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 seem 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

Dave Lightle
Conservation Agronomist
Lincoln, Nebraska

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.

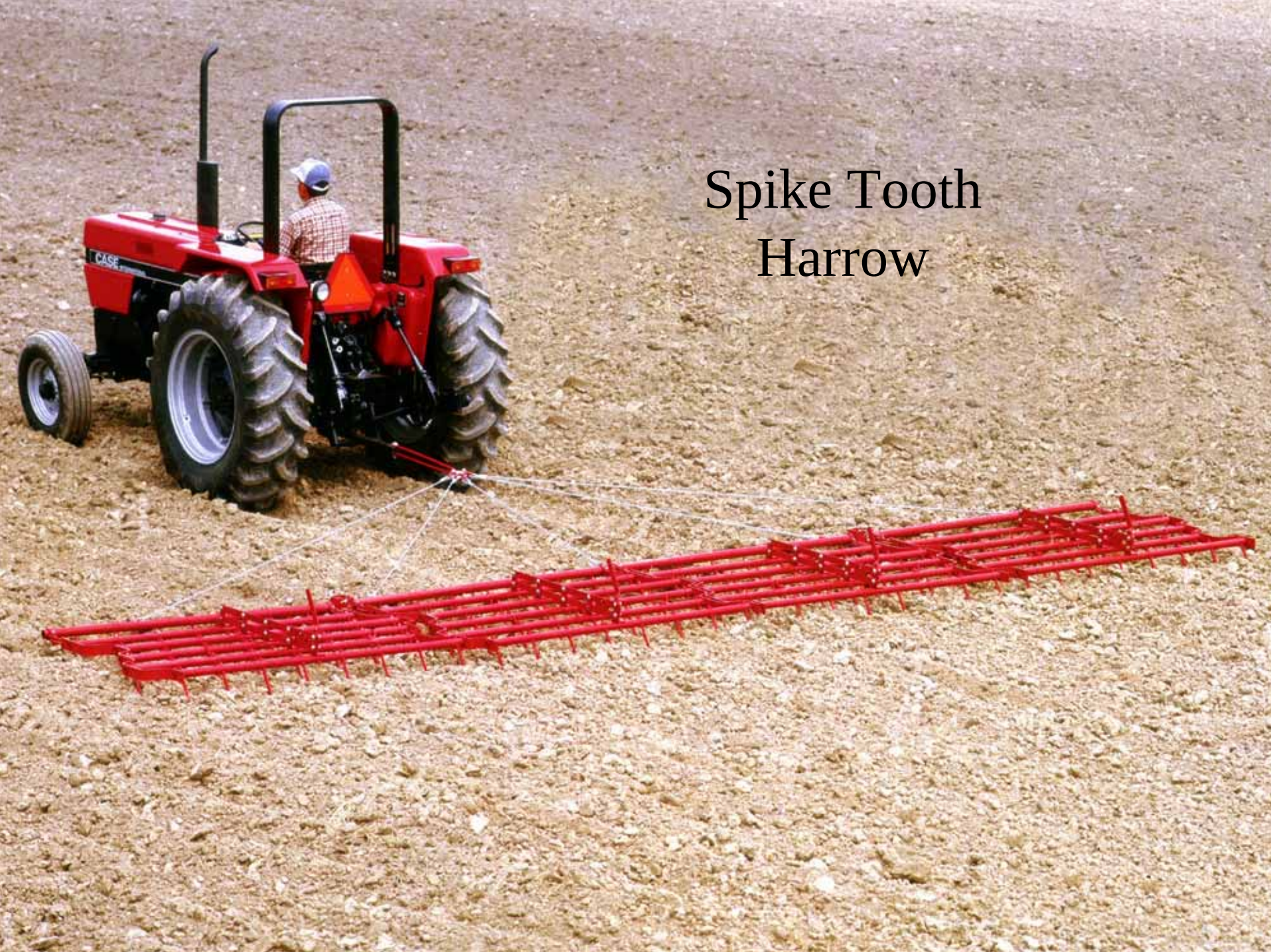
Farm equipment

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 over come the problems later

