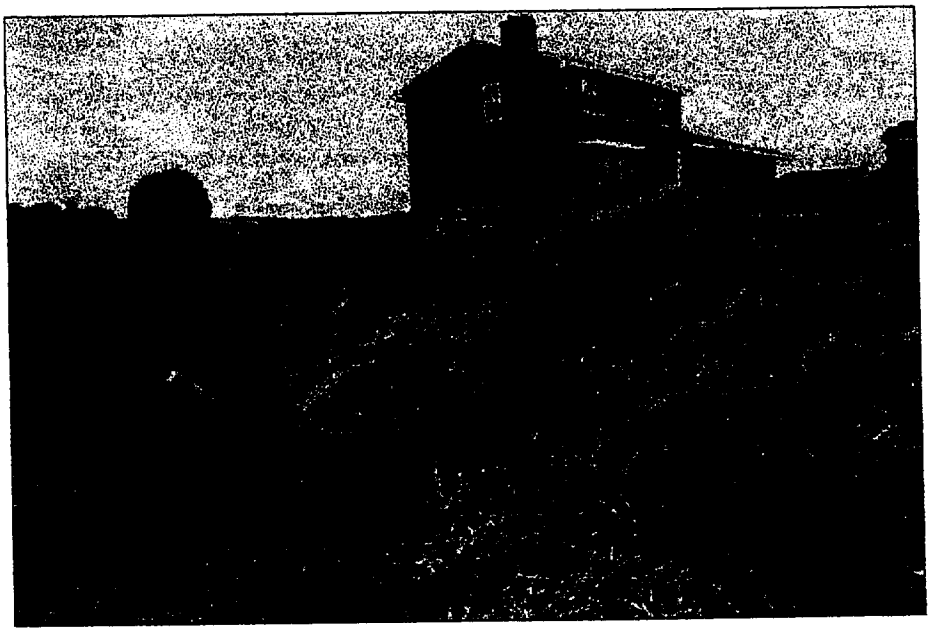
FARM WATER QUALITY PLANNING MANAGEMENT PRACTICE

Mulching
 # 484

University of California Cooperative Extension
Natural Resources Conservation Service



Mulching is the practice of applying plant residues or other suitable materials not produced on the site to the soil surface to conserve moisture, prevent compaction or crusting, reduce erosion and runoff, control weeds, and help establish plant cover.

Advantages	Disadvantages
• Reduces sheet and rill erosion	• May wash off steep slopes and plug drains or culverts if not anchored into soil
• Reduces wind erosion	• Harvested straw may contain weed seeds
• Improves soil tilth	• Untreated wood chips may contain pathogens
• Reduces soil compaction	
• Improves moisture use	
• Suppresses weeds	

Practice Costs

Installation Cost Range:
$250/acre
$350/acre with anchoring

Practice Effectiveness for Reducing Water Quality NPS Pollution Potential

Erosion-sheet & rill	Erosion-streambank	Pesticides-leaching	Pesticides-dissolved in runoff	Pesticides-adsorbed to sediment	Nutrients-leaching	Nutrients-surface waters
moderate to significant	negligible	slight	slight	slight		moderate

Empty boxes indicate information not yet collected for this practice

Additional sources of information regarding mulching:

- Your local NRCS, UCCE, and RCD offices
- UC Sustainable Agriculture Research and Extension Program http://www.sarep.ucdavis.edu/
- UC Weed Research and Information Center http://wric.ucdavis.edu/
- The picture and some of the information in this management sheet has been taken from the Natural Resource Conservation Service (NRCS) Handbook of Conservation Practices practice #484. Contact your local NRCS office or visit http://www.nrcs.usda.gov for more information.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

484 - MULCHING

I. SCOPE

The work shall consist of furnishing all materials and placing them on all exposed, disturbed, or barren areas within the field or project area to the limits as shown on the drawings, or as staked in the field.

