



United States Department of Agriculture

TILLAGE EQUIPMENT

Pocket Identification Guide



Natural Resources Conservation Service
Des Moines, Iowa
www.ia.nrcs.usda.gov



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About this guide...

The purpose of the guide is to help you identify commonly used farm equipment through images and illustrations. The guide will also help facilitate communication between NRCS and our customers by providing common definitions and erosion prediction modeling tool terminology.

Erosion prediction modeling tools, such as the Revised Universal Soil Loss Equation, Version 2 (RUSLE2) and the Water Erosion Prediction Process (WEPP), were developed primarily to guide conservation planning, inventory rates, and estimate sediment delivery. Values computed by these tools are supported by accepted scientific knowledge and technical judgment, are consistent with sound principles of conservation planning, and result in good conservation plans.

The different systems presented in this guide are color coded, grouping the different types of systems together:

Tillage Systems

Tillage Operations

Vertical Tillage

Fertilizer/Manure

Combination Tools

Other Systems

Producers use a variety of tillage operations to prepare the field, plant and harvest the crop. The following is a list of definitions to help describe the individual operations:

Erosion Prediction Tool Abbreviations

Glossary

3X	3 years of growth included	SP	Spring Plow
FC st pt	Fall chiseled with straight points	ST	Strip-till Planter
FC sweep	Fall chiseled with sweeps	eh	early harvest
FC twist	Fall chiseled with twisted points	ep	early plant
Fdisk	Fall disk	lh	late harvest
Ffcult	Fall field cultivate	lp	late planting date
FP	Fall Plow	mp	middle planting date
NR or nr	narrow row	wr	wide row (>30 inches)
NT	No-till Planter	z4	crop mgmt zone 4
NT anhyd	No-till with anhydrous application	z16	crop mgmt zone 16
RT	Ridge-till		
SC st pt	Spring chiseled with straight points	“F”	= First Tillage in Fall
SC sweep	Spring chiseled with sweeps	“S”	= First Tillage in Spring
SC Twist	Spring chiseled with twisted points		
Sdisk	Spring disk		
Sfcult	Spring field cultivate		

Many tillage tools are combinations of operations described in our erosion prediction tools. These tools can be accounted for using erosion prediction tool calculations by combining two or more operations on the same day to fully describe the overall tool being used.

Tillage Tool Terminology

It is important to recognize the differences in tillage terminology. The following definitions will help alleviate confusion between common tillage components:

Plowing — Aggressively turning the soil over and burying all crop residue. This is completed to a depth of at least 10 inches, usually leaving large clods.

Disking — Cutting through the soil and burying part of the crop residue. It can be done to break up the soil surface, or to a depth of up to 10 inches. Depending on the type of disk, it can leave a smooth surface. The different types of disks are explained in the “Other Tools” section.

Cultivating — Farmers use a field cultivator as a primary tillage tool to bury crop residue, control weeds, loosen the soil and prepare the seedbed. A row cultivator is used to remove weeds from between the row of crops.

Conditioning — Several operations combined into one tool, used as a primary tool to aggressively till the soil.

Finishing — Several operations combined into one tool, used to finish before planting.

Conventional Tillage or Mulch-till planting will leave varying residue levels after planting, depending on the number of tillage passes and the level of soil disturbance.

Conventional Tillage Planting System



In a conventional tillage system, the soil is disturbed the full width prior to planting. Tillage tools such as chisels, field cultivators, or disks are used full width. Weed control is accomplished with herbicides and/or cultivation.

Conventional Tillage Planting System



No-till planting with residue. Long-term no-till is an effective practice to control erosion, and significantly reduces surface runoff. No-till also helps reduce sediment and nutrient loading of lakes, ponds and streams, which improves water quality and reduces flooding.

No-Till Planting System



In no-till planting, the soil is left undisturbed from harvest to planting, except for nutrient injection. Planting or drilling is accomplished in a narrow seedbed or slot created by coulters, row cleaners or disk openers. Weeds are controlled primarily with herbicides.