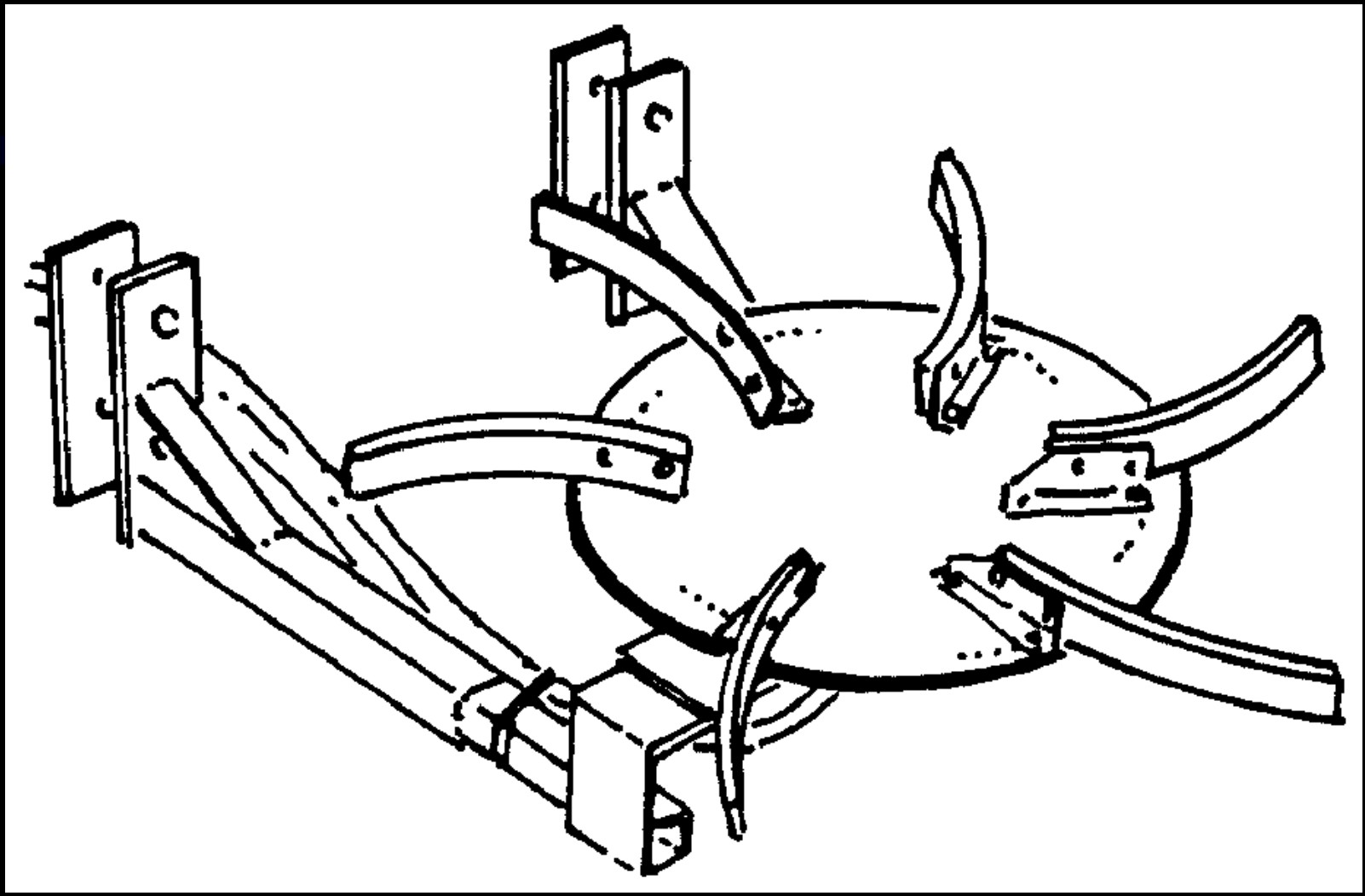
Considerations for Combine Operation

- 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

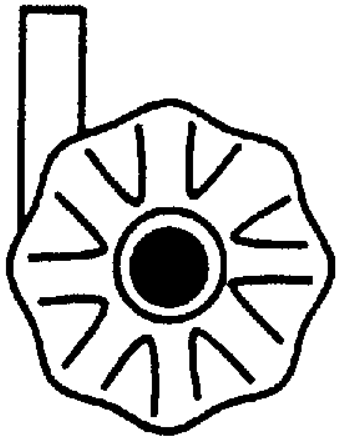
- Surface application often results in loss of nutrients and risk of air and water pollution
- Incorporation is desirable, but disturbs residue and requires lots of power
- Injection is now possible in no-till with new minimal disturbance injection tools such as one from Bazooka

Planting Equipment for No-till

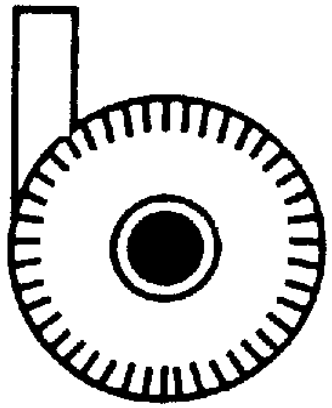
- Purposes
  - open seed furrow
  - meter seed uniformly
  - place seed in the furrow
  - cover the seed
  - firm the seedbed

Coulters

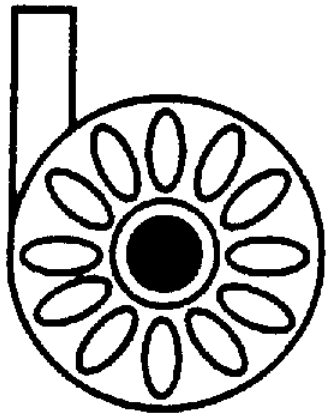
- Cut residue and slice open the seed slot



