

**Practice:** 324 - Deep Tillage

**Scenario:** #1 - Deep Tillage less than 36 inches

**Scenario Description:** Fields (80 acres) with adverse soils conditions that restrict plant growth such as compacted layers caused by tillage operations or restrictive layers such as hardpans (duripans) in the root zone. This practice does not apply to normal tillage practices to prepare a seedbed but is meant to fracture the restrictive soil layer.

**Before Situation:** In this geographic area, crop plants are observed as having reduced yield, water is not infiltrating into the soil. Soil layers have been compacted by shallow tillage operations, or soils have a hardpan (duripan) layer that is restricting root growth. Typical field size is 80 acres with crop rotations consisting of annual row crops or small grains with conventional tillage or when the harvesting of row crops (onions, sugar beets, potato, corn silage) use heavy trucks to assist with the harvest. Compaction has been caused when soil moisture is too wet for normal field operations or by excessive shallow tillage or field harvest haul traffic throughout the entire field. Soil structure has been reduced, aggregate strength is weak and soil biological activity is low. Soil organic matter is not adequate and the water holding capacity of the soil is limited for the desired root zone.

**After Situation:** Soil compaction is measured with a penetrometer and visual observation of limiting root growth. Deep tillage operations such as subsoiling, paratilling or ripping are performed not as a part of the normal tillage operation for seedbed preparation, but used to relieve compaction at depths less than 36 inches. Soil moisture is less than 30 percent when deep tillage is used. The fractured zone will be sufficient to permit root penetration below the restrictive soil layer. Penetrometers are used to identify the severity (psi) of the compaction and the depth of the restrictive layer. Deep tillage is generally performed in the fall after crop harvest when soil conditions are dry. After deep tillage, harvest operations should be avoided when soil moisture is greater than 50% of field capacity. Field harvest haul traffic should be limited to end rows or haul roads. Using dual tires or tracts beneath tractors or grain wagons can help spread the weight load.

**Scenario Feature Measure:** <Unknown>

**Scenario Unit:** Acre

**Scenario Typical Size:** 80

**Total Scenario Cost:** \$1,866.97

**Scenario Cost/Unit:** \$23.34

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Labor**

General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$21.97	2	\$43.94
Specialist Labor	235	Labor requiring a specialized skill set: Includes Agronomists, Foresters, Biologists, etc. to provide additional technical information during the planning and implementation of the practice. Does not include NRCS or TSP services.	Hour	\$100.62	2	\$201.23

**Equipment Installation**

Ripper or subsoiler, 16 to 36 inch depth	1235	Deep ripper or subsoiler, (16-36 inches depth) includes tillage implement, power unit and labor.	Acre	\$20.00	80	\$1,600.20
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$21.59	1	\$21.59

**Practice:** 324 - Deep Tillage

**Scenario:** #2 - Deep Tillage >= 36 inches

**Scenario Description:** Deep tillage of >=36 inches in depth is required to correct adverse conditions from soil compaction which results in slow water infiltration rates, limited root growth, and reduced crop production. Compaction is typically caused by tillage or harvester operations, or by heavy equipment traffic. This practice does not apply to normal tillage practices to prepare a seedbed, but is meant to fracture compacted soil zones. Resource Concern: Soil Condition - Compaction

**Before Situation:** Soil structure has been damaged through compaction caused by tillage equipment, harvest traffic, or construction equipment. Hardpan layers in the soil are restricting water infiltration, plant root growth, proper soil biological function, and overall crop production. Soil structure has been reduced, aggregate strength is weak and soil biological activity is low. Soil organic matter is not adequate and the water holding capacity of the soil is limited for the desired root zone.

**After Situation:** Deep tillage operations such as subsoiling, paratilling or ripping are performed not as a part of the normal tillage operation for seedbed preparation, but used to relieve compaction at depths of >=36 inches. Soil compaction is measured with a penetrometer and/or visual observations. Soil moisture is less than 30 percent when deep tillage is used. Deep tillage is generally performed in the fall after crop harvest when soil conditions are dry, or soon after construction of conservation practices such as terraces, diversions, etc. When possible, reduce tillage operations, and avoid tillage or harvest operations when soil moisture levels are high. Limit harvest traffic to end rows or haul roads when possible

**Scenario Feature Measure:** <Unknown>

**Scenario Unit:** Acre

**Scenario Typical Size:** 40

**Total Scenario Cost:** \$2,243.42

**Scenario Cost/Unit:** \$56.09

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Equipment Installation**

Ripper or subsoiler, > 36 inch depth	1236	Deep ripper or subsoiler, (>36 inches depth) includes tillage implement, power unit and labor.	Acre	\$55.59	40	\$2,223.41
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$20.00	1	\$20.00

**Practice:** 324 - Deep Tillage

**Scenario:** #2 - Deep Tillage more than 36 inches

**Scenario Description:** Fields (80 acres) with adverse soils conditions that restrict plant growth such as compacted layers caused by tillage operations or restrictive layers such as hardpans (duripans) in the root zone. This practice does not apply to normal tillage practices to prepare a seedbed but is meant to fracture the restrictive soil layer.