No-Till Planting System



Ridge-till planting. The soil is left undisturbed from harvest to planting. Planting is completed in a seedbed prepared on ridges with sweeps, disk openers, coulters or row cleaners.

Ridge-Till Planting System



In ridge-till, the residue is left on the surface between ridges. Weeds are controlled with herbicides and/or cultivation. Ridges are rebuilt during cultivation.

Ridge-Till Planting System



Strip-till Planting. Seedbed preparation is completed in a narrow band no more than one-third the row width. It may be completed in the fall with the application of nutrients, or at planting time. Crop residue and soil consolidation is left undisturbed between the seedbed areas.

Strip-Till Planting System



Strip-Till Planting System



Chisel Plow components may include various types of sweeps, spikes, and shovels attached to the shanks. In the Midwest, many producers use 2-inch wide reversible-point spikes, or 2.5 to 4-inch wide twisted shovels. Spikes and sweeps do less soil mixing and cover less residue than twisted shovels.



Chisel Plow

Some chisel plows are equipped with a gang of coulters or disk blades mounted in front to cut residue. Reduced tillage is usually done with a chisel plow, and leaves 15% to 30% residue cover on the soil.

Erosion Prediction Tool Chisel plow, coulter, st pts

Chisel Plow



The selection of the specific primary tillage tool and type of points or blades is important to the success of mulch-till systems. Generally, the less inversion action the point or shovel creates, the less residue is buried.

Erosion Prediction Tool Chisel, st pts

Chisel Straight Points



This is a primary implement used in the fall that breaks and shatters the soil, leaving it rough with residue on or near the surface. Operating depth ranges from 6 to 12 inches.

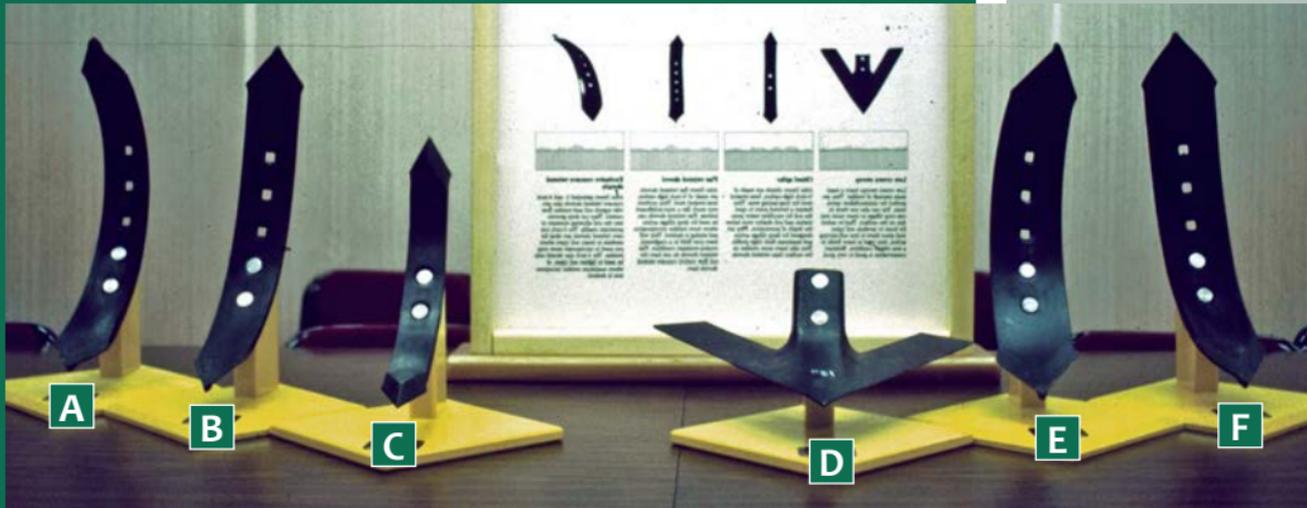
Erosion Prediction Tool
Chisel, sweep shovel

Chisel
with Sweeps



Chisel Points

Sweeps and spike points bury less residue than straight points or twisted points. Slower speeds and shallower operating depths usually leave more residues.