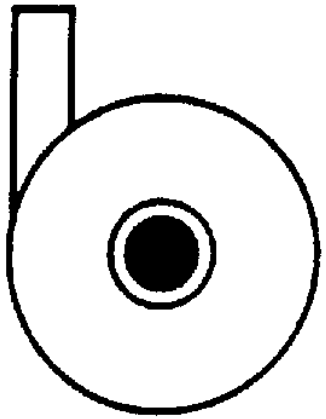
Fluted coulter



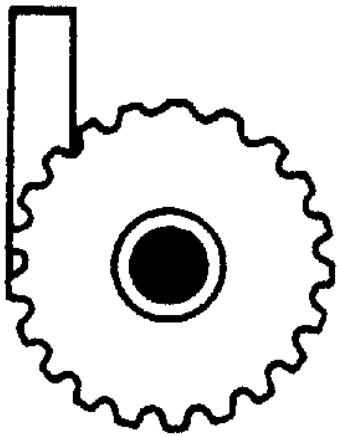
Ripple coulter



Bubble coulter



Smooth coulter



Notched coulter

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

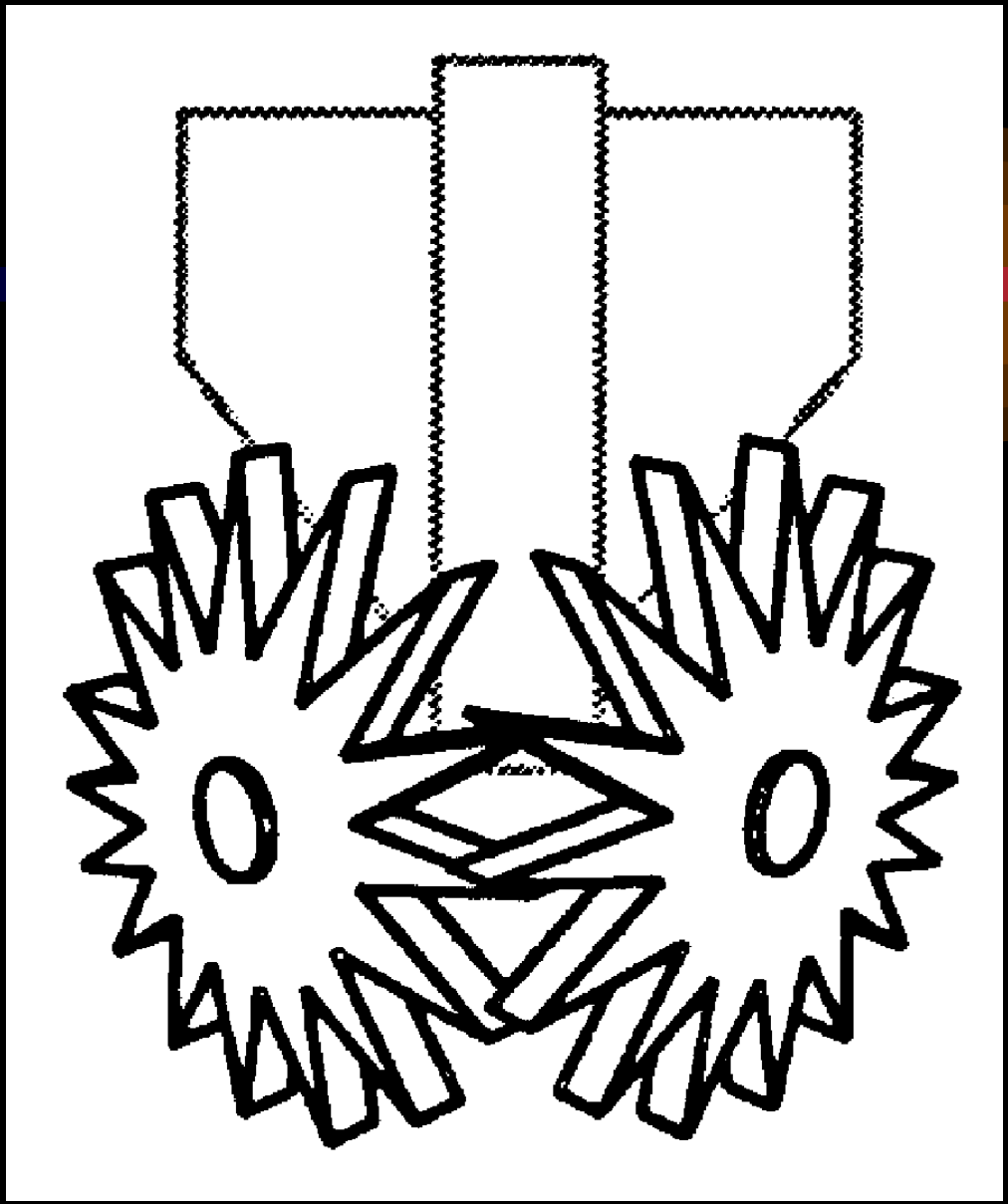
Multiple coulter systems

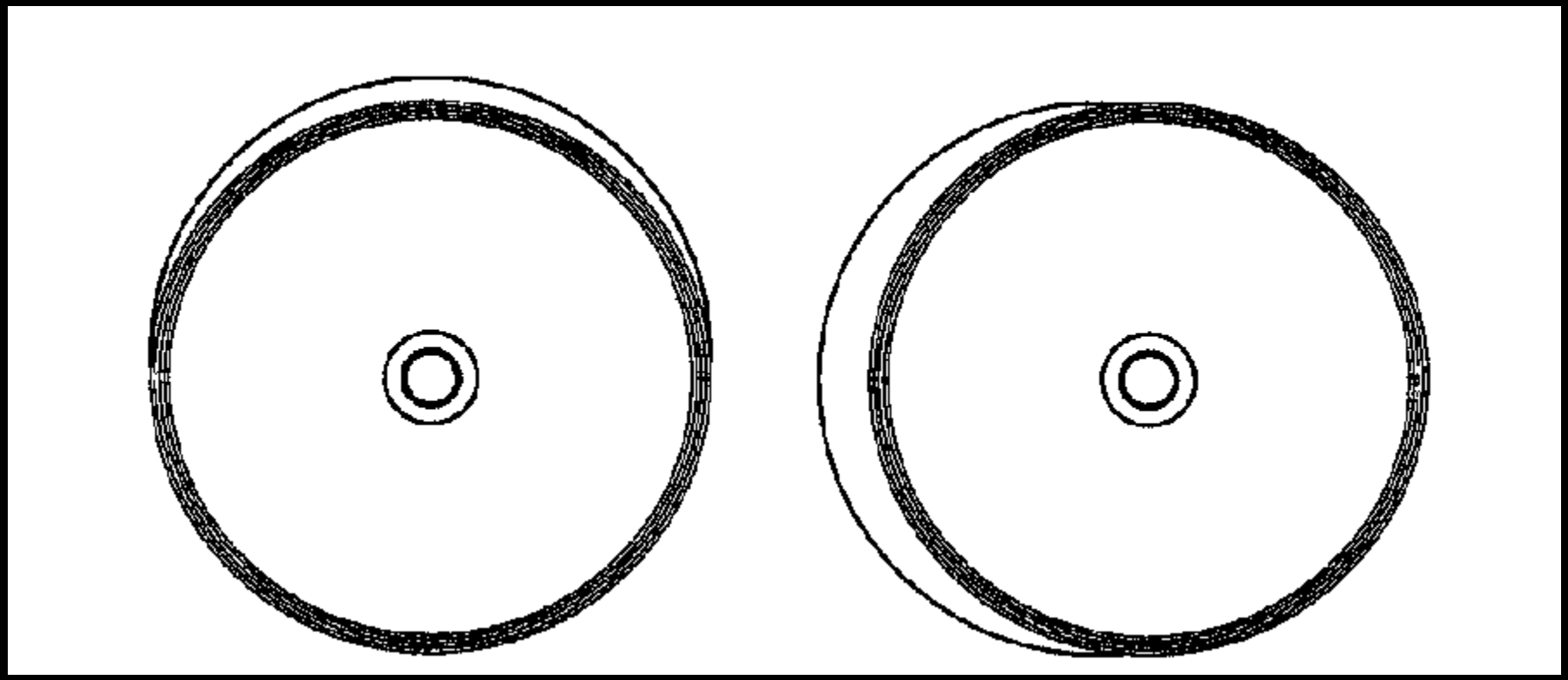
- Till a wider seed zone as in zone till and strip till