II. MATERIALS

Straw

Straw shall be new straw derived from rice, wheat, oats, or barley. Clearance shall be obtained from the County Agricultural Commissioner, as required by law, before straw obtained outside the county in which it is to be used is delivered to the site.

Wood Fiber

Wood fiber shall be a wood cellulose fiber that contains no germination or growth inhibiting factors. The wood fiber has the property to be evenly dispersed and suspended when agitated in water. The wood fiber mulch may also be produced from the following materials:

A. Recycled wood fiber, such as wood chips or similar wood materials

B. A combination of recycled newsprint and cardboard materials that contain at least 50 percent cardboard or,

C. A combination of recycled newsprint and non-recycled wood fiber or recycled wood fiber materials that does not contain more than 50 percent newsprint

Tackifier

Tackifier material shall be of the material specified on the Practice Requirements Sheet and shall have the property to be evenly dispersed and suspended in water when agitated. It shall be colored with a nontoxic water-soluble green dye to provide a proper gauge for metering of material over ground surfaces.

Jute Matting

Jute matting shall be of cloth of uniform plain weave of undyed and unbleached jute yarn with a minimum weight of 1 pound per 10 square feet, and shall have ¾ inch square openings.

Excelsior Matting

Excelsior matting shall consist of a mat of wood excelsior fiber with a consistent thickness and the fiber evenly distributed over the entire area of the blanket. At least 70% of the fibers shall be 6 inches or longer in length. The topside of the blanket shall be covered with a biodegradable, extruded plastic mesh with a maximum opening size of 2 by 2 inches.

Plastic Netting

Plastic netting shall be polypropylene extruded plastic netting with square or rectangular openings not greater than 1 inch and a weight of not less than 2.6 pounds per 1000 square feet.

Staples, Pins, and Stakes

Staples, pins, and stakes shall be of metal, wood, plastic, or other acceptable material and of a length as specified on the Practice Requirements Sheet.

Other Materials

Other materials shall be used when specified on the Practice Requirements Sheet.

III. MULCHING DATES

Mulching shall be performed prior as specified on the Practice Requirements Sheet.

IV. SITE PREPARATION

The area to be mulched shall be weed free and have a uniform surface. No implement shall be used that will

create an excessive amount of downward movement of clods on sloping areas.

Trash, weeds, and other debris that will interfere with mulching or maintenance shall be removed.

Site preparation shall be suspended when soil moisture conditions are not suitable for obtaining a satisfactory surface.

V. APPLYING THE MULCH

Use one of the following methods of application as specified on the Practice Requirements Sheet.

Mulching with Wood Fiber

A wood fiber covering shall be distributed uniformly over the area in a water slurry by hydroseeder.

The slurry shall contain wood fiber at the rate of 2,000 pounds per acre with a tackifier unless a different amount is specified on the Practice Requirements Sheet.

Application rates for wood fiber mulch products that have moisture contents greater than 15 percent shall be increased by the following factor, c:

$$c: = \frac{85 \text{ percent}}{\text{percent fiber (solids) in product}}$$

The application rate of the tackifier shall be:

Tackifier	Rate	Wood Fiber Mulch
M-Binder	100lbs	1,500 to 2,000lbs
Sentinel	100lbs	1,500 to 2,000lbs
Ecotak-SAT	100lbs	1,500 to 2,000lbs
Fish-STIK	100lbs	1,500 to 2,000lbs
Soil Master WR	100gal	2,000 to 2,500lbs

The hydroseeder shall be equipped with a built-in continuous agitation system of sufficient operating capacity to produce a homogenous slurry and a discharge system which will apply the slurry to the slopes at a continuous and uniform rate.

The materials shall not remain in the slurry longer than two (2) hours. Water used shall be potable water or Class 1 or 2 agricultural irrigation water.

The slurry shall be continuously mixed and shall be mixed for at least five (5) minutes after the last addition before application starts.

The slurry shall be applied uniformly over the site.