- A. 3-inch Twisted
- B. 3-inch Straight
- C. 2-inch Wide Straight

- D. Sweep
- E. 4-1/2-inch Wide Twisted
- F. 4-1/2-inch Straight Point

Erosion Prediction Tool Disk, offset, heavy 15 in depth



Heavy Offset Disk

Sometimes called a plowing disk, this disk uses its weight and large diameter blades to slice and turn soil and residue. It does extensive soil disturbance and residue burial.

Erosion Prediction Tool Disk, tandem, secondary op



Tandem Disk

A disk is a tillage implement that pulverizes or smooths the soil. Its concave cutting blades are mounted on a common shaft to form a gang. A disk consists of two or more gangs attached to a frame. The operating depth is usually one-quarter of the disk diameter. Tillage is done to a depth of 5 inches.

Erosion Prediction Tool Disk, tandem light finish



Tandem Disk Light Finish

The tandem light finish tool provides less soil disturbance than the offset disk, leaving more residue on the soil surface. The amount of residue left on the soil surface depends on tillage depth, speed, and soil moisture at the time of tillage.

Erosion Prediction Tool Para-plow or Para-till

Para-Plow



The purpose of the para-plow is to loosen compacted soil layers 12 to 16 inches deep, and still maintain high surface residue levels. The para-plow lifts and fractures the soil.

Erosion Prediction Tool
Para-plow or Para-till

Para-Plow



Erosion Prediction Tool Plow, moldboard

Moldboard Plow

The moldboard plow thoroughly lifts and inverts the soil, leaving very little residue on the soil surface.



Erosion Prediction Tool

Subsoiler

Subsoiler/ V-Ripper



The subsoiler is a primary tillage tool used in the fall, similar to a chisel plow. It is typically designed to penetrate 12 to 22 inches deep to alleviate soil compaction.

Erosion Prediction Tool Subsoiler

Subsoiler/ Shank



Subsoiling is often used to loosen compacted areas where heavy loads have passed. The amount of disturbance will depend on the shape of the shank and the working angle of the tool bar. In-row subsoilers do less soil disturbance than a conventional subsoiler or V-Ripper. Use “Subsoiler, In-Row” for the erosion tool operation when using subsoilers that do little disturbance of surface residue.

Subsoiler Shanks

Subsoiler/ Shank



Straight



Bent Leg/Parabolic

Erosion Prediction Tool
Aerator, field surface, ground driven, harrow, rotary



**Aerator/
Rotary Harrow**

For erosion prediction tool calculations, this is two operations: an aerator with a rotary harrow.

Erosion Prediction Tool
Aerator, field surface, ground driven, harrow, rotary

**Aerator/
Rotary Harrow**



Aerator

Erosion Prediction Tool Aerator, field surface, ground driven

AerWay®

AerWay® shatterines lift and fracture the soil to increase air and water movement. While maintaining surface residue, shatterines crack and shatter compacted soil 8 inches to open new channels for air and water.



Erosion Prediction Tool Coulter Caddy, 2x with coil tine harrow

2 Coulter Caddy/ Coil Tine Harrow

For erosion prediction tool calculations, this is three operations: two coulters caddies and one coiled tine harrow. Often considered vertical tillage.

See coulters caddy tool on page 46.



Erosion Prediction Tool Coulter Caddy, 2x with rolling basket incorporate

Coulter Caddy/ Rolling Basket

For erosion prediction tool calculations, this is three operations: two coulter caddies and a rolling basket.

See coulter caddy tool on page 46.