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





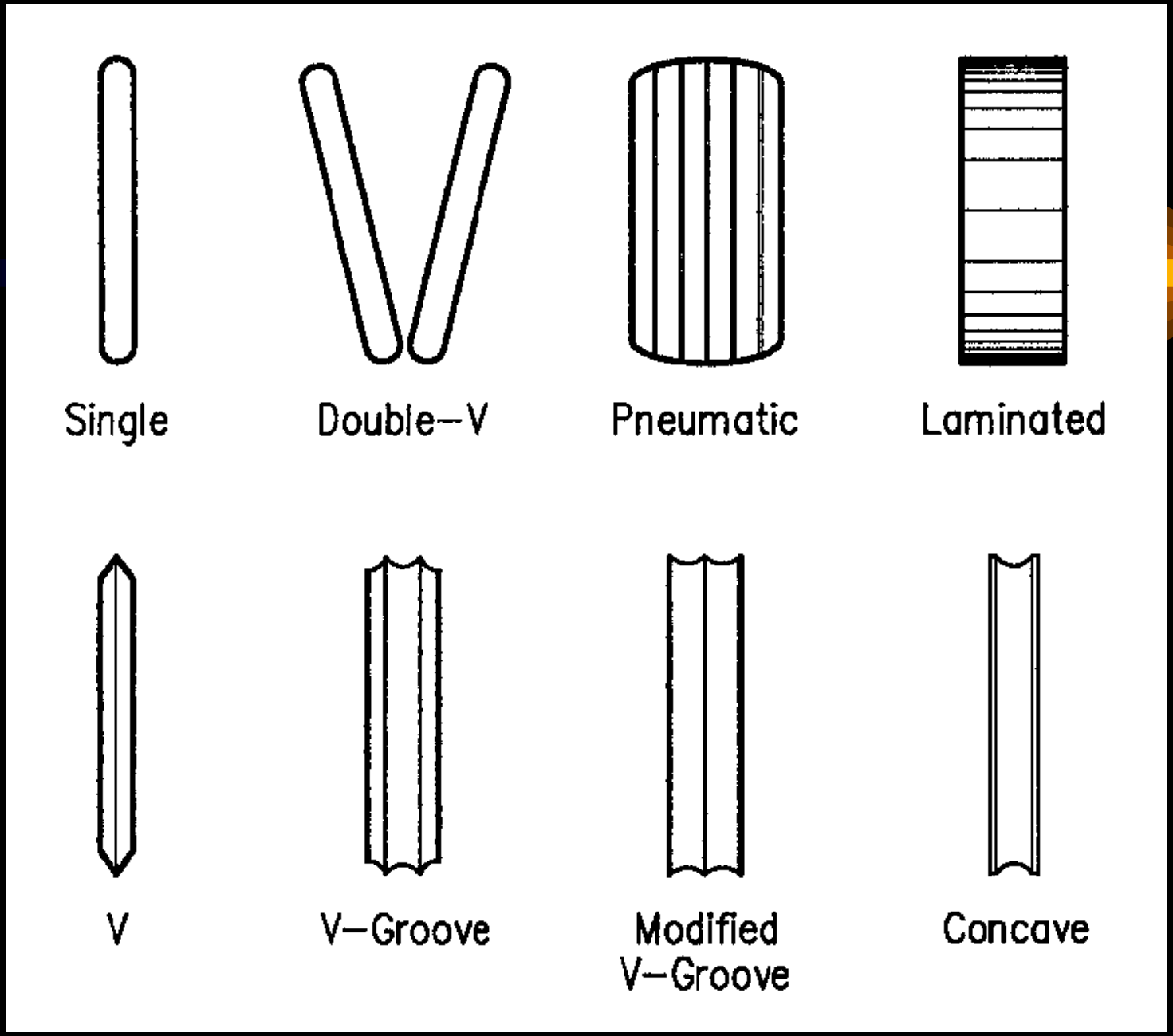
Double Disk

Staggered Double Disk

Gauge wheels

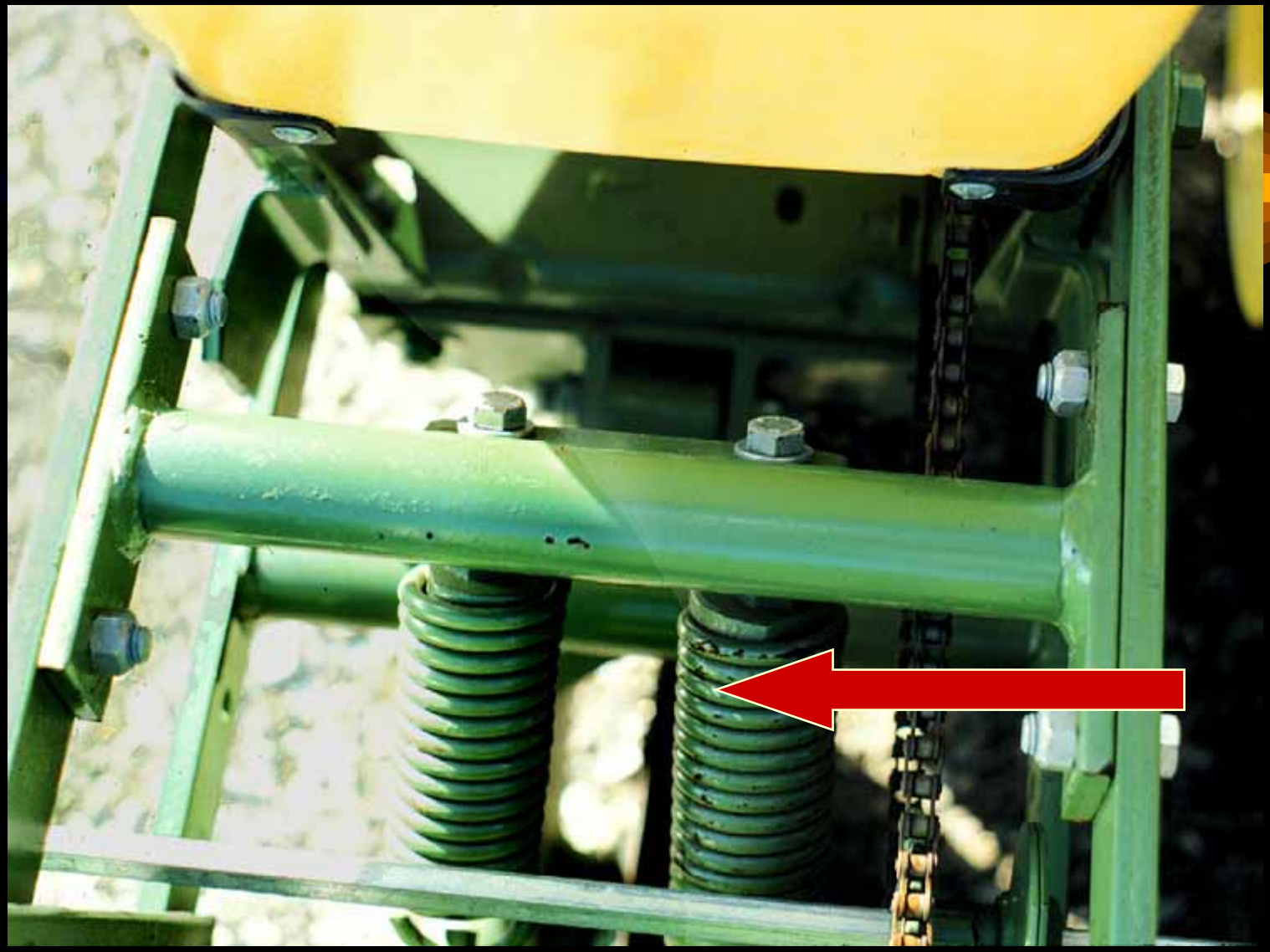
Double press wheels

