

About This Presentation

This Power Point presentation was prepared by Dave Lightle Conservation Agronomist at the Lincoln, Soil Lab as part of the Core 4 Initiative. It has nation wide applicability. Dave is instrumental in developing RUSLE databases.

How To Use This Presentation

- There are valuable notes attached to most of the slides in this presentation which are not seen when slides are viewed in the “View Show” mode. To see the notes, click the “Outline” tab to the left of the screen. Notes are seen at the bottom of the page.

Farm Equipment Identification and Use

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Objectives:

General (At the end of this session, participants will be able):

- Identify certain farm equipment and become familiar with the equipment's purpose.
- Be familiar with typical equipment used in conventional as well as the various residue management tillage systems.
- Be familiar with the equipment needed for vegetative establishment.

Farm equipment

CONVENTIONAL TILLAGE EQUIPMENT

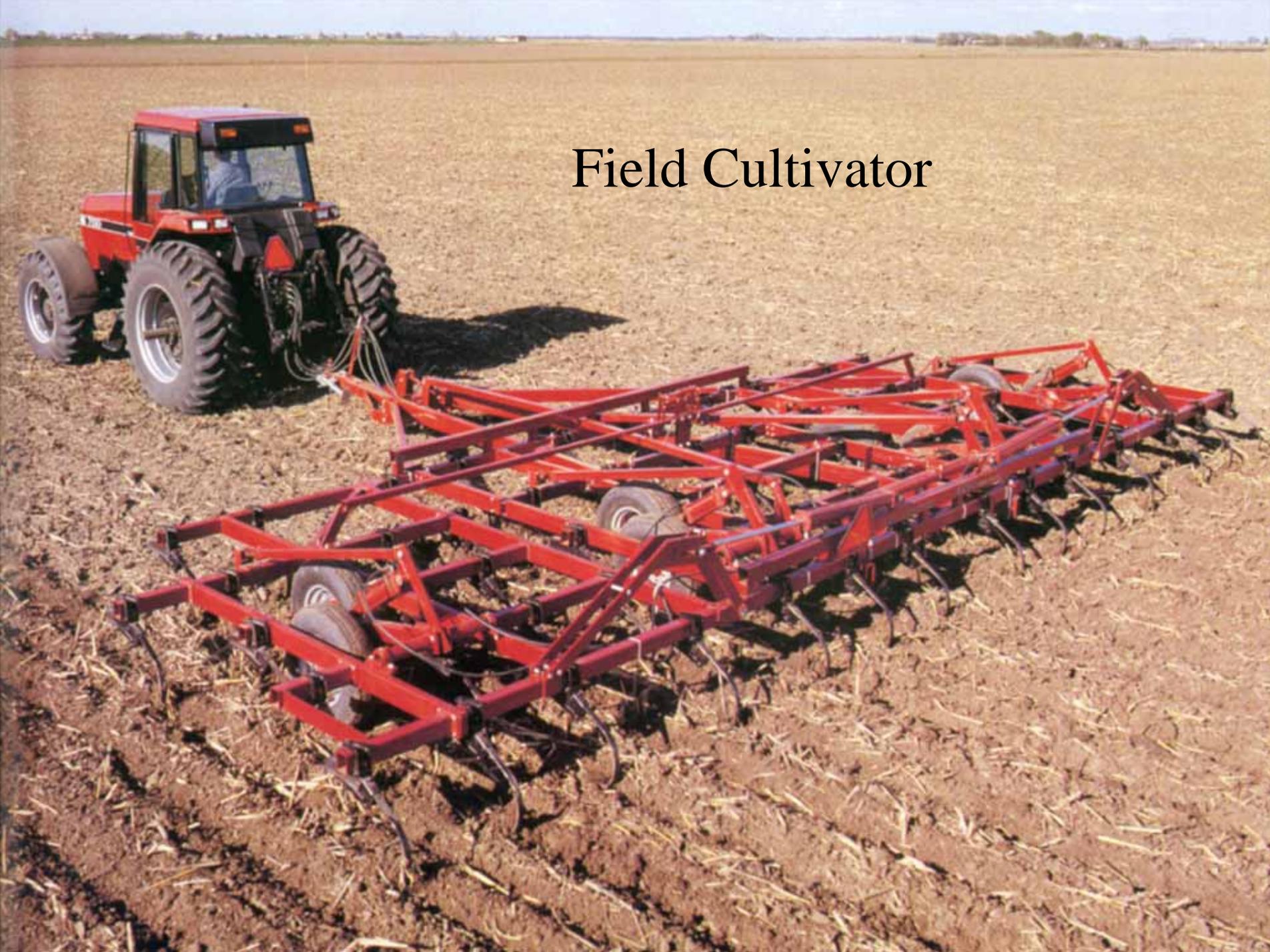


Moldboard plow
– Conventional
tillage

Tandem disk harrow



Field Cultivator



Spike Tooth Harrow



Roller packer or
corrugated roller



Bedder Lister





CONSERVATION TILLAGE EQUIPMENT

Residue management begins with harvest of the previous crop



- It is much easier to redistribute residue with the harvesting machine than to try to overcome the problems later

Considerations for Combine Operation

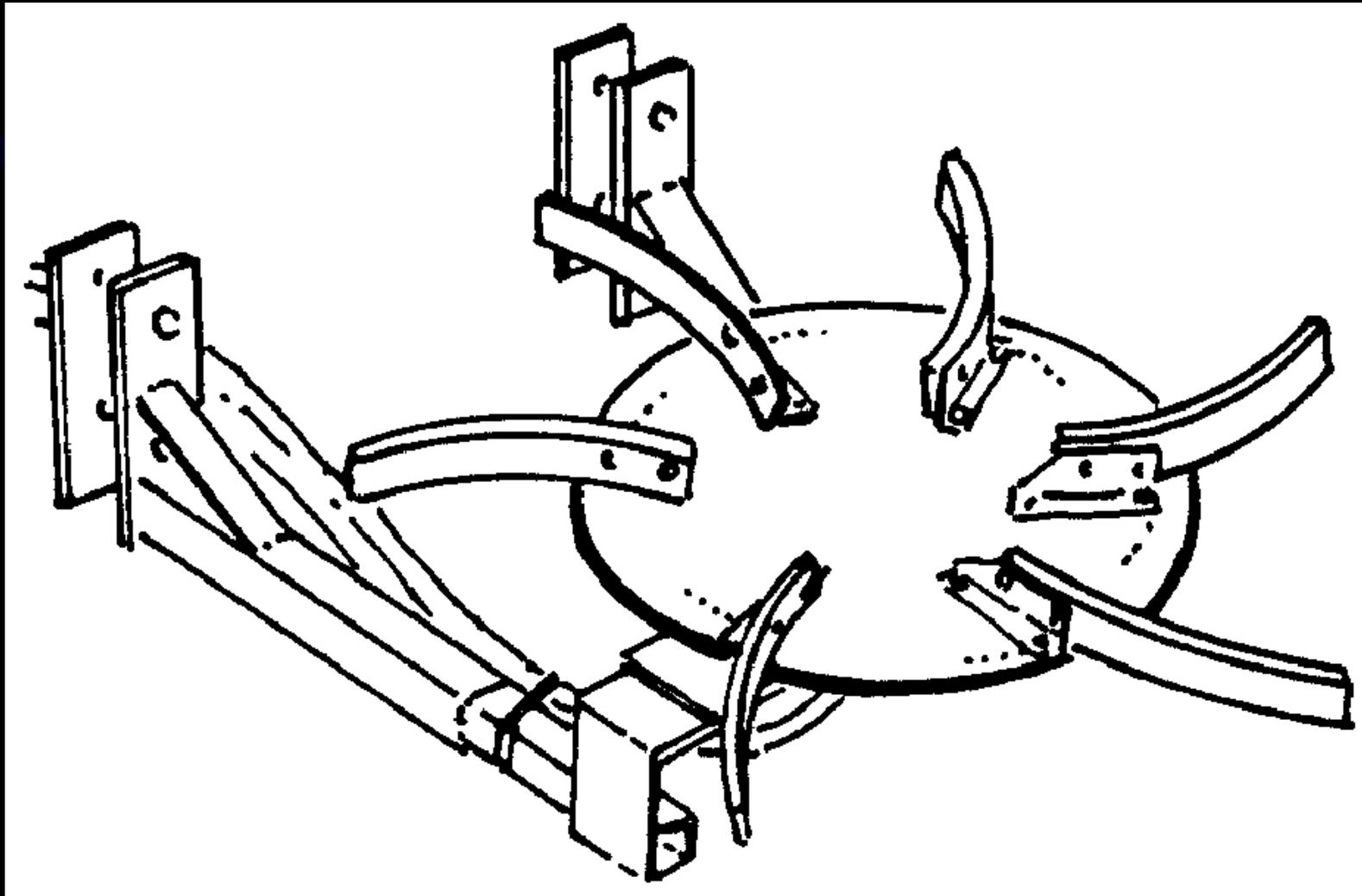
- Leave stubble as high as possible
- Loose residue may blow or float away
- Avoid frequent stops and resulting residue bunches



Straw and Chaff Management

- Avoid making straw and residue windrows
- Retrofit combines with chaff spreaders
- Adjust spreaders to redistribute residue and chaff to as close to full header width as possible

Chaff Spreader Attachment



Residue Related Planting Problems

- Cool, and wet conditions
- Poor control of planting depth
- Inadequate seed-soil contact
- Uneven stands
- Poor seedling vigor