Erosion Prediction Tool Coulter Caddy with harrow, rotary 2x



Coulter Caddy/ Rotary Harrow

For erosion prediction tool calculations, this tillage tool is three operations: one coulter caddy and two Phillips™ Harrows.

Erosion Prediction Tool Harrow, coiled tine or spiked tooth

Harrows



Pasture Harrow for Manure Distribution



Spiked Tooth Harrow



Coiled Tine Harrow

Harrows are primarily used to level the soil surface, redistribute surface residue, pulverize clods, and disturb weed germination. Harrows are often attached to the rear of disks, field cultivators, or drills to smooth and firm the soil surface and redistribute residue.

Erosion Prediction Tool

Harrow, rotary or harrow rotary light fluff fragile

Harrow/
Phillips™



The Phillips™ Rotary Harrow works in the top inch or so to prepare seedbeds. It redistributes residue and levels the ground.

Tines disturb only the top inch or so of soil. In general, the greater a tool is angled off the tool bar, the more that operation will disturb the soil. The Phillips™ Harrow is permanently set at a 45 degree angle.

Erosion Prediction Tool Harrow, rotary or harrow rotary light fluff fragile

Harrow/ Phoenix™

The Phoenix™ Harrow is a high residue tillage tool that disturbs the soil .5 to 2 inches deep, leaving most of the residue on the soil surface. The greater the harrow is angled off the tool bar, the more it will disturb the soil. The angle may be adjusted from 20 to 45 degrees.



Erosion Prediction Tool

Fertilizer application, anhyd knife 30 in

Fertilizer/ Anhydrous Ammonia

In the Midwest, Anhydrous Ammonia comprises the majority of commercial nitrogen application. Anhydrous Ammonia must be injected into the soil, commonly done with narrow knives attached to a tool bar pulled by a tractor.



Photo Courtesy of John Deere

Erosion Prediction Tool Fertilizer application, Strip-Till 30 in

Fertilizer/ Strip-Till



Strip tillage is confined to 6- to 8-inch strips into which dry fertilizer or anhydrous ammonia can be placed. Loosened soil in the strips creates a ridge or berm 3 to 4 inches high, which settles down to 1 to 2 inches by spring planting. Crop residue in the middle rows is left undisturbed.



Erosion Prediction Tool Fertilizer application, Strip-Till 30 in

Courtesy No-Till Farmer



Banding Dry Fertilizer Application

When a strip-till operation is done at planting time with no previous tillage, use “Planter, Strip-Till.” When strip-till is created in the fall or spring prior to planting, use “Fert. Applic., Strip-Till 30 In.”

Erosion Prediction Tool

Manure injector, liquid high disturbance 30 in

Manure Injector/ High Disturbance

When using an umbilical cord manure injection system on 30-inch spacing in bean stubble, the type of injector system will determine the amount of residue and soil disturbance.

Fifty percent or more of the row area is disturbed.



Tank Type Liquid Manure Injector with High Disturbance

Manure Injector/ High Disturbance

The covering disk disturbs a significant amount of soil to cover the manure.

Fifty percent or more of the row area is disturbed.



Erosion Prediction Tool

Manure injector, liquid low disturbance 15 in

Manure Injector/ Low Disturbance

Tank type liquid manure injector with low disturbance coulters. However, because 15-inch rows are used here, this method disturbs twice the soil surface as with 30-inch rows. As a result, erosion prediction tool soil loss calculations will be higher with 15-inch units.



Erosion Prediction Tool
**Coulter caddy with subsoiler
and rolling basket incorporate**

**Coulter Caddy/
Subsoiler/
Rolling Basket**



This tillage is a coulter/ subsoiler designed to cut and size residue, as well as deep rip horizontal density layers in one pass. For erosion prediction tool calculations, this is three operations: coulter caddy with subsoiler and rolling basket.

Erosion Prediction Tool Cultivator, field with 6-12 in shovel c and spiked tooth harrow

Field Cultivator with Harrow Attachment

A field cultivator is designed for light tillage and field finishing, usually used for secondary tillage and incorporating herbicides. Spiked point field cultivators do little soil mixing and leave more residue on the surface.

