

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

DEEP TILLAGE

(Acres)

CODE 324

DEFINITION

Performing tillage operations below the normal tillage depth to modify the physical or chemical properties of a soil.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following:

- Fracture restrictive soil layers.
- Bury or mix soil deposits from wind or water erosion or flood overwash.
- Reduce concentration of soil contaminants, which inhibit plant growth.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to land having adverse soil conditions which inhibit plant growth such as compacted layers formed by field operations, restrictive layers such as claypans, overwash or deposits from wind and water erosion or flooding, or contaminants in the root zone.

This standard includes tillage operations commonly referred to as deep plowing, subsoiling, ripping, or row-till, occasionally performed below the normal tillage depth.

CRITERIA

General Criteria Applicable to All Purposes

Deep tillage operations shall be performed when soil moisture is less than 30 percent of field capacity, according to the "feel test" or

other acceptable method, at the maximum depth to which the tillage will be done.

The presence and the depth of a restrictive layer must be verified by a soil bulk density test, by hand or with power equipment. Observations shall be made during the growing season to determine whether the crop root system is impacted.

Additional Criteria to Fracture Restrictive Soil Layers

Tillage equipment such as chisels, subsoilers, bent-leg subsoilers, or rippers, with the ability to reach the required depth shall be used.

The depth of tillage shall be a minimum of one inch below the depth of the restrictive layer on the entire treatment area. Tillage depth should be set carefully and periodically checked to maintain this depth.

Complete fracturing of the restrictive layer is not required. The fractured zone, as a minimum, shall be sufficient to permit root penetration below the restrictive soil layer. The fractured zone does not need to extend to the row middles and should be limited to the area near the rows [in the case of crops broadcast-planted or drilled in narrow rows (less than 15 inches), the fractured zone may be disrupted completely].

Additional Criteria to Bury or Mix Soil Deposits from Wind and Water Erosion or Flood Overwash

Tillage equipment such as moldboard plows, disk plows, or chisels with twisted points with the ability to reach the required depth and the ability to either mix or bury unwanted material shall be used.

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

**NE-T.G. Notice 512
Section IV
NRCS-MAY 2002**

The tillage operation shall uniformly mix soil to a depth of 6" or 2 times (2 X) the depth of the overwash, whichever is deeper, to adequately mix the existing soil with the overwash and to break the hydrologic barrier caused by the overwash layer.

Additional Criteria to Reduce Concentration of Soil Contaminants Which Inhibit Plant Growth

Presence of contaminants will be verified using the appropriate soil test prior to field operations.

Tillage equipment such as moldboard plows, disk plows, or chisels with twisted points with the ability to reach the required depth shall be used.

Tillage operation(s) shall mix a sufficient amount of uncontaminated soil with the contaminated material so that the concentration of the contaminant is below the crop tolerance level. Crop tolerance levels shall be established in accordance with University of Nebraska guidance and recommendations.

The soil contaminant shall be uniformly distributed throughout the deep tilled layer.

CONSIDERATIONS

Where restrictive layers have been verified, the effects of this practice can be enhanced by including deep rooted crops in the rotation that are able to extend to and penetrate the restrictive layer.

Consider applying this practice before starting long-term, no-till systems when restrictive layers are verified.

Research on numerous crops has shown that tillage conducted much deeper than the compacted layer does not increase yields, requires excessive energy to till the site, and can lead to compaction from vehicle traffic.

Reduce or control equipment traffic during periods when soils are prone to compaction and formation of tillage pans.

When infertile flood overwash is mixed with the pre-flood soil profile, the soil rebuilding process

can be enhanced by additions of organic matter such as manure or cover crops utilized as green manure. Crop rotations, tillage, and planting systems which maintain high levels of crop residues such as no-till can accelerate this process.

Generally, no more than about 6 inches of overwash can be effectively mixed into the pre-flood soil profile using commonly available equipment. Where the overwash layer is too thick, redistribution by smoothing or removal may be necessary; or specialized equipment may be needed if greater depths of overwash must be incorporated.

Where unfavorable soil materials such as sand deposits or sediment that is high in sodium, calcium; gypsum; or other undesirable materials are within anticipated deep tillage depth and would be brought to the surface by deep tillage operations, this practice should not be applied.

Offsite transport of sediment-borne pollutant(s) can be reduced when this practice is used in conjunction with erosion and runoff control practices in a conservation management system.

To help reduce compaction, it is desirable to conduct normal tillage operations when soil moisture is less than 50 percent of field capacity. When possible, harvest operations should be avoided when soil moisture is greater than 50 percent of field capacity. Field harvest haul traffic should be limited to end rows or haul roads. Compacted regions between crop rows that are not fractured can assist in supporting vehicle traffic, limiting rutting and soil compaction beneath the row.

If application of this practice will impact cultural resources (Archaeological, historic, historic landscape, or traditional cultural properties), follow NRCS national policy and State operating procedures for considering cultural resources.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit according to the Criteria, Considerations and Operations & Maintenance

described in this standard. Appropriate erosion prediction calculations including tillage operations and timing will be retained in the customer folder to verify the design of this practice.

OPERATION AND MAINTENANCE

Deep tillage for reduction of soil compaction shall be performed whenever compaction reoccurs. Appropriate cropping, wheel traffic, tillage/planting/fertilizing and timing of operations will be conducted in order to maintain or improve the impacts of this practice.

When deep tillage has been performed to reduce the concentration of soil contaminants, the contaminate levels in the root zone shall be monitored to assist with determining when or if treatment will be reapplied.