Weed Control Problems

- Weed seed accumulations in residues piles result in weedy spots
- Residue piles may intercept herbicides
- Weed seed germination may be enhanced in moist conditions beneath residue piles

Other Residue Management Considerations

- Rodent problems
- Nutrient tie up
- Shredding stubble

Coulter-knife Anhydrous Applicator



- Minor changes needed to accommodate residue
 - Coulters to cut residue and reduce clogging
 - Closing disks, etc to close the slot and redistribute residue

Manure Management Equipment & Operation

- Surface application often results in loss of nutrients and risk of air and water pollution
- Incorporation is desirable, but disturbs residue and requires lots of power
- Injection is now possible in no-till with new minimal disturbance injection tools such as one from Bazooka





Planting Equipment for No-till

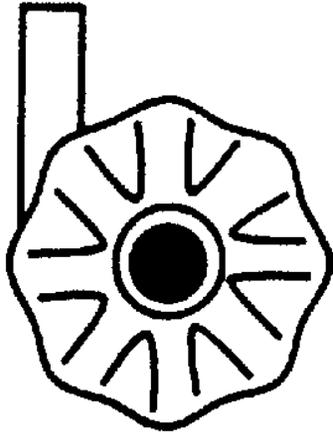
- Purposes
 - open seed furrow
 - meter seed uniformly
 - place seed in the furrow
 - cover the seed
 - firm the seedbed



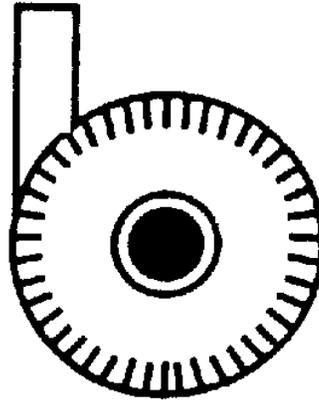
Coulters

- Cut residue and slice open the seed slot

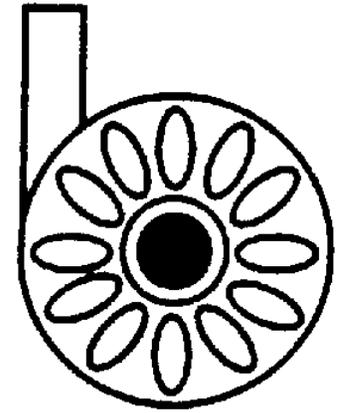




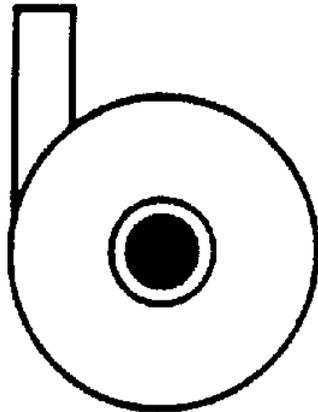
Fluted coulters



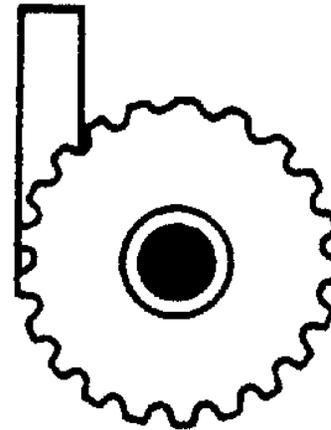
Ripple coulters



Bubble coulters



Smooth coulters



Notched coulters

Coulter types

- Fluted - 1 to 1.5 “ best with double disk openers on most soils
 - some problems on wet or heavy clay soils
- Bubble and rippled - till narrow 0.5 to 0.75” slot
 - better in mulch-till and conventional seedbeds
- Smooth and notched smooth - narrowest slot
 - best in sod but don't till the slot

Multiple coulter systems

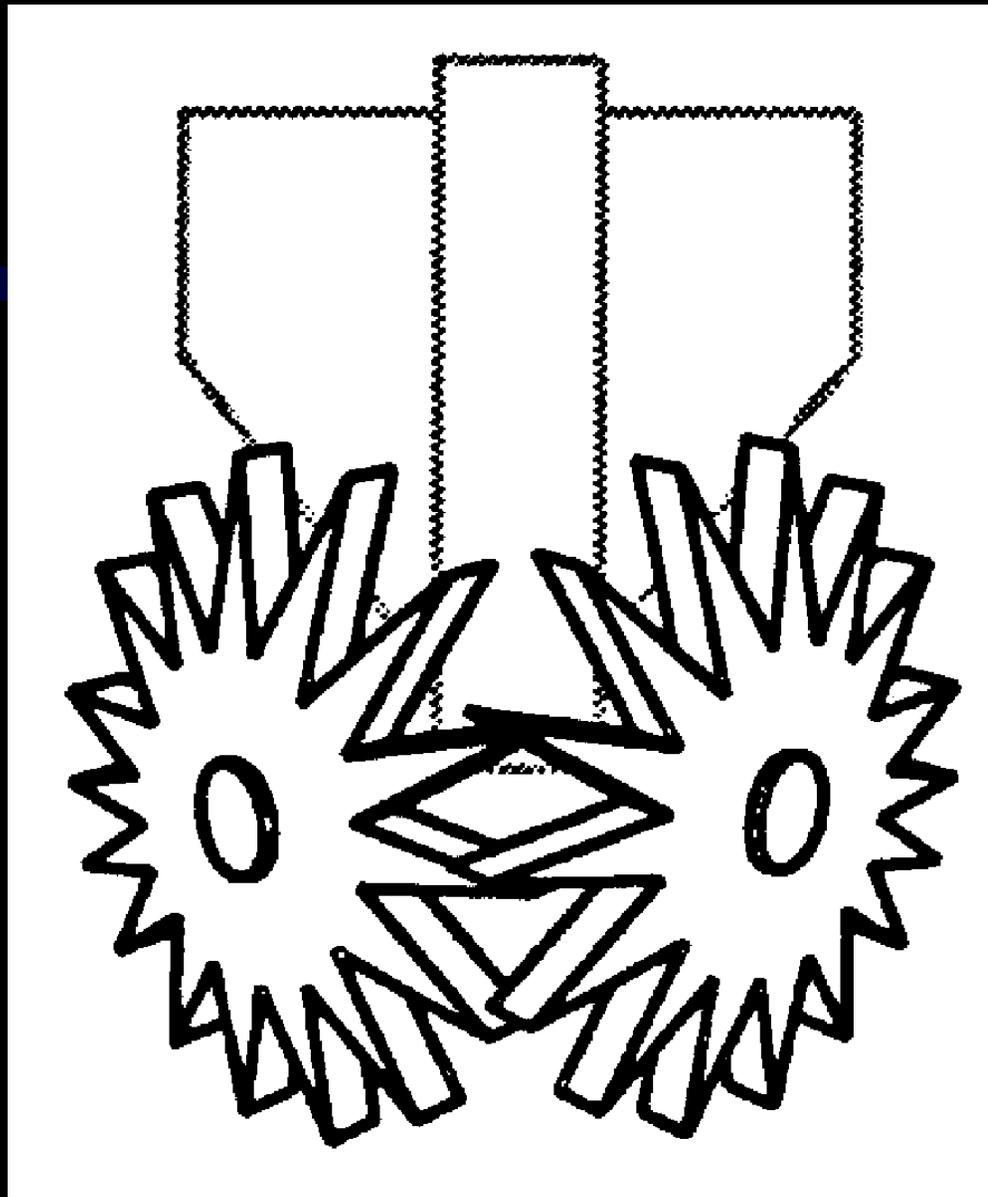
- Till a wider seed zone as in zone till and strip till

Coulter placement and depth



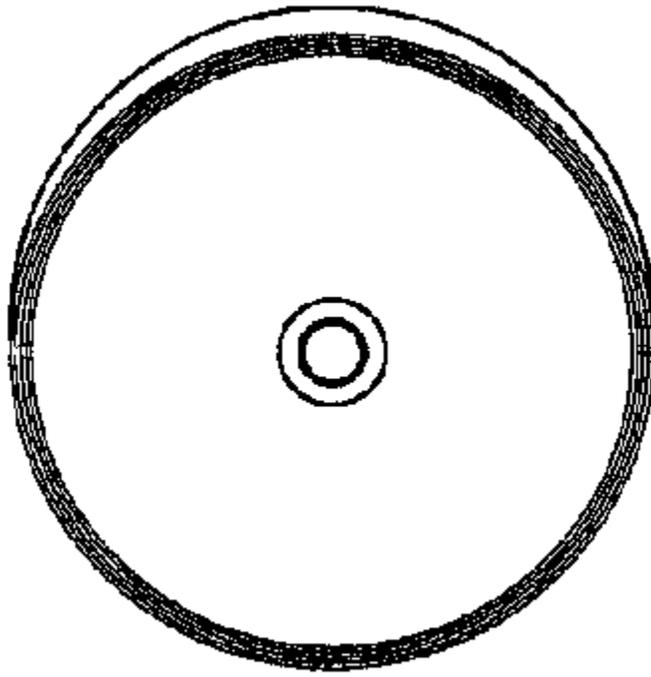
Row cleaners

- Clear row ahead of planter unit
- Set to run shallow to move only residue
- Little if any tillage should be done since exposed moist soil is easily compacted by the unit

