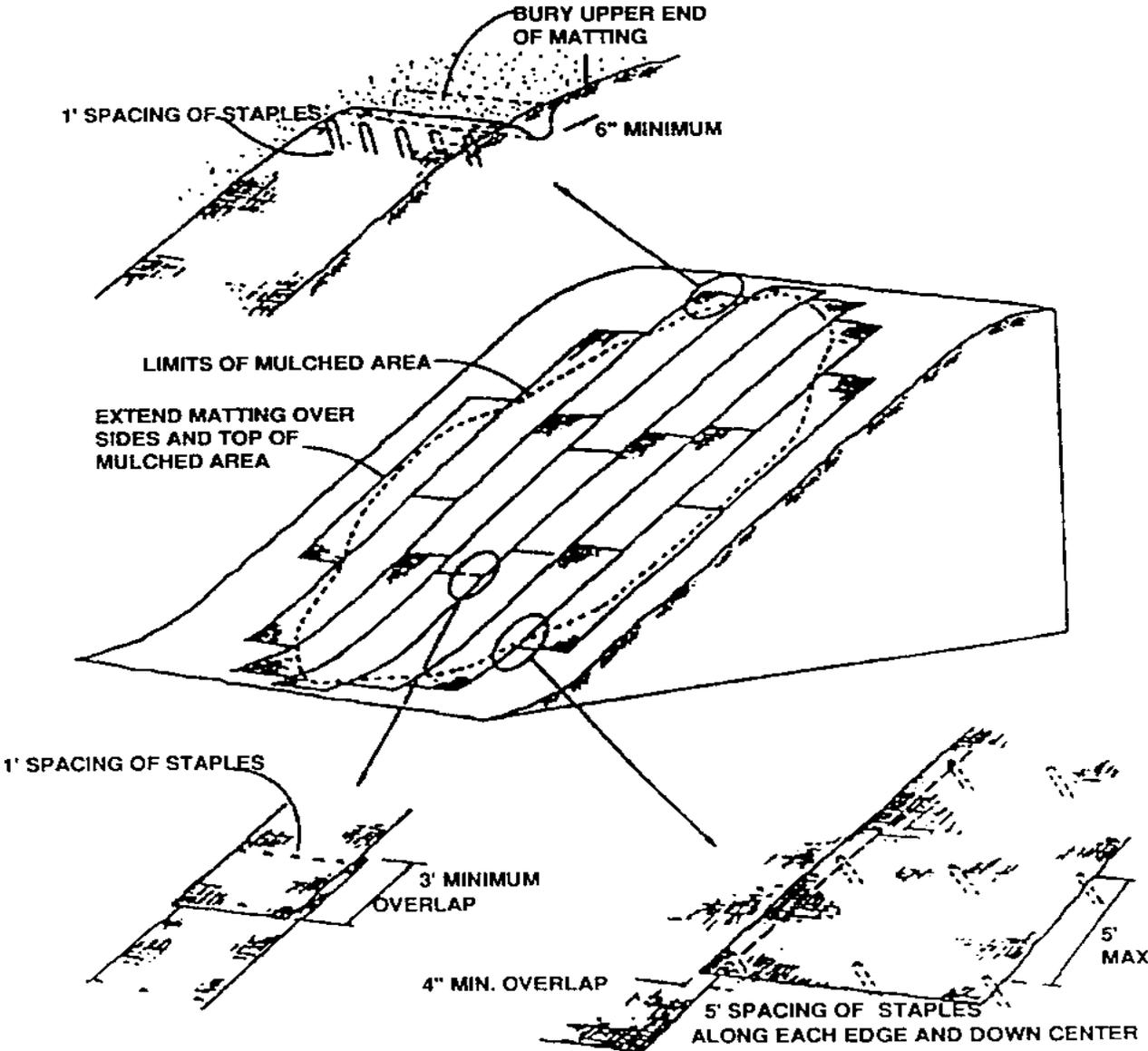
Anchor the netting to the soil surface with anchor pins or staples. Anchor pins are made of rigid 0.12-inch diameter or heavier galvanized wire with a minimum length of 10 inches for hook or "J" type pins. Staples should be of wire .09 inch in diameter or greater and should have "U" shaped legs that are at least 6 inches long. Longer staples are needed for sandy soils.

Staples or anchor pins need to be driven perpendicular into the slope face and should be spaced about 5 feet apart down the sides and center of the roll.

Spacing between staples at the upper end of a roll and at the end overlap of 2 rolls should not be greater than 1 foot.

