NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

GRAZING LAND MECHANICAL TREATMENT

(acre)
CODE 548

DEFINITION

Renovating, contour furrowing, pitting, land imprinting, or chiseling native grazing land by mechanical means.

PURPOSES

To improve plant cover and water quality by aerating the soil, increasing infiltration and available moisture, reducing erosion, and protecting low lying land or structures from siltation.

CONDITIONS WHERE PRACTICE APPLIES

(1) On native grazing land where perennial plants must be increased; (2) where soil and slope are suitable for each method and type of equipment used; (3) as emergency treatment after wildfire and other abnormal disturbances; (4) where grazing is managed to allow plants to respond to this treatment.

Mechanical treatment may not be desirable on areas to be used for recreation.

CRITERIA

Chiseling refers to soil ripping operations to depths less than 16 inches deep.

Shallow hardpans, claypans, and plowpans can be broken up to allow deeper root zones and increased water holding capacity.

Chiseling operations need to be carried out while soil moisture in the restrictive layer is less than 25 percent of field capacity and no more than 50 percent above the restrictive layer.

Perform the chiseling cross-slope on sloping pastures.

Adjust the depth and spacing so the chisels penetrate through the restrictive layer and shatter the restrictive layer and shatters this layer over 70 percent of the area between implement penetration points.

Maximum spacing of chisel shanks is 30 inches. Rotary type implement spacing should not be less than one set per square yard.

The use of a parabolic chisel will decrease draft requirements, increase upward lift on soil, and give better penetration on vary hard soils.

Land imprinting refers to a no-till process of imprinting the soil surface with a series of micro basins or mini watersheds. A typical basin is 6 to 10 inches in depth and of various shapes.

Smooth, sealed soil surfaces with low infiltration rates are transformed with micro rough, macro porous surfaces able to rapidly exchange rainwater and displace soil are across the air-earth interface.

Imprinting rollers can be fabricated in almost any size ranging from those requiring the power of large crawler tractors down to small rollers that can be operated by a garden tractor or hand pushed. Angle leg length (L) can vary from 2 in. to 10 in. although the 6 in. size is typical of the imprinters designed, fabricated and used heretofore. Hand- and foot-operated imprinters of several designs are also available. Typically they have a single angular imprinting tooth with either a 45^0 or 90^0 tip which is forced into the soil through the combined forces applied by the hands on a T-handle and one foot in a D-shaped stirrup.

Useful imprinter attachments include seeder and rippers. Both broadcast and drop seeders have been used to scatter seeds on the soil surface. Drop seeders distribute seed more uniformly and are less affected by wind and physical differences in seed such as size, shape, density, smoothness/roughness and appendages. Ripping shanks have also been attached to the imprinter frame to loosen extremely hard dry soils enough to obtain adequate penetration of imprinting teeth. Where deep compacted soil has occurred, deep ripping should be carried out initially with heavy duty equipment.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

CONSIDERATIONS

1. Areas to be treated shall be relatively free of undesirable or noxious plants that are likely to increase because of surface disturbance.

2. Desirable forage species shall be of sufficient quantity and have a distribution pattern that allows the plants to take advantage of the improved moisture and to spread into disturbed areas.

3. Mechanical treatment shall be limited to soils and slopes where surface disturbances will not result in unacceptable levels of erosion and sedimentation.

4. Mechanical treatments shall not interfere with trafficability and the visual quality of the area.

5. Treated areas shall be deferred to allow desirable forage plants to increase.

6. Mechanical treatment(s) located upslope from seasonal wetlands must not adversely impact those wetlands. US Army C.O.E. 404 permit(s) may be needed before practice installation.

Water Quantity

This practice uses mechanical means to shatter compacted soil layers to increase infiltration. Evapo-transpiration is expected to increase because of the stimulated plant growth. With increased vegetation production, snow trapping is increased where applicable, and the rate of runoff slowed, further increasing infiltration.

1. Improved vegetation will impact the water budget, especially on volumes and rates of infiltration and runoff.

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

3. Possible effects on downstream flows or aquifers that would affect other water uses or users.

Water Quality

The mechanical soil disturbance resulting from this practice may cause increased soil erosion and sediment transport until revegetation occurs. However, the practice is designed to increase vegetative production which would slow runoff, increase soil infiltration, and filter sediment, water soluble nutrients, and other sediment attached substances.

Small storm runoff and erosion may be eliminated. The practice improves soil drainage and aeration, decreasing the potential for denitrification. This may result in nitrates being leached deeper into the soil. The plant roots are able to go deeper so the nitrates may still be taken up by the plants. The time of year and extent of plant growth will need to be considered.

In rainfall deficient areas, subsoiling may bring salts and toxic materials to the surface or into the root zone, thus making these materials available to plants or subject to being relocated by erosion forces.

The poor physical conditions of a sodic soil may be ameliorated by subsoiling, which may bring calcium salts up into the surface horizons.

1. Effects of slope and direction of tillage may impact on sediment delivery to surface water.

2. There maybe impacts from erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances carried by runoff.

3. There are hazards for development of saline seeps or other salinity problems resulting from increased infiltration near restrictive layers.

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.

PLANS AND SPECIFICATIONS

Contour furrowing

Specify: (1) Soils or sites where contour furrowing is adapted; (2) slope criteria; (3) cross section and spacing for particular conditions of soil, slope, and vegetation; and (4) how long area is to be rested from grazing after treatment.

Chiseling

Specify (1) Range sites or other soil groupings and conditions to which chiseling is adapted; (2) soils suitable to treat; (3) slope criteria; (4) spacing and depth of treatment; and (5) how long area is to be rested after treatment

Disking or other renovation

Specify: (1) On fine textured and medium textured soils that have few stones in the upper part of the profile; (2) slope criteria; (3) that treatment is to be applied on the approximate contour ; and (4) how long area is to be rested from grazing after treatment.

Pitting

Specify: (1) To be applied on fine textured and medium textured soils having few stones in the upper profile; (2) slope criteria; (3) dimensions and spacing of pits or basins; and (4) how long area is to be rested form grazing after treatment.

Land Imprinting

Specify: (1) uncompacted soil of most textures, may require chiseling or shallow subsoiling; (2) slope criteria; (3) depth and dimensions of basins; (4) how long area is to be rested from grazing following treatment.

OPERATION AND MAINTENANCE

An operation and maintenance plan must be prepared for use by the owner or other responsible person for this practice. The plan should provide specific instructions for incorporating this practice into the overall resource management system to insure that it functions properly. It should also provide for periodic inspections and prompt attention to correct any items noted during the inspection.