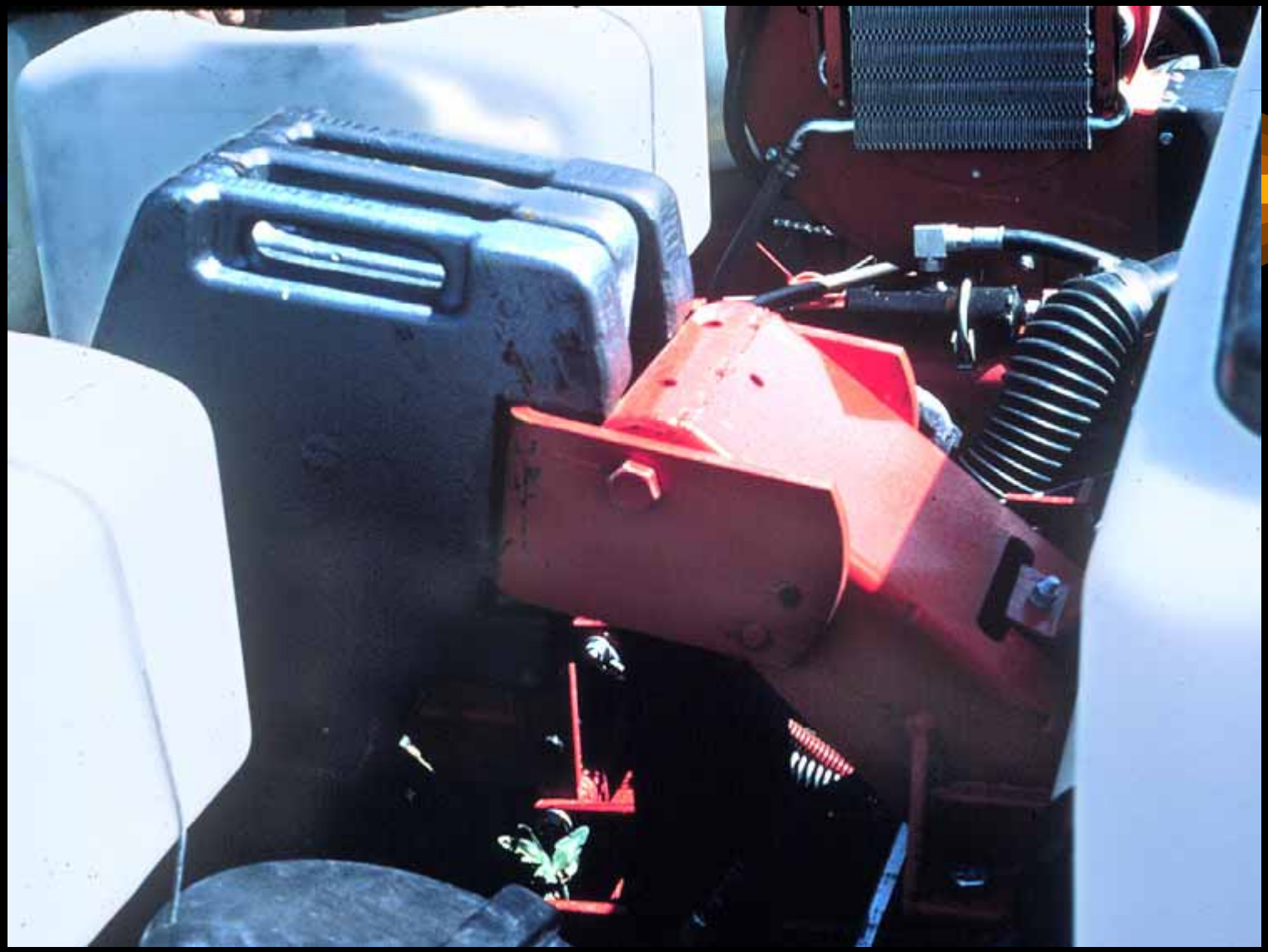
Single press wheel


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

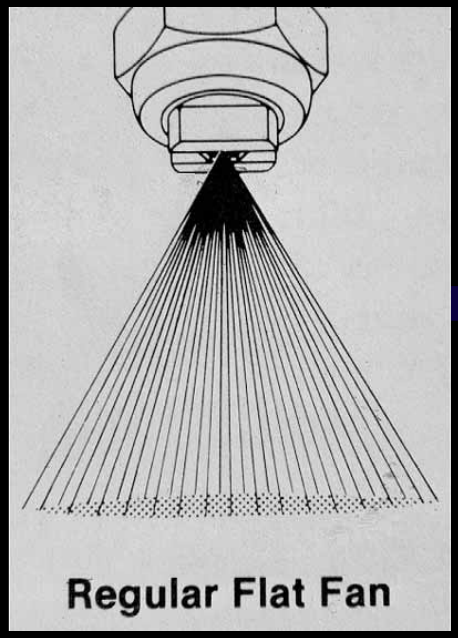
Starter fertilizer 2”
to the side and 2”