The netting should go beyond the edge of the mulched or seeded area at least 1 foot at the sides and 3 feet at the bottom. If there is vegetation at the boundaries of the area, the netting should be continued into the stable vegetated area or to the edge of a structure.

Jute Netting



SANDBAG PROTECTION

An inexpensive temporary barrier or wall, 1 to 2 feet high, can be constructed by stacking sand-filled or earth-filled sandbags. They can be placed to divert mud and other debris flows away from buildings. They will not, however, provide protection from high debris flows.

When to Use

- To protect building sites vulnerable to low mud debris flows from steep, erodible slopes that are partially or completely void of vegetation due to wildfire burns.
- As an inexpensive, temporary protection method for home before predicted rainfall.

Note: Sandbags deteriorate when exposed to continued wetting and drying for several months. If the bags need to be used for more than a few months, cement can be mixed with the sand. The cement and sand mixture will harden when the bags dry.

Methods and Materials

Sandbag barriers are easy to construct. Burlap bags, sand, plastic, lumber, cement and plywood are readily available at local lumberyards. Some fire stations and other emergency centers can also help with materials.

Place filled sandbags to direct debris flows away from buildings, pools, and other structures. Clear a path for the debris. Do not try to dam or stop debris flows.

Protect your most valuable property first. Debris can enter a building through doors and windows, so they should be boarded up and waterproofed with plastic sheets. **Remember:** Sandbags will not seal out water.

Work with your neighbors and be prepared to use your property to provide good protection for the community.

How to Fill Bags

Fill sandbags one-half full. Use sand, if available, or, local soil. Fold the top of the sandbag down and place the bag on its folded top (see illustration).

How to Place Bags

Refer to illustration. Place each sandbag as shown finishing each layer before starting the next. Limit placement to two layers unless they are stacked against a building or pyramided.

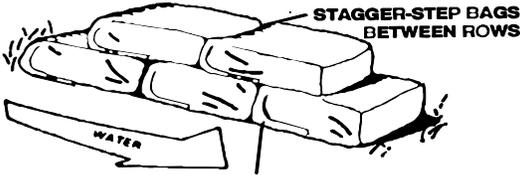
It is important to place bags with the folded top in the upstream or uphill direction facing the flow of water to prevent them from opening when water runs by.

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Sandbag Protection

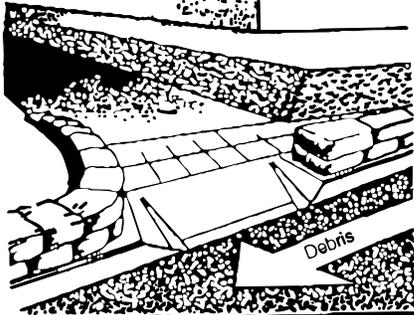


FILL HALF FULL FOLD TOP UNDER

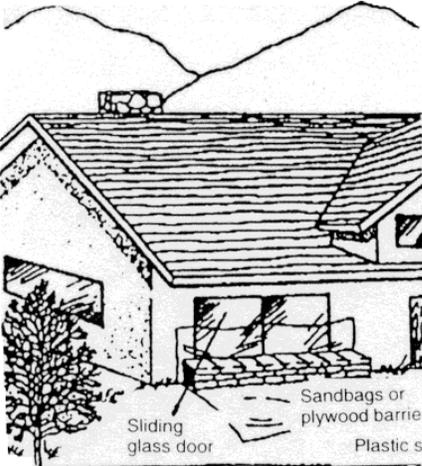
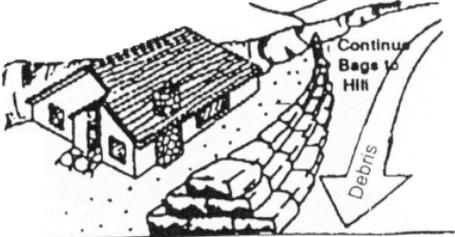


STAGGER-STEP BAGS BETWEEN ROWS

PLACE BAG WITH FLAP UNDER BAG



Controlling debris/storm flows in streets



Sliding glass door sealing

SILT FENCE

What is it?

This is a temporary barrier made of woven wire and fabric filter cloth that is used to catch sediment-laden runoff from small areas of disturbed soil such as following a fire. Silt fences are easy to construct, and materials are available from hardware stores, nurseries, and lumberyards. Silt fences are easy to construct, and materials are available from hardware stores, nurseries, and lumberyards.

When is it used?

Silt fences are used for specific situations. Major considerations are slope, slope length, and the amount of drainage area from which the fence will catch runoff. Here are some design considerations:

Slope Steepness

2:1 = 50%
3:1 = 33%
4:1 = 25%
5:1 = 20%
<5:1 = <20%

Maximum Slope Length

50 feet
75 feet
125 feet
175 feet
200 feet

*For longer slopes, add additional silt fences.