Mulching with Straw

A straw covering shall be distributed uniformly over the area at the rate of 2 tons per acre unless a different amount is specified on the Practice Requirements Sheet. The straw shall be applied by hand, blower, or other suitable equipment. If straw is applied by blower, it shall not be chopped in lengths less than 6 inches.

Anchoring the Straw Mulch

When specified on the Practice Requirements Sheet, the straw mulch shall be anchored in place. The anchoring process may include hand tools, mulching rollers, disks, or similar types of suitable equipment alone or in combination with a hydro-mulch material and shall be performed in a satisfactory manner. When specified on the Practice Requirements Sheet, hydro-mulch material alone may be used.

Anchoring may be accomplished using the following:

Hand Punching: A spade or shovel shall be used to punch the straw into the slope until 95 percent of the area has straw standing perpendicular to the slope and embedded at least 3 inches into the soil. It shall be punched from 12 to 18 inches apart.

Roller punching: A roller equipped with straight studs not less than 6 inches long, from 4 to 6 inches wide and approximately 1 inch thick shall be rolled over the slope.

Crimper Punching: A crimper with serrated disk blades about 4 to 8 inches apart shall be rolled over the slope forcing the straw mulch into the soil. Crimping should be done in two directions with the final pass across the slope.

The following shall be used on large steep areas which cannot be punched by hand or by roller:

Matting. Jute, excelsior or other matting specified on the Practice requirements Sheet shall be utilized.

Matting shall be applied up and down slope and continue beyond the edge of the mulched area at least I foot.

Matting shall be cut around objects so that it lies flat on the soil surface.

At the top of the area the matting shall be buried in a trench at least 6 inches deep.

Overlap: Sides of the rolls shall overlap at least 4 inches. Overlapping ends will have at least 6 inches of overlap with the uphill roll overlying the downhill roll.

Staple: Staples shall be driven perpendicularly into the slope and spaced approximately 5 feet apart on the sides of the rolls and approximately 1-foot apart where the ends of the rolls overlap.

Plastic Netting

Plastic netting shall be applied up and down slope and shall continue beyond the edge of the mulched area at least one foot at the sides, top, and bottom of the area.

At the top of the area, the netting shall be buried in a trench at least 6 inches deep.

Overlap: Sides of the rolls shall overlap at least 4 inches. Overlap the upper strip 3 feet over the lower strip and secure with stakes every 2 feet.

Staples, pins, or stakes shall be driven perpendicularly into the slope.

Secure the upper end with stakes every 2 feet. The sides of the rolls shall be secured with stakes spaced approximately 5 feet apart. Additionally, the center of each roll shall be secured down the center approximately every 5 feet.

Where the ends of the rolls overlap, secure with stakes approximately 2 feet apart.

Tackifier

The hydro-mulch material shall be applied uniformly over the straw in water slurry by hydroseeder within 48 hours following mulching. Unless otherwise specified on the Practice Requirements Sheet, the hydro-mulch shall be wood fiber mulch, a tackifier, and water in the following portions per acre:

Tackifier	Rate	Wood Fiber Mulch	Water
M-Binder	100 lbs	150 lbs	700 gal
Ecotak-SAT	100 lbs	150 lbs	700 gal
Sentinel	100 lbs	500 lbs	2,000 gal
Fish-STIK	60 lbs	500 lbs	3,000 gal
Soil Master WR	100 gal	250 lbs	1,000 gal

Application rates for wood fiber mulch products that have moisture contents greater than 15 percent shall be increased by the following factor, c:

$$c: = \frac{85 \text{ percent}}{\text{percent fiber (solids) in product}}$$

The hydroseeder shall be equipped with a built-in continuous agitation system of sufficient operating capacity to produce homogenous slurry and a discharge system, which will apply the slurry to the slopes at a continuous and uniform rate.