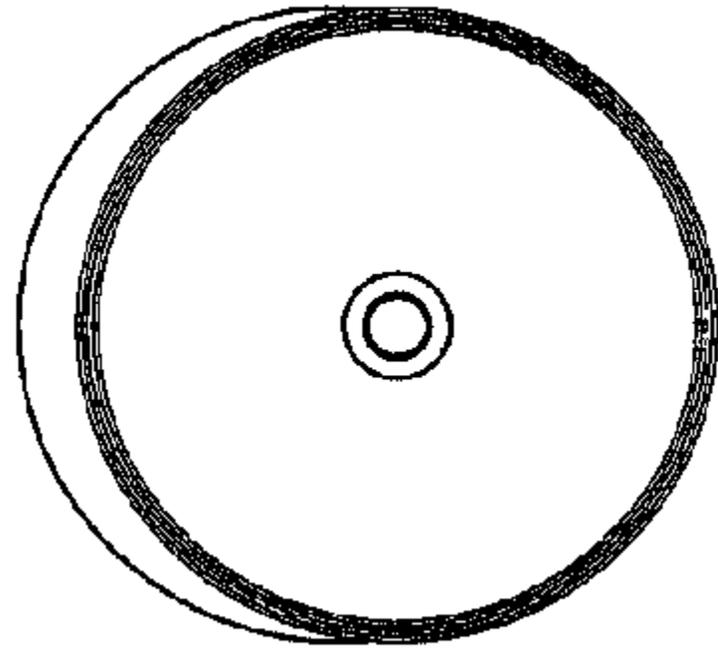








Double Disk



Staggered
Double Disk

Gauge wheels





**Double press
wheels**

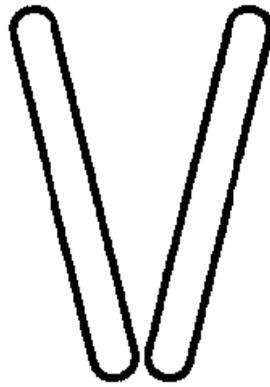


Single press wheel

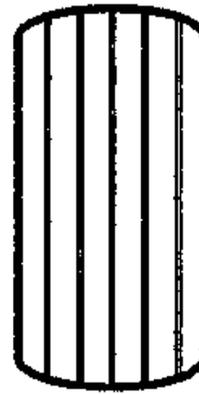




Single



Double-V



Pneumatic



Laminated



V



V-Groove



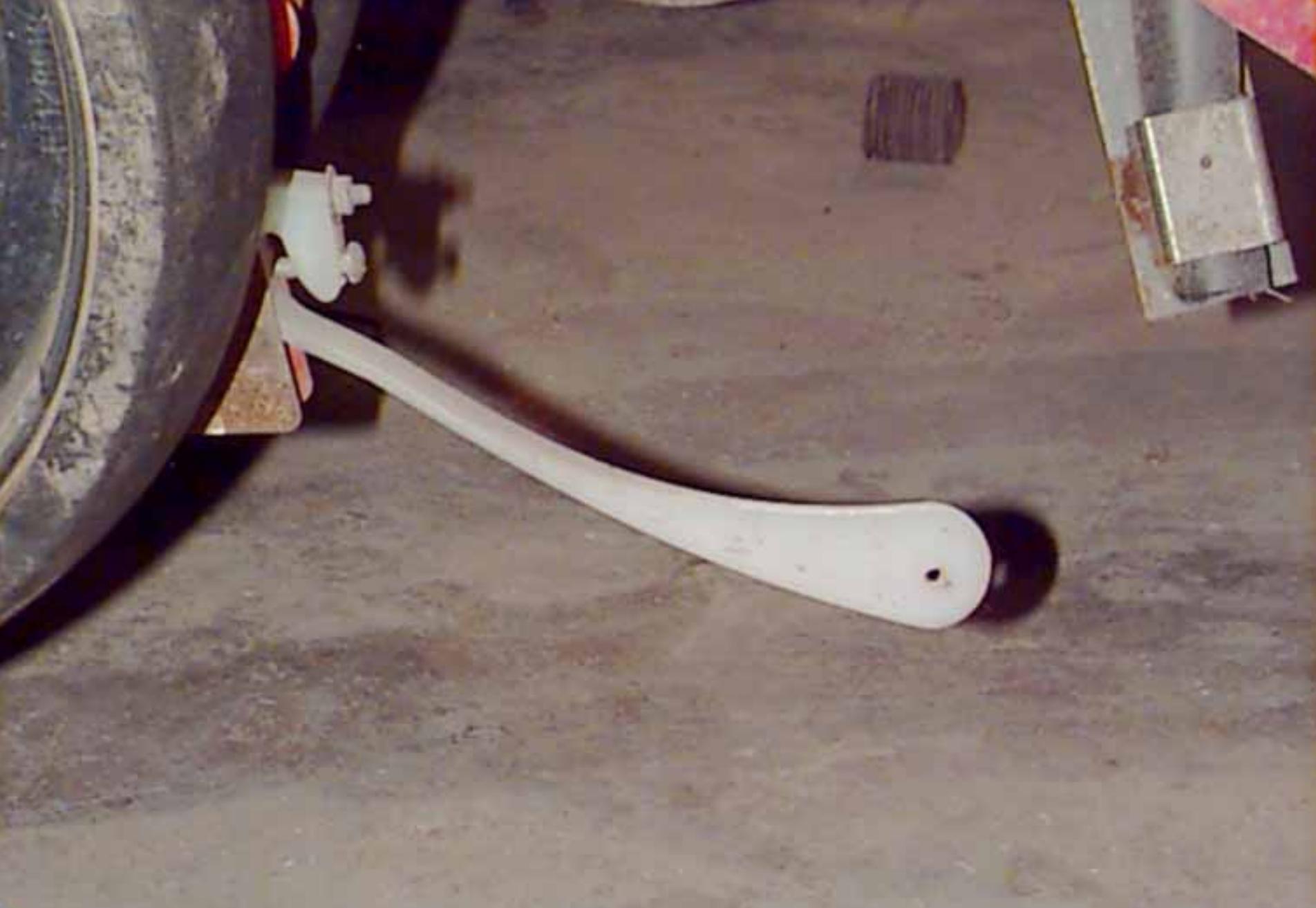
Modified
V-Groove

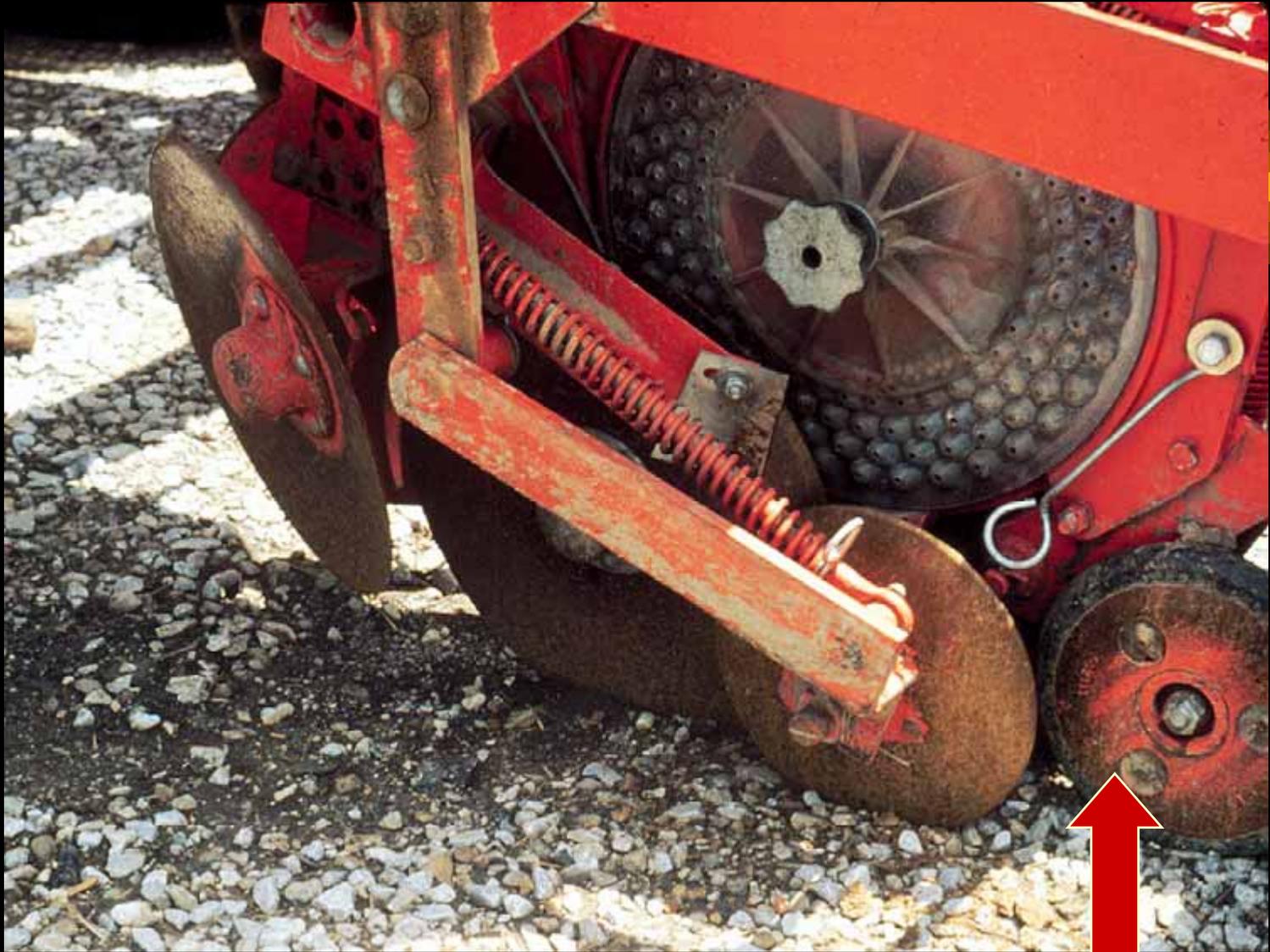


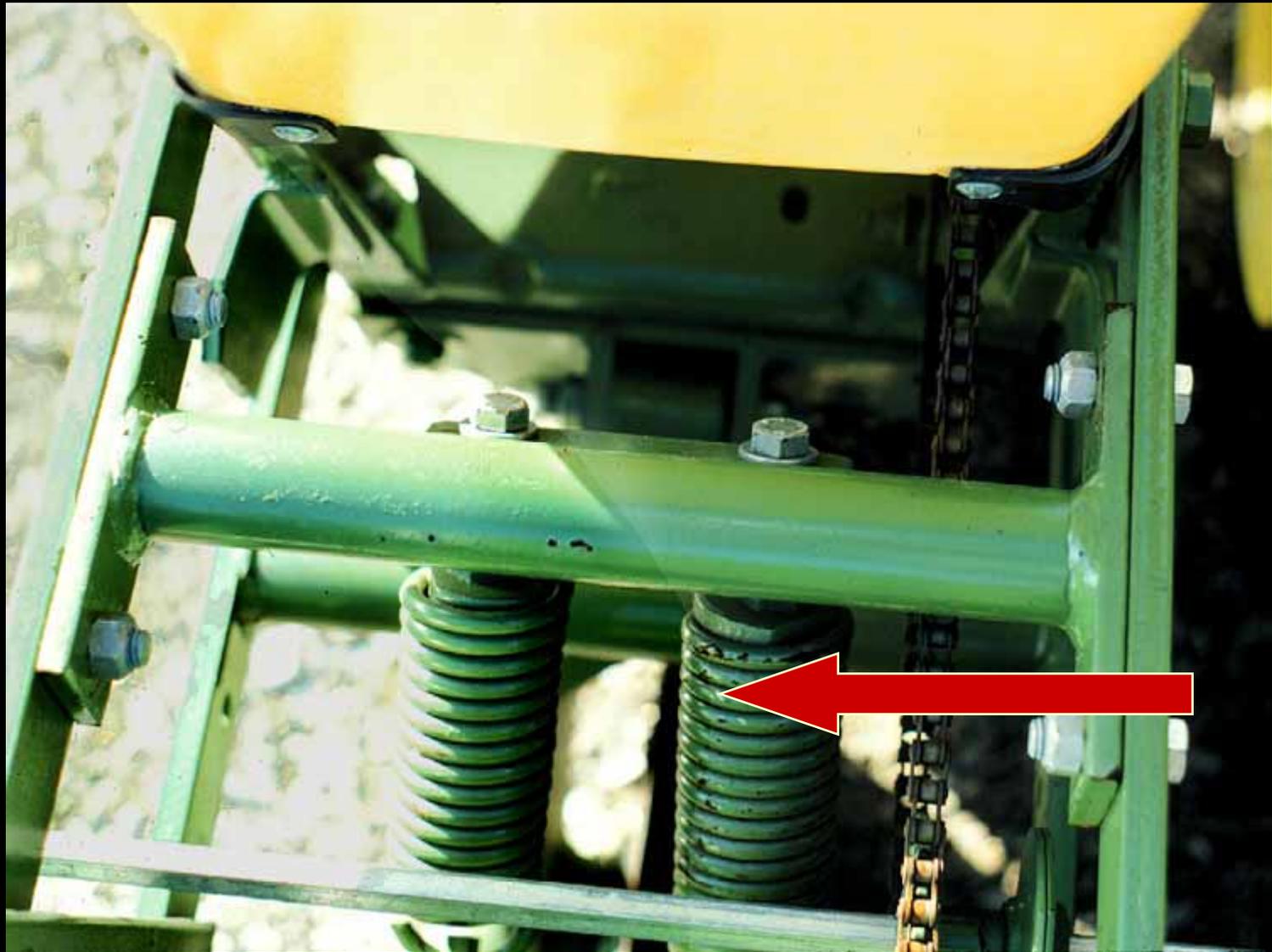