Drainage Area:

The area that contributes runoff to be caught by the silt fence should not be greater than 1/2 acre for 100 feet of fence.

Type of Runoff:

Silt fences are designed to catch runoff that is in the form of "sheet flow" and not "concentrated flow." Sheet flow differs from concentrated flow in that the runoff is spread evenly over the ground surface (like a sheet) rather than concentrated in small rills or gullies.

Methods and Materials:

Fence Posts:

Posts should be at least 36 inches long. Wood posts should be of hardwood with a minimum cross sectional area of 3 inches. Steel posts should be standard "T" or "U" section and should weigh no less than 1 pound per linear foot.

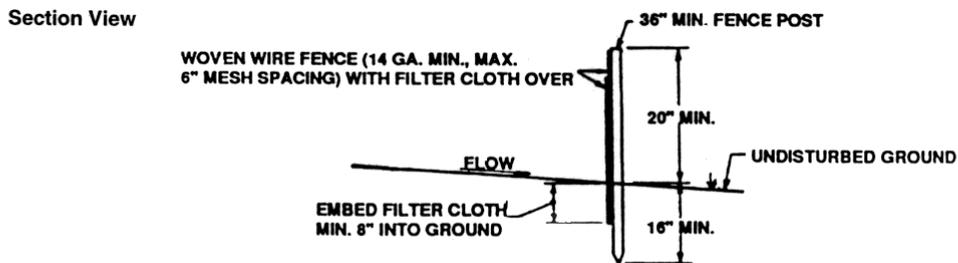
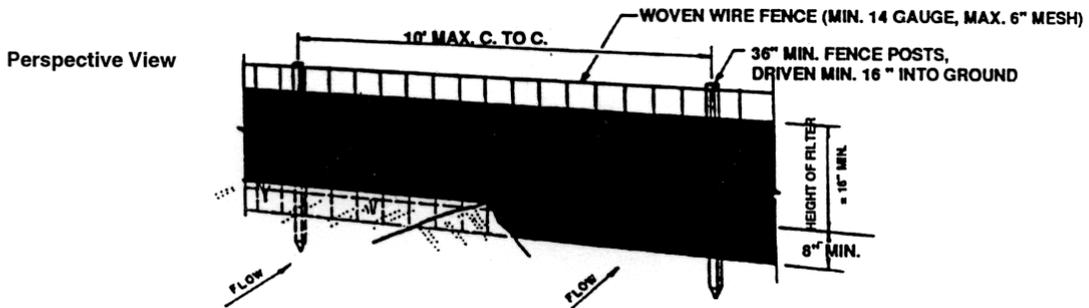
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Silt Fence

Fabric Properties:

Filter fabric properties should be as follows (hardware store personnel can help you with these):

Fabric Property	Minimum Acceptable Value	Test Method
Grab tensile strength (LBS)	90	ASTM D1682
Elongation at Failure (%)	50	ASTM D1682
Mullen Burst Strength (PSI)	190	ASTM D3786
Puncture Strength (lbs)	40	ASTM D751 (mod)
Slurry flow Rate (gal./min/sf)	0.3	
Equivalent Opening Size	40-80	US Std Sieve
Ultraviolet Rad. Stability	90	ASTM-G-26



Construction Notes

1. Woven wire fence to be fastened securely to fence posts with wire ties or staples.
2. Filter cloth to be fastened securely to woven wire fence with ties spaced every 24" at top and midsection.
3. When 2 sections of filter cloth adjoin each other, they shall be overlapped by 6" and folded.
4. Maintenance shall be performed as needed and material removed when "bulges" develop in the silt fence.

STRAW BALE CHECK DAM

What is it?

These are temporary sediment barriers constructed of straw bales located across small drainages.

These temporary structures are used to slow debris flows in small channels. They are not intended to provide protection from large storm events nor to control debris flows in water bodies such as creeks, streams and rivers.

When is it used?

Planning Criteria:

Straw Bale Check Dam design limits are as follows:

Slope	Maximum Drain Area	Maximum Slope Length Between Check Dams
0-15 percent	1 acre	200 feet
15-20 percent	1/2 acre	100 feet
>20 percent	Not recommended	--

Methods and Materials:

Bales should be bound with wire or nylon string. Twine bound bales are less durable. The bales should be placed in rows with bale ends tightly abutting the adjacent bales.

Downstream Row (refer to illustration):

Dig a trench across the small channel, wide enough and deep enough to so that the top of the row of bales placed on their long, wide side is level with the ground. The tops of bales across the center of the channel should all be level and set at the same elevation. Place the bales in position and stake them according to the instructions below.