**Before Situation:** In this geographic area, crop plants are observed as having reduced yield, water is not infiltrating into the soil. Soil layers have been compacted by shallow tillage operations, or soils have a hardpan (duripan) layer that is restricting root growth. Typical field size is 80 acres with crop rotations consisting of annual row crops, orchard /vineyards or small grains with conventional tillage or when the harvesting of row crops (onions, sugar beets, potato, corn silage) use heavy trucks to assist with the harvest. Orchards and vineyards may be deep ripped prior to establishment of perennial crop. Compaction has been caused when soil moisture is too wet for normal field operations or by excessive shallow tillage or field harvest haul traffic throughout the entire field. Soil structure has been reduced, aggregate strength is weak and soil biological activity is low. Soil organic matter is not adequate and the water holding capacity of the soil is limited for the desired root zone.

**After Situation:** Soil compaction is measured with a penetrometer and visual observation of limiting root growth. Deep tillage operations such as subsoiling, paratilling or ripping are performed not as a part of the normal tillage operation for seedbed preparation, but used to relieve compaction at depths more than 3 feet. Soil moisture is less than 30 percent when deep tillage is used. The fractured zone will be sufficient to permit root penetration below the restrictive soil layer. Penetrometers are used to identify the severity (psi) of the compaction and the depth of the restrictive layer. Deep tillage is generally performed in the fall after crop harvest when soil conditions are dry. When possible, harvest operations should be avoided when soil moisture is greater than 50% of field capacity. Field harvest haul traffic should be limited to end rows or haul roads. Using dual tires or tracts beneath tractors or grain wagons can help spread the weight load.

**Scenario Feature Measure:** <Unknown>

**Scenario Unit:** Acre

**Scenario Typical Size:** 80

**Total Scenario Cost:** \$5,090.80

**Scenario Cost/Unit:** \$63.64

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Labor**

General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$21.97	2	\$43.94
Specialist Labor	235	Labor requiring a specialized skill set: Includes Agronomists, Foresters, Biologists, etc. to provide additional technical information during the planning and implementation of the practice. Does not include NRCS or TSP services.	Hour	\$100.62	2	\$201.23

**Equipment Installation**

Ripper or subsoiler, > 36 inch depth	1236	Deep ripper or subsoiler, (>36 inches depth) includes tillage implement, power unit and labor.	Acre	\$60.30	80	\$4,824.04
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$21.59	1	\$21.59

**Practice:** 324 - Deep Tillage

**Scenario:** #1 - Deep Tillage < 36 inches

**Scenario Description:** Deep tillage of <36 inches in depth is required to correct adverse conditions from soil compaction which results in slow water infiltration rates, limited root growth, and reduced crop production. Compaction is typically caused by tillage or harvest operations, or by heavy equipment traffic. This practice does not apply to normal tillage practices to prepare a seedbed, but is meant to fracture compacted soil zones. Resource Concern: Soil Condition - Compaction

**Before Situation:** Soil structure has been damaged through compaction caused by tillage equipment, harvest traffic, or construction equipment. Hardpan layers in the soil are restricting water infiltration, plant root growth, proper soil biological function, and overall crop production. Soil structure has been reduced, aggregate strength is weak and soil biological activity is low. Soil organic matter is not adequate and the water holding capacity of the soil is limited for the desired root zone.

**After Situation:** Deep tillage operations such as subsoiling, paratilling or ripping are performed not as a part of the normal tillage operation for seedbed preparation, but used to relieve compaction at depths less than 36 inches. Soil compaction is measured with a penetrometer and/or visual observations. Soil moisture is less than 30 percent when deep tillage is used. Deep tillage is generally performed in the fall after crop harvest when soil conditions are dry, or soon after construction of conservation practices such as terraces, diversions, etc. Reduce tillage operations, avoid tillage or harvest operations when soil moisture levels are high, and limit harvest traffic to end rows or haul roads when possible

**Scenario Feature Measure:** <Unknown>

**Scenario Unit:** Acre

**Scenario Typical Size:** 80

**Total Scenario Cost:** \$1,484.28

**Scenario Cost/Unit:** \$18.55

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Equipment Installation**

Ripper or subsoiler, 16 to 36 inch depth	1235	Deep ripper or subsoiler, (16-36 inches depth) includes tillage implement, power unit and labor.	Acre	\$18.30	80	\$1,464.27
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$20.00	1	\$20.00