Concave

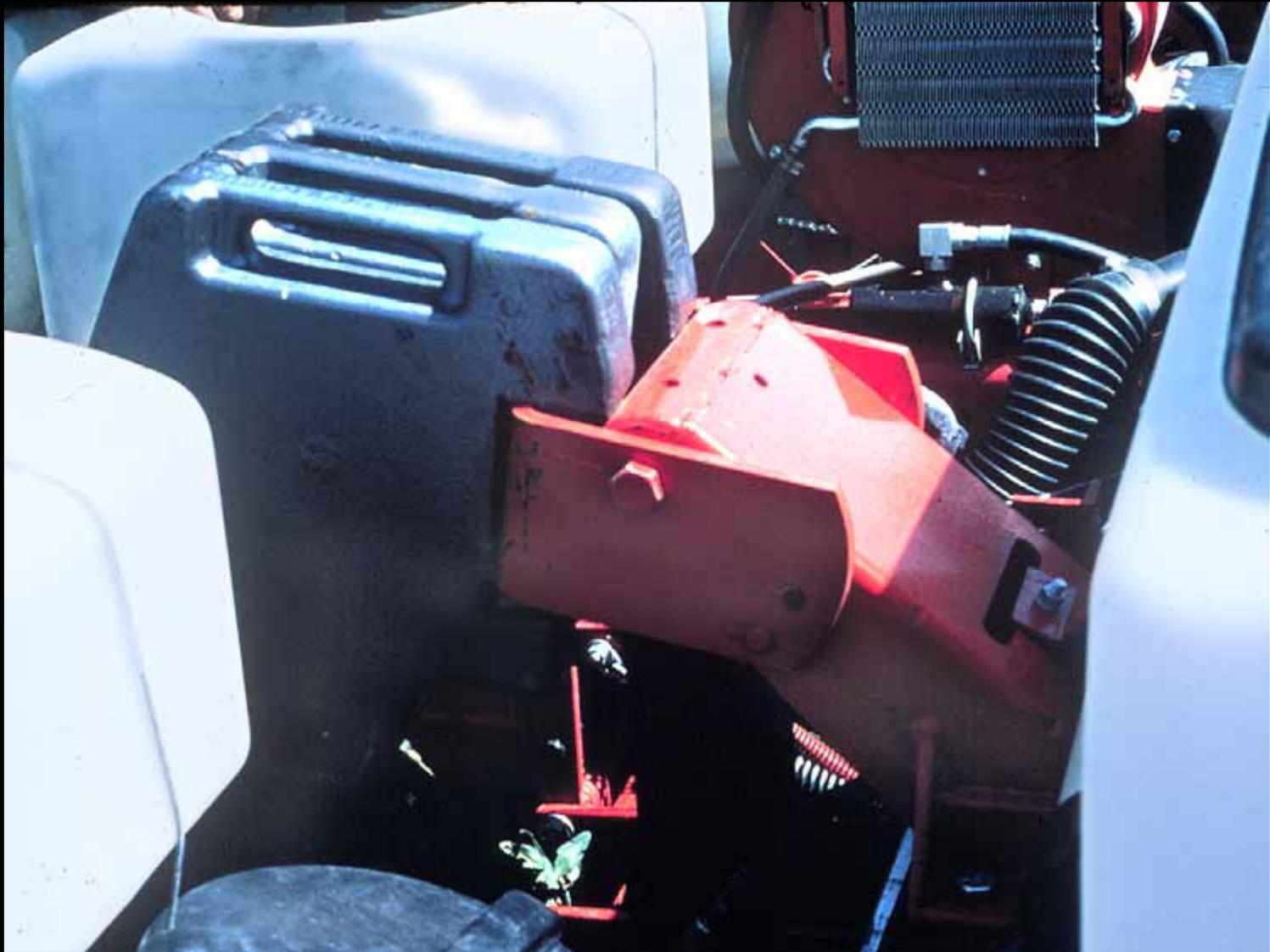
Press wheels and seed firmers

- Heavy cast iron press wheels are useful in no-till except in soils easily compacted
- Seed firmers are small devices including small wheels or fingers that firm the bottom of the seed trench for better seed placement











Insecticide
equipment



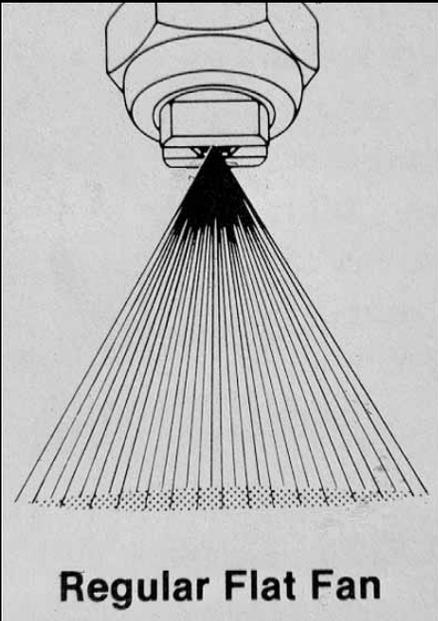
**Starter fertilizer 2”
to the side and 2”
deeper than seed**