Dig another trench across the small channel, upstream and immediately adjacent to the first row of bales. The trench should be wide enough to accommodate a row of bales set vertically on their long edge. The trench should be deep enough so that at least 6 inches of each bale is below ground starting with the bale in the channel bottom. The trench should be as level as possible so that the tops of the bales across the center of the channel are level and water can flow evenly across them.

Continue this trench up the side slopes of the small channel to a point where the unburied bottom line of the highest bale (point "C", illustration) is higher than the top of the bales that are in the center of the channel (point "D", illustration).

Upstream Row:

Anchorage:

Drive 2 x 2 stakes or #4 rebar through the

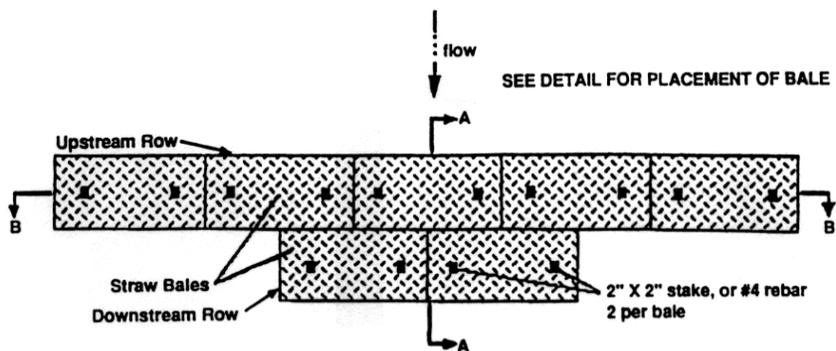
bales and into the ground 1 1/2 to 2 feet for anchorage. The first stake in each bale should be driven toward a previously laid bale to force the bales together (see illustration).

Maintenance:

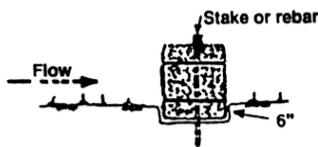
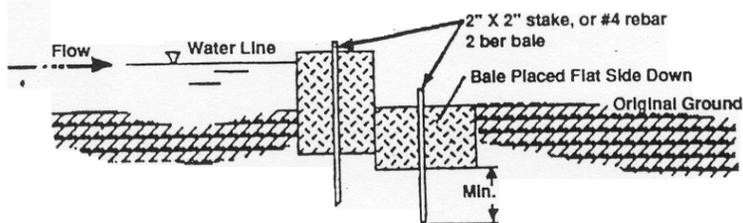
Inspect the bale check dam and provide necessary maintenance following each storm period. It is important to assure that loose straw does not enter storm drain facilities. Remove the bales and stakes once permanent drainage and stabilization is re-established. Used straw can be used as mulch in other areas.

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Straw Bale Check Dams



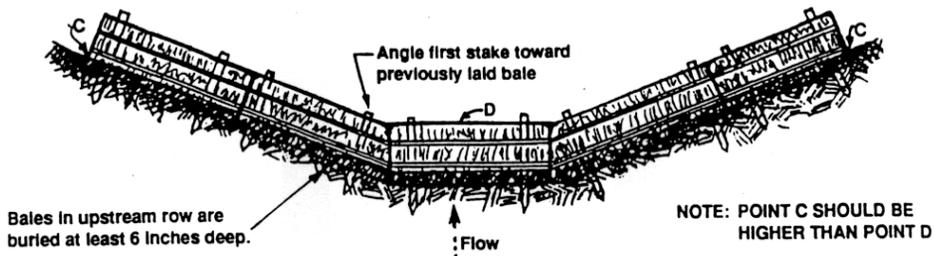
Section A-A



PLACEMENT DETAIL
UPSTREAM ROW

Remove #4 rebar after
straw bales are no longer
in place

Section B-B



STRAW BALE DIKES

Straw bale dikes are a temporary sediment barrier constructed of straw bales located downslope of a disturbed area or around a storm drainage outlet to redirect debris flows or trap debris materials.

They are usually installed in areas requiring protection from sedimentation expected from predicted rainfall events that will cause erosion.

They are intended to provide protection for a limited time, usually less than 3 months.

Installation Tips

Drainage area limits:

- **0-15% slope:** Maximum drainage area is 1 acre and maximum slope length is 200 feet.
- **More than 15% slope:** Maximum drainage area is ½ acre, maximum slope length is 100 feet.

