

**USDA**  
**NATURAL RESOURCES**  
**CONSERVATION SERVICE**  
  
**DELAWARE CONSERVATION**  
**PRACTICE STANDARD**  
  
**DEEP TILLAGE**  
  
**CODE 324**  
**(Reported in Acres)**

**CONSIDERATIONS**

Where restrictive layers are a concern, 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.

Research on numerous crops has shown that tillage conducted excessively deeper than the compacted layer does not promote increased yields, requires excessive amounts of tillage energy, and promotes future compaction from nearby vehicle traffic.

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 also accelerate this process.

Where the flood overwash layer is too thick to effectively mix with the pre-flood soil profile, redistribution of the overwash layer by smoothing or removal may be necessary. Generally, no more than about 6 inches of overwash can be uniformly mixed into the soil profile using commonly available equipment. Specialized equipment may be necessary where greater depths of overwash are to be incorporated.

Where unfavorable soil materials such as high sodium, highly acidic, sulfidic materials, or other undesirable materials, are present within anticipated deep tillage depth and would be brought to the surface by deep tillage operations, this practice should not be applied.

Soils are prone to compaction and formation of tillage pans during periods of high moisture compact. To minimize compaction, reduce or control equipment traffic during those times. 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

**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.

**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 fragipans, or overwash or deposits from wind and water erosion or flooding.

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

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

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.

This practice has the potential to affect National Register listed cultural resources or eligible (significant) cultural resources. These may include archeological, historic, or traditional cultural properties. Care should be taken to avoid adverse impacts to these resources. Follow NRCS state policy for considering cultural resources during planning.

### **CRITERIA**

#### **Criteria Applicable to All Purposes**

Deep tillage operations shall be performed when soil moisture is less than 25 percent of field capacity at the maximum depth to which the tillage will be done. Refer to NRCS Program Aid 1619, "Estimating Soil Moisture by Feel and Appearance to determine percent of field capacity.

#### **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 deeper than the depth of the restrictive layer. Tillage depth should be set carefully and periodically checked to maintain this working 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 shall be used.

The tillage operation shall uniformly mix soil 6" or 2 times (2 X) the depth of overwash, whichever is deeper, to achieve a desired available water-holding capacity (AWC) and to break the hydrologic barrier caused by overwash layer.

### **PLANS AND SPECIFICATIONS**

Plans and specifications for establishment of this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail to ensure success of the practice. Documentation shall be in accordance with the section "Supporting Data and Documentation" in this standard.

### **OPERATION AND MAINTENANCE**

Deep tillage for reduction of soil compaction shall be performed whenever compaction reoccurs.

### **SUPPORTING DATA AND DOCUMENTATION**

The following is a list of minimum data and documentation to be recorded in the case file:

1. Field location where the practice was implemented with plan map.
2. Assistance notes.

### **REFERENCE**

1. USDA, Natural Resources Conservation Service. Program Aid 1619, "Estimating Soil Moisture by Feel and Appearance.