Planter marking systems

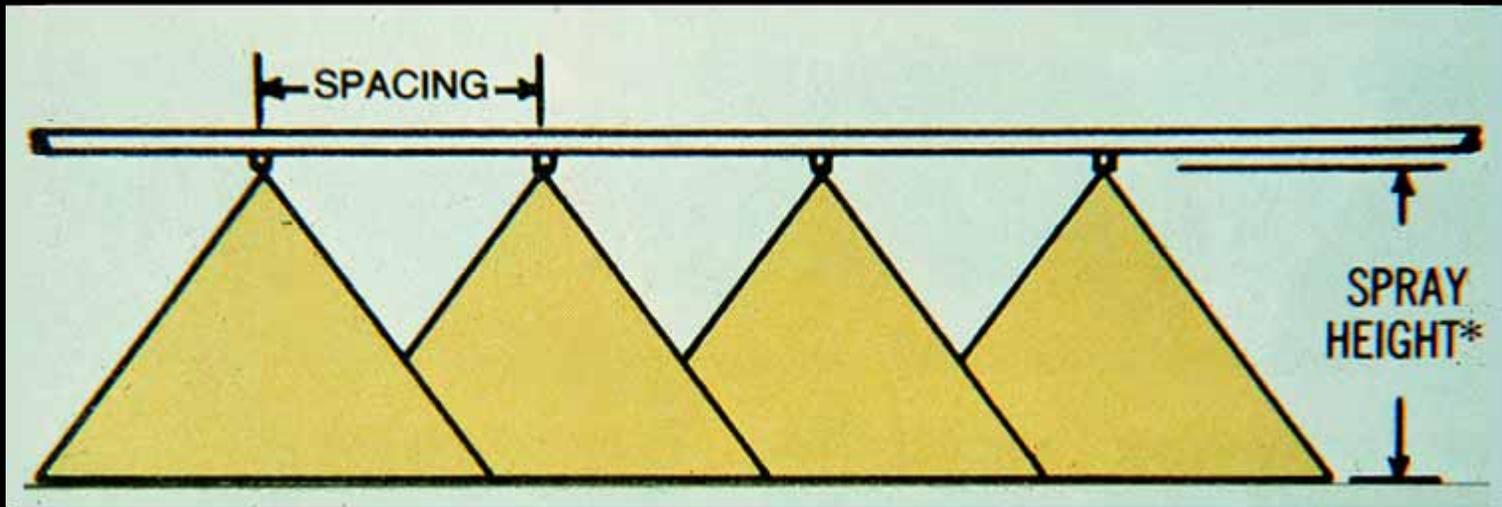
- No-till planter markers need extra weight to cut through residue
- These marks can disturb pesticides and lead to weed escapes

Sprayers for burndown herbicides

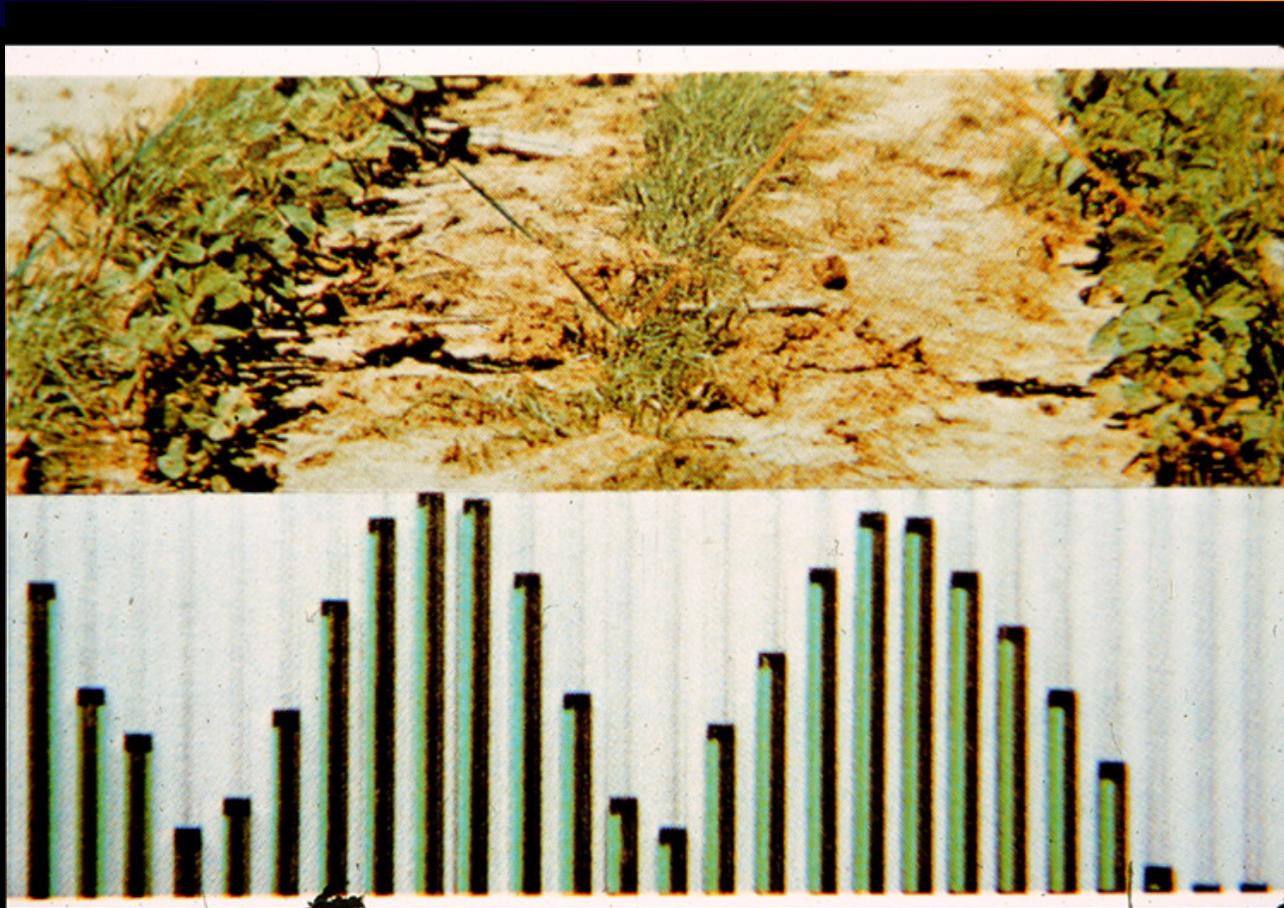
- Select nozzles and set pressure to produce large droplets to prevent drift
 - 8006 or smaller flat fan nozzles with 30 to 50% overlap
 - TK-5 or smaller flood nozzles pointed down with 100% overlap
 - To reduce drift and increase accuracy set the pressure to 20 to 30 psi and cut speeds to less than 12 mph



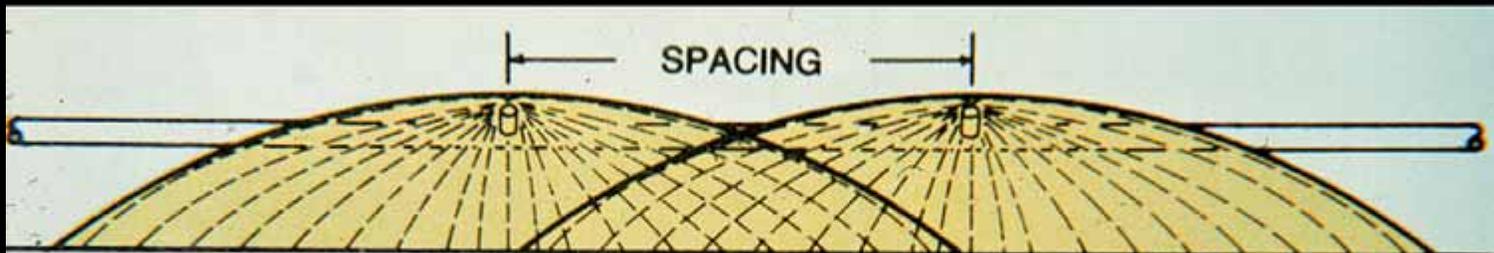
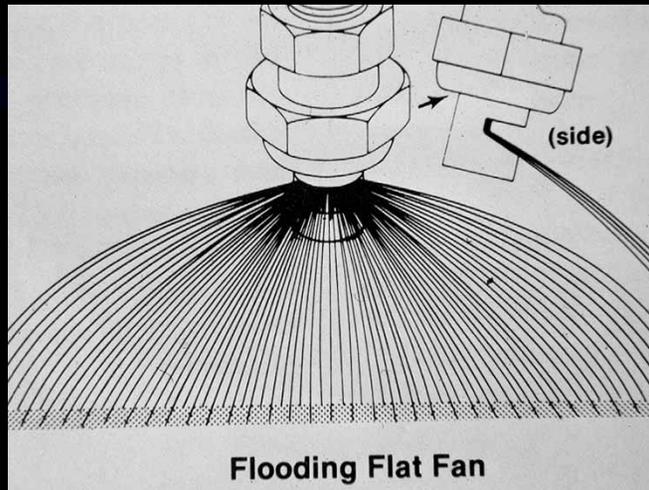
Regular Flat Fan Nozzles