deeper than seed

Planter marking systems

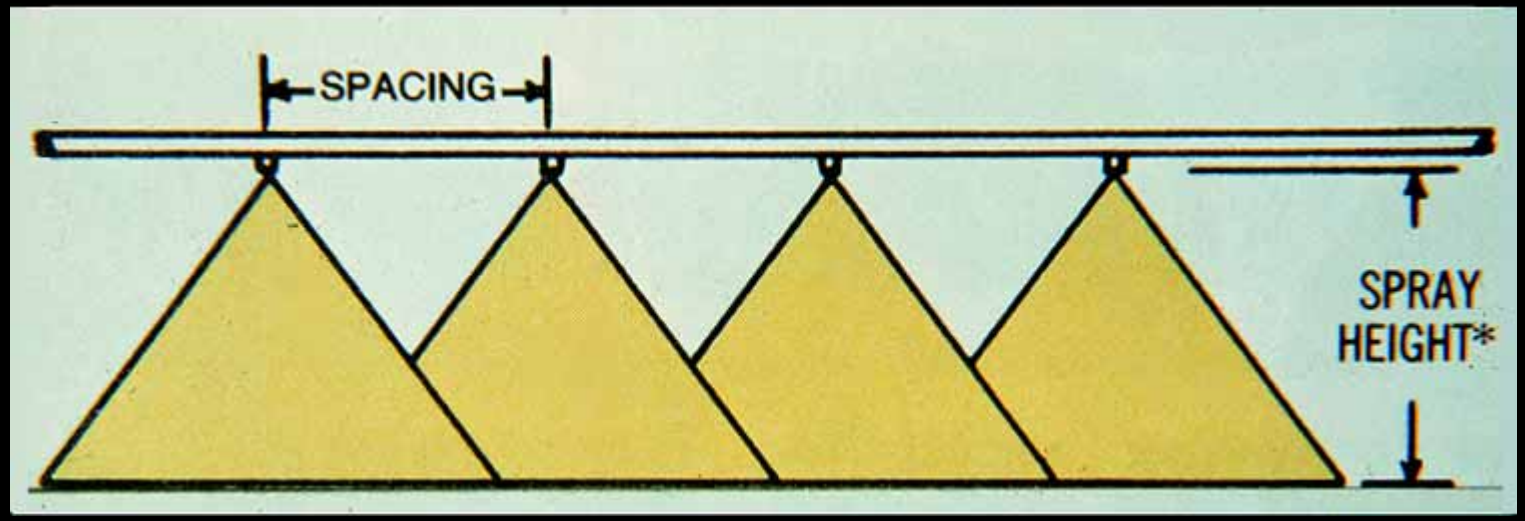
- No-till planter markers need extra weight to cut through residue
- These marks can disturb pesticides and lead to weed escapes