The materials shall not remain in the slurry longer than two (2) hours. Water used shall be potable water or Class 1 or 2 agricultural irrigation water.

The slurry shall be continuously mixed and shall be mixed for at least five (5) minutes after the last addition before application starts.

The slurry shall be applied uniformly over the site.

Mulching with Gravel

A gravel covering, with the size of the gravel specified on the Practice Requirements Sheet shall be distributed uniformly over the area at the rate specified on the Practice Requirements sheet to provide at least 95 percent ground cover. A fabric may be placed under the gravel.

Mulching with Other Materials

The material(s) specified on the Practice Requirements Sheet shall be distributed uniformly over the area at the rate specified on the Practice Requirements Sheet to provide at least 80 percent ground cover unless otherwise specified on the Practice Requirements Sheet.

Other Materials – Mats

Mats: Mats shall be applied as specified on the Practice Requirements Sheet. They will be anchored in a manner that will keep them in place.

VI. OTHER REQUIREMENTS

Operations shall be done in such a manner that soil erosion and air and water pollution are minimized and held within legal limits.

The owner, operator, contractor, and other persons shall conduct all work and operations in accordance

with proper safety codes for the type of equipment and operations being performed with due regards to the safety of all persons and property.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

MULCHING
(Acre)
CODE 484

DEFINITION

Applying plant residues or other suitable materials to the soil surface.

PURPOSES

To conserve moisture; prevent surface compaction or crusting; reduce runoff and erosion; modify surface temperatures, control weeds; help establish plant cover and reduction of particulate matter emissions into the air.

CONDITIONS WHERE PRACTICE APPLIES

On soils subject to erosion; on areas where traffic may cause compaction, erosion, or airborne emissions, where conserving soil moisture is desirable and on soils that have a low infiltration rate.

CRITERIA

Erosion Control on Critical Areas

When mulching with straw, use at least 4,000 pounds of cereal grain straw or grass hay per acre evenly distributed over the area to be treated and anchored sufficiently to hold it on the site.

When mulching with wood fiber, use at least 2,000 pounds of wood fiber mulch per acre.

Other Applications

When mulching with straw, use at least 2,000 pounds of cereal grain straw or grass hay per acre evenly distributed over the area to be treated and anchored sufficiently to hold it on the site

When mulching with other wood products (chips, bark, shavings) or other material, they must be applied in an amount that will provide at least 80 percent ground cover.

When mulching with gravel or other inorganic material for permanent erosion control, they must be applied in sufficient amounts to provide 90 percent ground cover.

All straw mulch materials will be acceptable to the County Agricultural Commissioner, per California Food and Agriculture Code Section 5101 and 5205.

Protection or Soil Improvement

The mulch material used will be evenly applied in sufficient amounts to achieve the results contemplated when used alone or in combination with other practices.

When waste materials with potential for polluting surface waters are used for mulching (animal manures, sewage sludge, wastes from food processing, other similar materials) care will be taken to assure that runoff from the area will not enter streams, lakes, ponds, or reservoirs and that nitrate leaching will not be a problem. Measures will also be taken to prevent mulch from washing away due to concentrated flows, rainfall, or irrigation.

CONSIDERATIONS

Common mulch materials available include barley oats, rice, and wheat straw. Rice straw tends to persist longer. Most hay will decompose faster than barley or wheat.

Many hillside producers often "winterize" their steep farm roads with straw at the beginning of the rainy season and then restrict vehicle traffic.

Disturbed construction sites (incl. building pads, mass grading, house pads, rough grading projects) often use mulches to comply with their conditional use permit to comply with their storm water pollution prevention plan, grading ordinance, erosion control plan or conditional use permit.

Barley and wheat straw usually contains 10 to 15 pounds/acre of seed. The resulting green growth does

not interfere with most intended uses or future landscaping.

Use of wheat straw usually results in less volunteer grain when compared to barley straw.