Boom set to close - inadequate overlap causes skips



Flood Nozzles

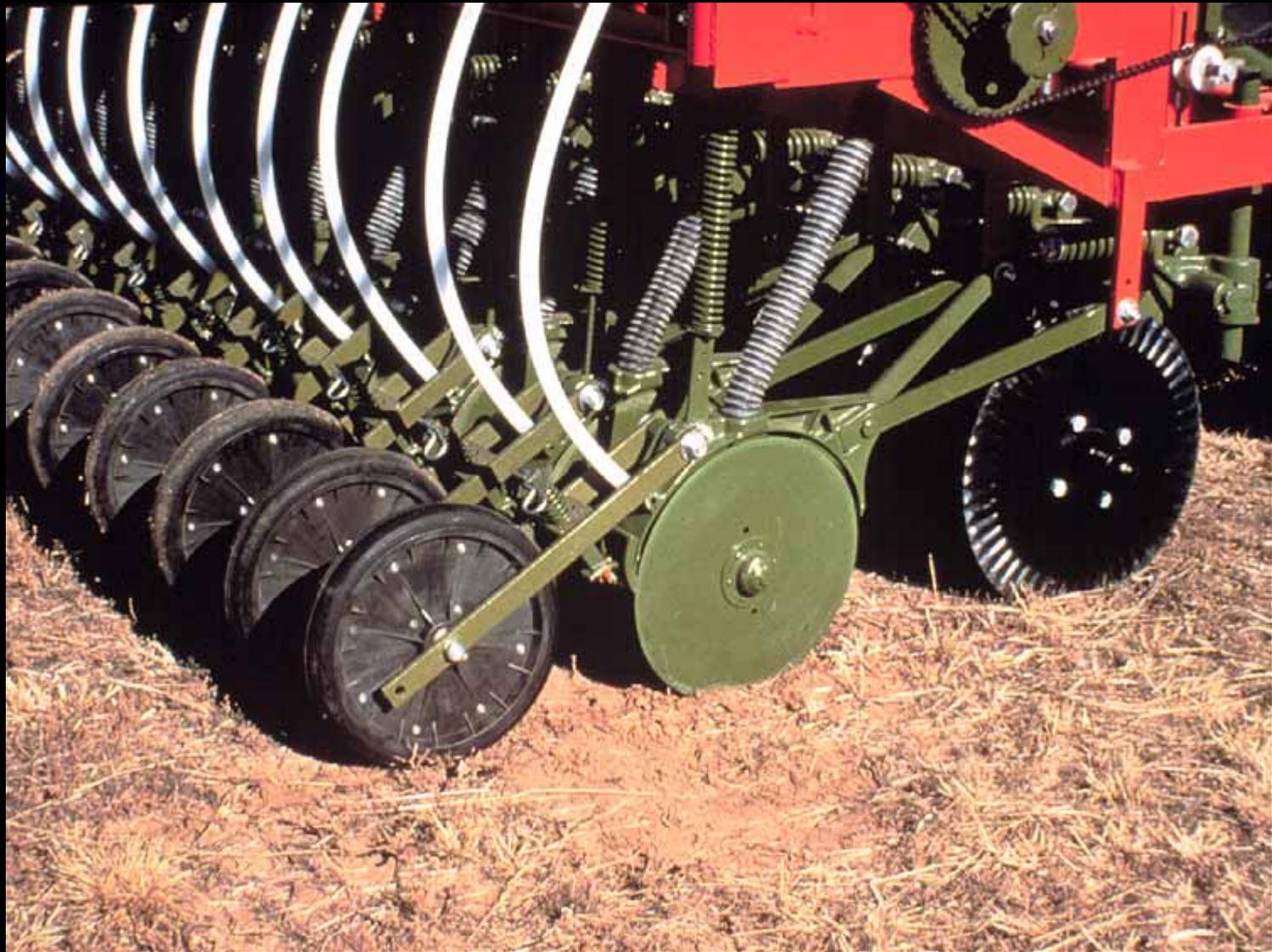


Spray overlap can be varied by raising or lowering boom — and by rotating boom.

Drill with coultter caddy







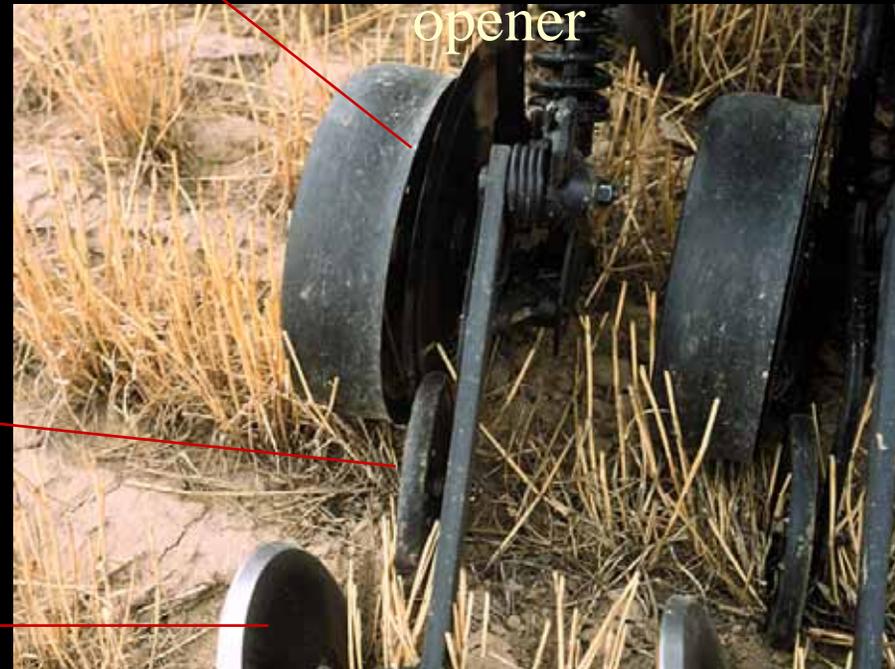
Single disk Openers



Firming wheel

Cast iron press wheel

Gauge wheel and single disk opener





Air Seeder

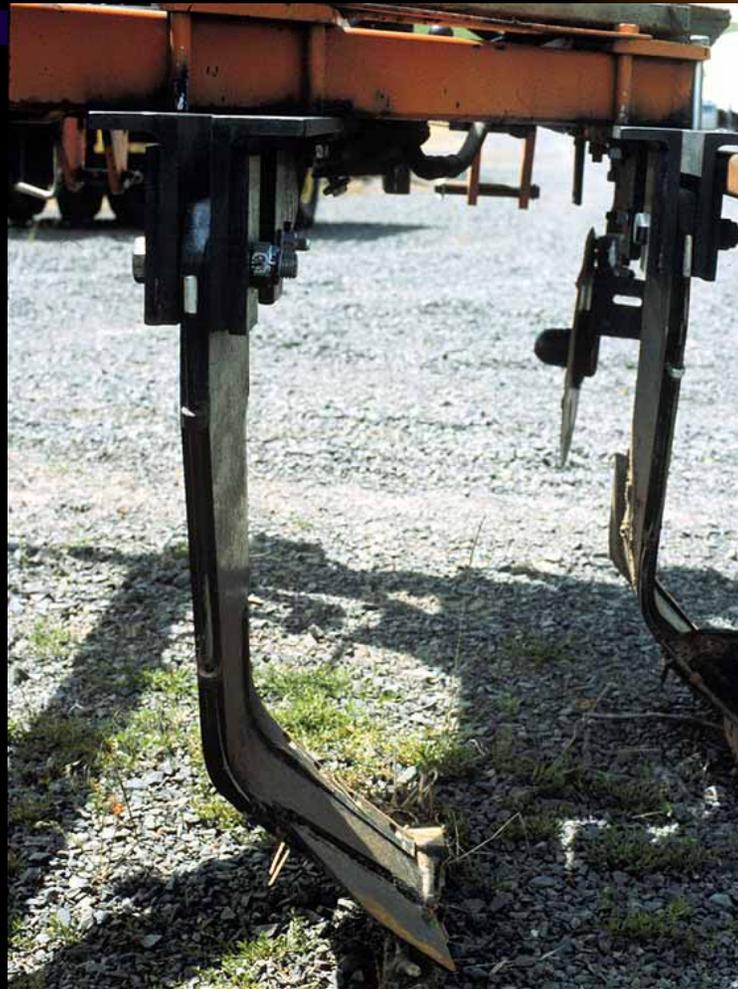


Reducing Soil Compaction





Paraplow



Conservation Tillage - Equipment

Mulch-till Equipment



Equipment for Mulch-till

- Three categories
 - subsurface
 - primary
 - secondary

Sub-surface tillage

- Examples:
 - Subsoil chisels, paraplows, vee rippers, disk sub-soilers
- Fracture tillage pans to improve air and water movement
- Operated as deep as 14”
- Often require additional operations to break clods and level the soil