Sprayers for burndown herbicides

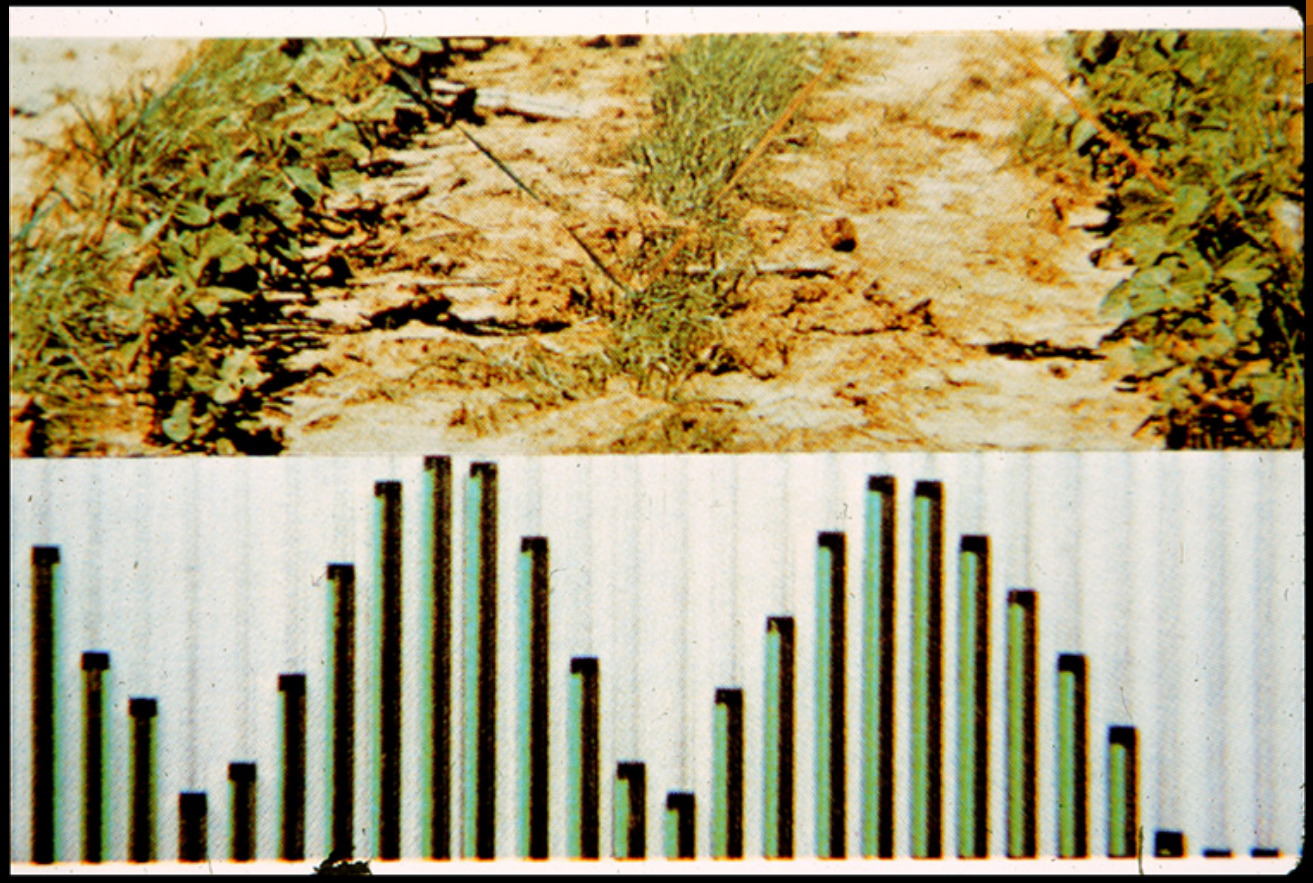
- Select nozzles and set pressure to produce large droplets to prevent drift
  - 8006 or smaller flat fan nozzles with 30 to 50% overlap
  - TK-5 or smaller flood nozzles pointed down with 100% overlap
  - To reduce drift and increase accuracy set the pressure to 20 to 30 psi and cut speeds to less than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