For Erosion Prediction Tool calculations, this is actually two operations: Cultivator, Field with 6-12 inch shovels and spiked tooth harrow.



Erosion Prediction Tools Cultivator, field with coiled tine harrow

Field Cultivator/ Coiled Tine Harrow

For erosion prediction tool calculations, this is two operations: field cultivator with coiled tine harrow.



Erosion Prediction Tool Drill or air seeder

Air Seeder



An air seeder is a planter which uses a medium or heavy duty cultivator, a central pneumatic seed and fertilizer delivery system, and a ground opener for seed and/or fertilizer placement.

Erosion Prediction Tool Coulter caddy with fluted coulters

Coulter Caddy

Coulter caddies are installed in front of grain drills and other planting equipment to facilitate planting under high residue conditions. They also cut residue in vertical tillage tools.



Erosion Prediction Tool Cultivator, field with 6-12 in sweeps

Field Cultivator Sweeps

Field cultivators equipped with sweeps do extensive horizontal and vertical soil mixing. Sweeps are the choice for herbicide incorporation. They bury more residue than field cultivators equipped with spiked points.



Types of Disk Blades

Types of Disks

Plain Disk Blade



Notched Disk Blade



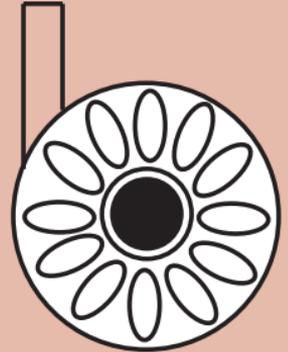
Plain Deep Cone Disk Blade



Bubble Coulter. Bubble coulters till a narrow 0.5 to 0.75 inch slot and do not till as much of the seed slot. Planting depths are more restricted than with the fluted coulters.



Disks, Coulters and Points

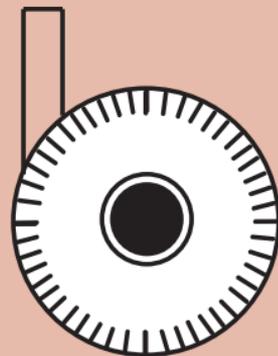


Low Disturbance

Ripple Coulter. Ripple coulters till a narrow 0.5 to 0.75 inch slot and do not till as much of the seed slot. Planting depths are more restricted than with fluted coulters.



Disks, Coulters and Points

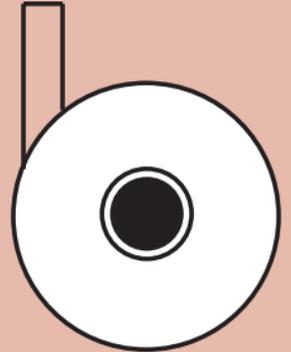


Low Disturbance

Straight Disk. Straight disks are used to cut the surface residue and do little inversion of the soil.



Disks, Coulters and Points

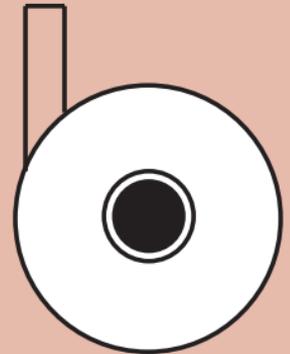


Low Disturbance

Concave Disk. Depending upon the size and depth of tillage, the concave disk does full width tillage and inversion of soil. It is used as a compaction tool.



Disks, Coulters and Points

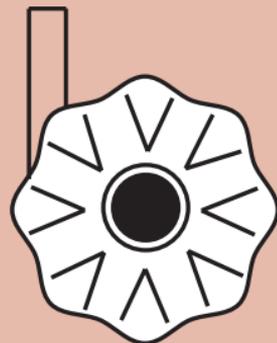


Medium Disturbance

Fluted Coulter. The 1 to 1.5 inch narrow fluted coulters till a slot wide enough to allow double disk openers to place the seed at optimum depths. This wider slot permits deeper placement of the seed.