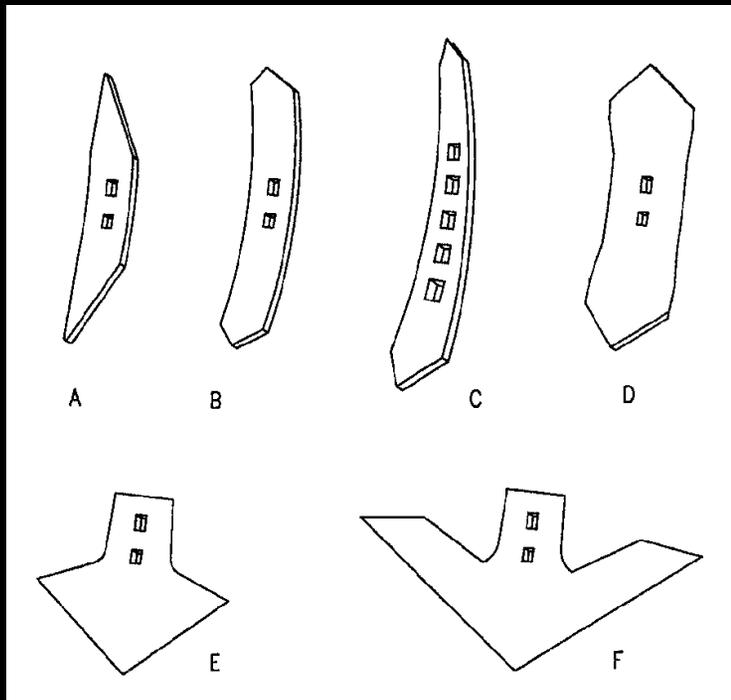
Mulch-till Primary operations

- **To loosen and fracture the seedbed**
- **To cut, size and partially bury residue**
- **If too much is buried, it is difficult to bring back with secondary operations**
- **Typical machines**
 - **Chisel plows, disks, blade plows and in some cases, field cultivators**





Chisel plow points

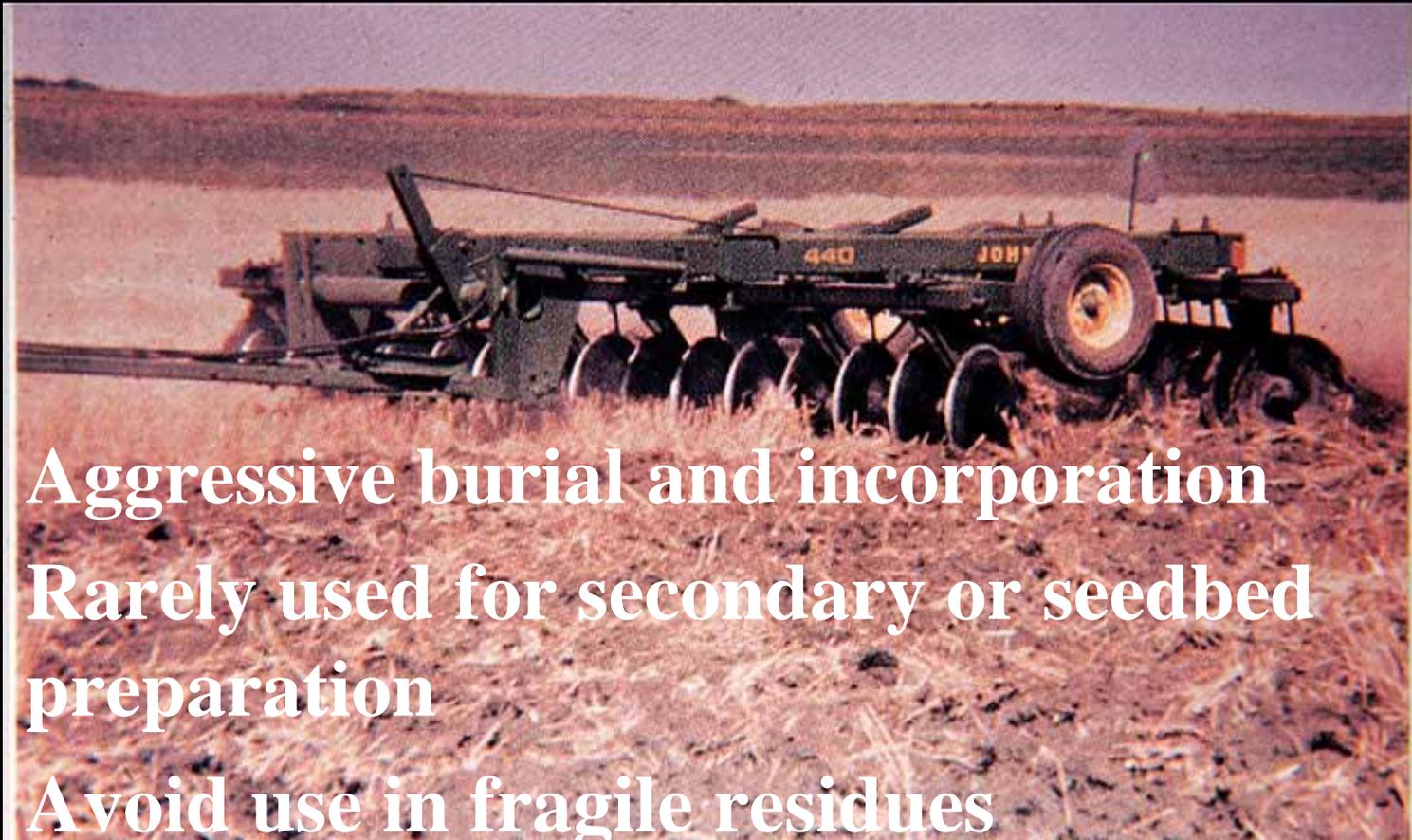




Tandem Disk Harrows



Offset Disk Harrow



- **Aggressive burial and incorporation**
- **Rarely used for secondary or seedbed preparation**
- **Avoid use in fragile residues**

Blade Plows

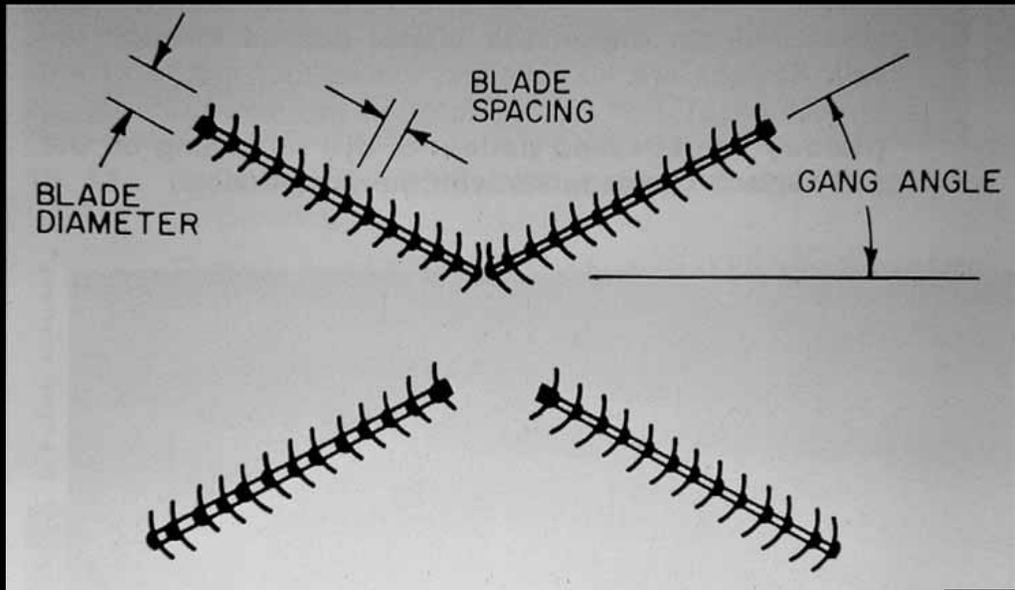
- 3' to 5' sweeps run at shallow depths
- typically used in fallow systems to kill weeds and retain mulch and dry soil on top



Secondary tillage tools

- Tandem disks
- Field Cultivators
- Combination finishing tools

Tandem Disks (secondary)



Field Cultivators - Secondary



Combination Tools and Seedbed Finishers



Combinations of finishing attachments

One-pass incorporation and seedbed preparation

Good residue clearance

Other equipment for Mulch-till

- Planters and drills
 - residue managers and row cleaning disks needed to remove residues from row
 - Bubbled coulters are typically used but fluted and rippled coulters may be needed in heavy residues
 - Residue managers and row cleaning disks may also be needed in heavy residues



Other Mulch-till equipment

- Fertilizer applicators may need coulters to cut through residues and closing disks to seal the slot and redistribute residue
- Manure can be either surface spread and lightly incorporated with tillage or injected



Rotary Hoe





Ridge-till



Ridge-till Equipment

- Similar to strip-till except planting is done on a ridge
- Ridges are rebuilt with row cultivation
- Ridges are preserved until the next planting season

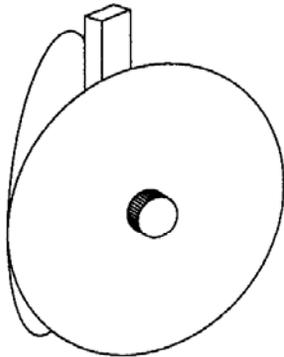


Harvesting Considerations for Ridge-till

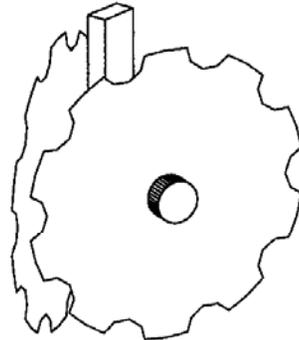
- Combine, tractor and grain cart tire widths and spacing must be changed to run between the ridges
- Wide flotation tires should be replaced with narrow duals with wide spacers
- Incidental traffic should be avoided or restricted to end rows or to the same rows traveled by the combine