Bind bales with wire or nylon twine (jute twine-bound bales are less durable). Bales should be made from clean weed free straw. Place bales in a row with ends tightly abutting

adjacent bales. Do not place bales with wire or twine touching—see illustration. Compress some loose straw between adjacent bales to close voids. The tops of bales should all be level and set at the same direction.

Staking

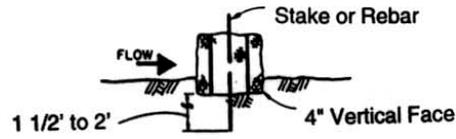
Each bale should be embedded in the soil a minimum of 4 inches. Drive 2x2 stakes or rebar through the bales and into the ground 1.5 to 2 feet for anchorage. The first stake in each bale should be driven toward a previously laid bale to force the bales together—see illustration.

Maintenance

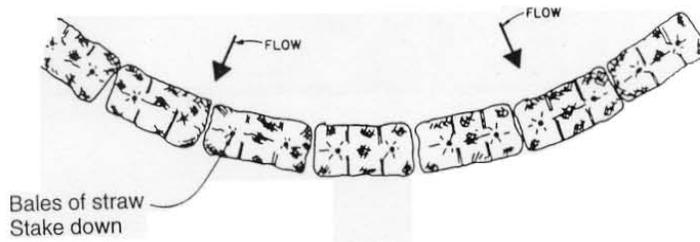
Inspect dikes and provide necessary maintenance following each storm event. It is important to ensure that loose straw does not enter storm drain facilities. Remove bales once permanent drainage and stabilization are re-established. Use the straw as mulch in other areas.

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Straw Bale Dikes



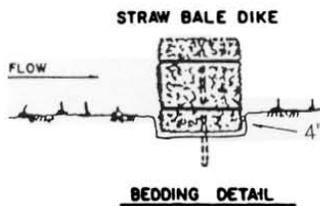
EMBEDDING DETAIL
N.T.S.



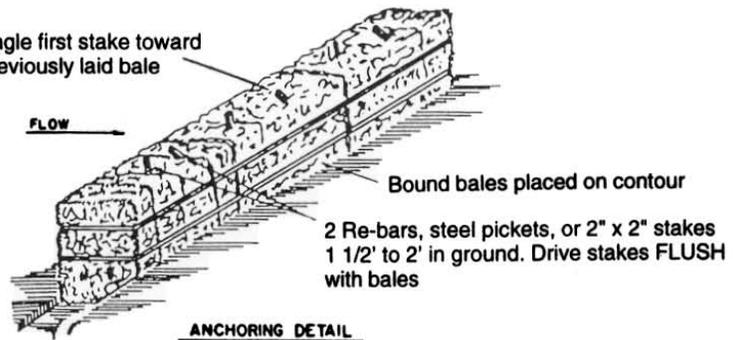
PLAN
N.T.S.



ELEVATION
N.T.S.



Angle first stake toward
previously laid bale



VEGETATION ESTABLISHMENT FOR SOIL PROTECTION

The USDA Natural Resources Conservation Service (NRCS) and its conservation partners are working to help you and your community recover from the recent wildfires. NRCS technical teams, working through the Emergency Watershed Protection Program (EWP) and providing conservation technical assistance services, are helping people recover from problems associated with wildfires including soil erosion, water runoff and drainage, and vegetation damage. The goal of these programs is to protect lives, prevent damage to buildings, roads, bridges and other structures, and to protect soil resources and re-establish vegetation.

KEEP DAMAGED WOODY VEGETATION INTACT

With the exception of trees and other vegetation that may pose a personal safety or property damage risk, leave existing standing vegetation intact. Although trees and shrubs will likely appear dead or dying, many may be able to recover in time. Tree and shrub roots are highly efficient at holding the fragile soil in place. For those trees and shrubs that must be removed, remove only the portion above the soil surface. Try not to remove the roots or the soil around the roots.

The services of a professional arborist should be retained to help you determine which trees and shrubs pose a risk and should be removed.

Contact your local Cooperative Extension Office for advice.

SEEDING AND MULCHING

Although burned vegetation may remain on your site, seeding can still be done. There's a good chance that native seeds on your property are still alive and will germinate. Old and new vegetation provides protection to the soil and conserves moisture. If you have questions about whether you need to perform seeding and mulching activities on your land, contact the USDA Natural Resources Conservation Service Field Office in your area. The professional conservationists that serve that office may provide an on-site evaluation and/or recommendations for seeding mixtures as well as guidance on proper seeding and mulching methods.

IRRIGATION

If rain has fallen in the area and the soil is moist, discontinue irrigating hillsides to avoid over saturating the soil. Natural rainfall will germinate new seeds.

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