Rollers and crimpers can be pulled on slopes up to 3:1. Where there is access, equipment can be winched up and down steeper slopes. Tackifiers can be utilized to anchor when equipment cannot be used on the site.

Use 75 feet as the effective range for straw blowing equipment.

Use 125 feet as the effective range for hydroseeders. With the use of a 100-foot hose the range can be extended up to 200 feet.

Many organic waste materials are suitable for use as mulches. These materials include wood bark, chips, shavings, and sawdust: animal manures; rice hulls; and some food processing plant wastes.

Demand for mulching as a method of protecting steep areas disturbed by construction (road sides, ditch banks, building sites, dams, etc.) has led to development of equipment for applying mulches and a number of products to hold mulching materials in place.

Mulching application equipment includes blowers, hydro applicators.

Manufactured mulches include wood-fiber and paper mulch.

Anchoring

Anchoring of mulches can be accomplished by using the following methods:

Netting, tackifiers, matting: hand, roller, or crimper punching and disk-type straw punchers.

Netting to anchor mulches is made from plastics, paper, jute, and burlap. They are anchored with staples of various materials.

Several liquid "tackifiers" that can be mixed with water and sprayed on fiber mulches to bind them together are available. These "tackifiers" will be compatible with the mulch applied and in sufficient amount to adequately bind the materials together for the intended life of the practice.

Water Quantity

Mulching is the application of some material around plants and crops, and on areas which have been disturbed and require temporary protection. Mulching is used to control weeds, surface temperatures, erosion, and to retain moisture.

Mulching may improve microbial action in the soil surface, may improve infiltration, and may reduce runoff, erosion, and evaporation. Increased infiltration may result in soluble chemicals moving below the root zone.

There is a potential for changes in plant growth and transpiration because of changes in the soil water volume.

Cultural Resources Considerations

Determine if installation of this practice with any others proposed will have any effect on any cultural resources. NRCS's objective is to avoid any effect to cultural resources and protect them in their original location. GM 420, Part 401, the California Environmental Handbook and the training for the California Environmental Assessment Worksheet specify how the NRCS must account for cultural resources. The Field Office Technical Guide, Section II contains general information, with Web sites for additional information, about cultural resources. The Environmental Handbook is online at www.ca.nrcs.usda.gov/rts/rts.html.

Endangered Species Considerations

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern or at least not have any adverse effect on a listed species.

If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the

landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Some species are year-round residents in some streams, such as, freshwater shrimp. Other species, such as steelhead and salmon, utilize streams during various seasons. Be aware that critical periods, such as spawning, eggs in gravels, and rearing of young may preclude activities in the stream that may directly affect the stream habitat during those periods. For example there should be no disturbance of stream gravel beds that may have eggs in them. That could include any equipment in the stream or even walking in the stream or work upstream that may result in sediment depositing in the gravel beds. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Water Quantity

Mulching is the surface application of plant residues or other suitable materials on the soil surface. It includes the application on areas which have been disturbed and require temporary protection. Mulching is used to control weeds, help establish plant cover, control surface temperatures, reduce erosion, reduce particulate matter and to retain moisture.

Mulching may improve microbial action on the soil surface, may reduce runoff, erosion and evaporation. Increased infiltration may result in soluble chemicals moving below the root zone.

There is a potential for changes in plant growth and transpiration because of changes in the soil water volume.

Water Quality

This practice may reduce the delivery of sediment and related chemicals to surface water by reducing runoff and erosion. The temperature of the surface runoff may be lowered.

PLANS AND SPECIFICATIONS

Plans and Specifications shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Include the amount and type of mulch needed on the Practice Requirement Sheet along with all details needed for proper application.

OPERATION AND MAINTENANCE

The owner or operator will be responsible for operating all equipment safety and maintaining this practice.

Mulch will be replaced as needed to maintain the amount of mulch during the required period.

The area mulched will be inspected after significant events to ensure the mulch is adequate for the intended purpose.

REFERENCES