Ridge-till Planting Equipment

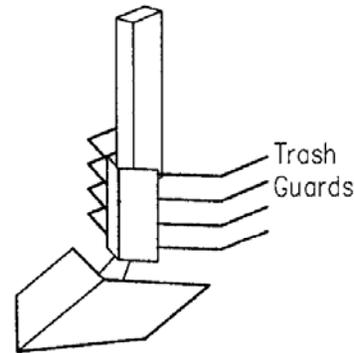
- A row cleaning device is required to skim the top 1 -2 inches of the ridge
- Disk furrowers, staggered notched disk furrowers, sweeps with trash guards and horizontal disks are available



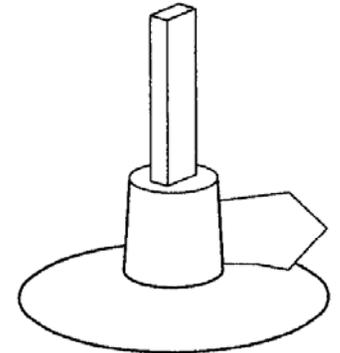
Disk Furrowers



Staggered and Notched
Disk Furrowers



Sweep



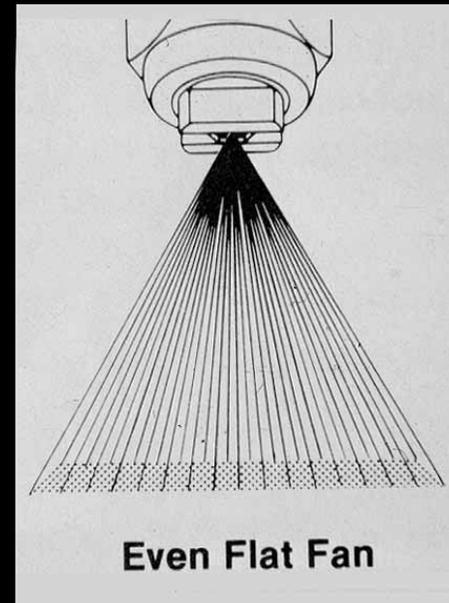
Horizontal Disk

Ridge-till Planter



Specialized Equipment for Ridge-till

- Planters can be equipped with spray equipment to band spray chemicals during planting



Specialized Equipment for RidgeTill

- The ridge-till cultivator cleans the row middles and rebuilds the ridges





Specialized equipment for ridge-till

- All traffic is confined to the same rows but compaction can result
- Between row subsoilers can alleviate this compaction if done when soils are dry
- Fertilizer and manure application equipment is the same as discussed under No-till except for preservation of the ridge geometry

Farm Equipment

- Relationship to models and evaluation tools
 - RUSLE2
 - Soil Conditioning Index
 - Soil Tillage Intensity Rating
 - Manure Management Planner
 - Wind Erosion Equation
 - Energy Calculator

climates
contour-systems
deep-soil-drain-systems
erosivities
hydraulic-element-flow-paths
hydraulic-element-systems
hydraulic-elements
managements
no path coeff
operations
plans
profiles
residues
soils
strip-barrier-systems
structures-barriers
vegetations
work.sheets

Name	Modified	Owner	Group	Permissions
Add mulch	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Aerator, field surface, ground driven	11/04/2003 ...	dave.lightle	R2_NRCS	RwCD
Aerial seeding	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Bale Corn stalk strips	09/25/2003 ...	dave.lightle	R2_NRCS	RwCD
Bale straw or residue	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Bed shaper	11/04/2003 ...	dave.lightle	R2_NRCS	RwCD
Bed shaper, 12 in	11/04/2003 ...	dave.lightle	R2_NRCS	RwCD
Bedder, hipper, disk hiller	03/01/2002 ...	dave.lightle	R2_NRCS	RwCD
Bedder, hipper, hiller 12 in high	04/14/2003 ...	dave.lightle	R2_NRCS	RwCD
Bedder, hipper, hiller 15 in high	04/14/2003 ...	dave.lightle	R2_NRCS	RwCD
Bedder, hipper, hiller 18 in high	02/28/2002 ...	dave.lightle	R2_NRCS	RwCD
Begin growth	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Begin new growth	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Begin weed growth	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Bulldozer, clearing/cutting	06/25/2003 ...	dave.lightle	R2_NRCS	RwCD
Bulldozer, clearing/cutting light	11/04/2003 ...	dave.lightle	R2_NRCS	RwCD
Bulldozer, filling/leveling	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Burn residue	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Burn residue, high intensity	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Burn residue, low intensity	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Burn residue, mod. high intensity	02/10/2004 ...	dave.lightle	R2_NRCS	
Burn residue, moderate intensity	02/10/2004 ...	dave.lightle	R2_NRCS	
Chisel, st. pt.	02/05/2002 ...	dave.lightle	R2_NRCS	RwCD
Chisel, st. pt. 12 in deep	02/28/2002 ...	dave.lightle	R2_NRCS	RwCD
Chisel, st. pt. 15 in deep	02/28/2002 ...	dave.lightle	R2_NRCS	RwCD
Chisel, sweep shovel	04/14/2003 ...	dave.lightle	R2_NRCS	RwCD
Chisel, twisted shovel	06/07/2001 ...	dave.lightle	R2_NRCS	RwCD
Chop veg. with machete	09/23/2003 ...	dave.lightle	R2_NRCS	RwCD
Cultipacker, roller	11/08/2001 ...	dave.lightle	R2_NRCS	RwCD
Cultivate, manually	05/14/2002 ...	dave.lightle	R2_NRCS	RwCD
Cultivator, field 6-12 in shovels C	06/07/2001 ...	dave.lightle	R2_NRCS	RwCD
Cultivator, field 6-12 in sweeps	08/27/2002 ...	dave.lightle	R2_NRCS	RwCD
Cultivator, field w/ spike points	01/11/2002 ...	dave.lightle	R2_NRCS	RwCD
Cultivator, hipper, disk hiller on beds	11/04/2003 ...	dave.lightle	R2_NRCS	RwCD
Cultivator, off bar w/disk hillers on beds	11/04/2003 ...	dave.lightle	R2_NRCS	RwCD
Cultivator, rotary	04/05/2004 ...	Dave.Lightle	R2_NRCS	
Cultivator, row - 1st pass ridge till	11/04/2003 ...	dave.lightle	R2_NRCS	RwCD

Management: CMZ 01a.Single Year/Single Crop Templates\Corn grain\corn grain w/manure; FC, st pt, disk, z1

Graphic Long-term natural rough., in. 0.24
 Rel. row grade, % 100 Normally used as a rotation? Yes
 Duration, yr 1

Build new rotation using this management

Rotation builder for this management

Operations Info

Management Operations

Date, m/d/y	Operation	Vegetation	Yield (# harv. units)	External residue	Surf. res. add. / remove,	Cover from addition, %
10/15/1	Manure spreader, solid and semi-solid			Manure, solid, signif. bedding	1400.0	61
10/20/1	Chisel, st. pt.					
5/10/2	Disk, tandem light finishing					
5/10/2	planter, double disk opnr					
10/10/2	Harvest, killing crop 50pct standing stubble	Corn, grain	112			

Profile: OHCBWNT*

STEP 1: Choose location to set climate: Location

STEP 2: Choose soil type: Soil

STEP 3: Set slope topography: Slope length (along slop Avg. slope steepness, %

STEP 4a: Select base management Base management

STEP 4b: Modify/build man. sequence if desired: Management seq

Man.	Management
1	...6\b.Multi-year Rotation Templates\Corn Fall Plow -

Profile: Soil conditioning...

Wind & irrigation-induce

SCI OM subfactor

SCI FD subfactor

SCI ER subfactor

STIR value

Soil conditioning index (SCI)

Results Additional Results

Soil loss for cons. plan, t/ac/yr

T value, t/ac/yr

Surf. res. cov. values

Soil conditioning index

Management: CMZ 16\b.Multi-year Rotation Templates\Corn Fall Plow - Soybeans Fall Plow

Graphic

Long-term natural rough., in.

Normally used as a rotation?

Duration, yr

Build new rotation using this management

Rotation builder for this management

Operations Info

Date, m/d/y	Operation	Vegetation	Yield (# harv. units)
11/1/1	Plow, moldboard		
5/1/2	disk, tandem light finishing		
5/5/2	Cultivator, field 6-12 in sweeps		
5/5/2	planter, double disk opnr	Corn, grain	140
10/20/2	Harvest, killing crop 50pct standing stubble		
11/1/2	Plow, moldboard		
5/5/3	disk, tandem light finishing		
5/10/3	Cultivator, field 6-12 in sweeps		
5/10/3	Drill or airseeder, double disk	Soybean, mw 7in rows	40.0
10/5/3	Harvest, killing crop 50pct standing stubble		

Specific Outcomes :

At the end of this session students will:

- Have an understanding of farm equipment and that will enable the employee to relate to the client.
- Understand the effects of equipment used in conventional tillage.
- Be able to offer alternatives that will improve the resource concern.
- Understand the particular equipment needed for successful implementation of residue management systems.
- Be able to provide technical assistance to clients that will improve the resource concern.