Disks, Coulters and Points

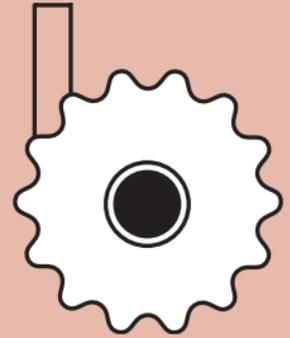


Medium Disturbance

Notched Disk. Notched disks are very similar to the concave disk. It depends upon the size and depth of tillage as to how much soil disturbance is done.



Disks, Coulters and Points

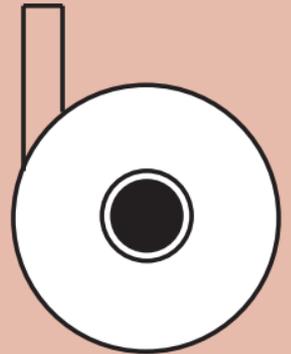


High Disturbance

Single Disk Openers. Single disk openers are used to cut the surface residue.



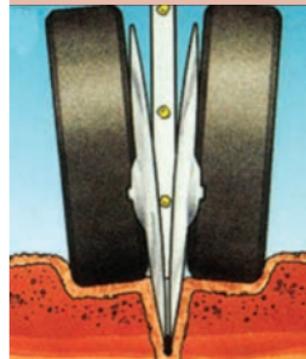
Disks, Coulters and Points



Low Disturbance

Double Disk Openers. Double disk openers are typically used in no-till or high residue systems. They are mounted parallel and equidistant to each other, forming a “V” shaped slot in to which the seed is dropped as the planter moves along.

Disks, Coulters and Points



Erosion Prediction Tool

Drill or air seeder, single disk openers, 7-10 in spacing

Grain Drills

Conventional grain drills deliver accurate seed metering and placement with optimum soil-to-seed contact.



Specialty drills provide exceptional seed placement and accurate seeding of everything from very small, light seeds to difficult to handle seed, such as native grass seeds.

Grass Drills



Erosion Prediction Tool

Baling stover or residue

Residue Removal



Plant residue left in the field is a valuable resource. Residue helps reduce soil erosion, add organic matter to the soil, and contributes nutrients back to the soil.

Erosion Prediction Tool Residue, row cleaner

Residue Row Cleaner



Residue row cleaners are used to move crop residue away from the seedbed to facilitate the planting process.

Erosion Prediction Tool
Residue, row cleaner

Residue
Row Cleaner



Erosion Prediction Tool Cultipacker, roller

Cultipacker

The cultipacker firms the seedbed. This contributes to better seed-to-soil contact and is important for establishing small seeded crops like forages.



Erosion Prediction Tool

Smooth roller

Roller/ Packer

Land/smooth rollers level fields without packing. They smash high spots, while flat areas receive little pressure.

These rollers are intended to provide improved seed-to-soil contact, weed control, and reduced moisture loss.



Erosion Prediction Tool Roller/Crimper

Roller/ Crimper



Crimpers are often used by organic farmers or those who choose not to use herbicides to terminate a growing cover crop.



Erosion Prediction Tool Cultivator, rotary

Rolling Cultivator



A rolling cultivator uses two spider gangs on each row assembly. It operates in heavy residue without clogging.

Erosion Prediction Tool

Rotary Hoe

Rotary Hoe



A rotary hoe consists of one or two staggered gangs of spider-like wheels about 3.5 to 4 inches apart. It is a fast, economical way to control small weeds and break surface crust to improve crop emergence.

Erosion Prediction Tool Cultivator, row

Row Cultivator



Row cultivators
kill weeds while
preserving the crop.

Erosion Prediction Tool
Cultivator, row, high residue

Row
Cultivator



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