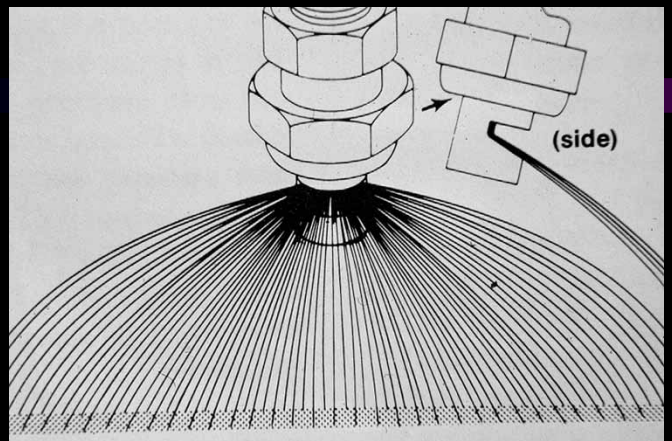
Regular Flat Fan Nozzles



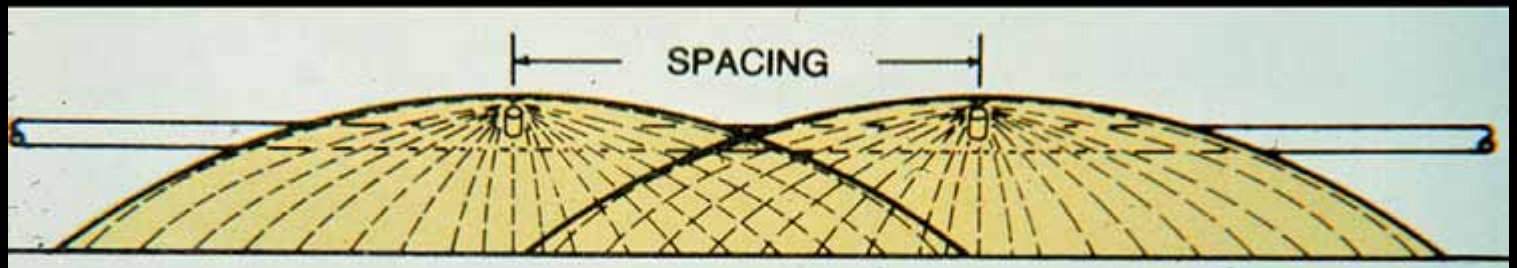
Boom set to close - inadequate overlap causes skips



Flood Nozzles

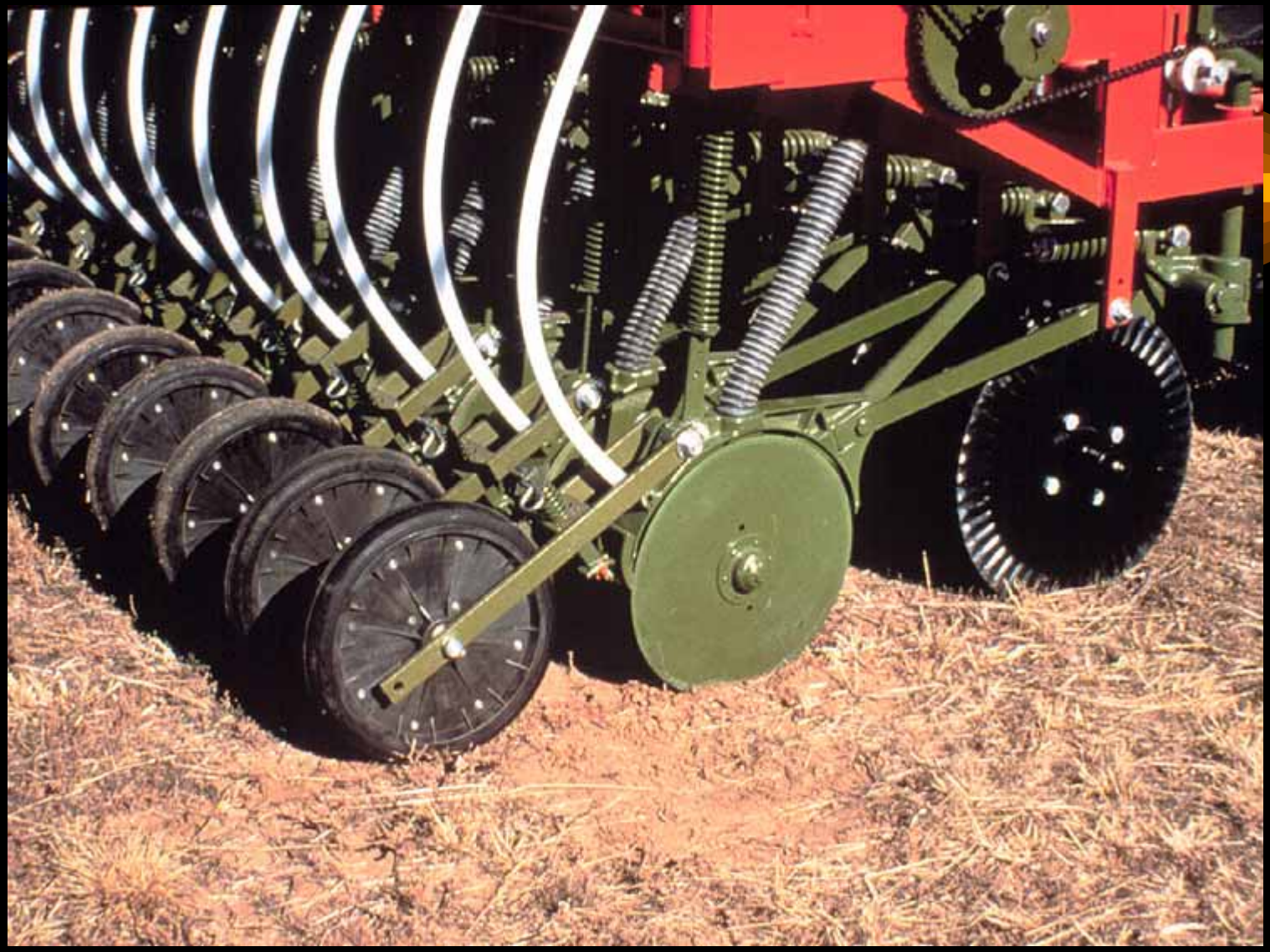


Flooding Flat Fan



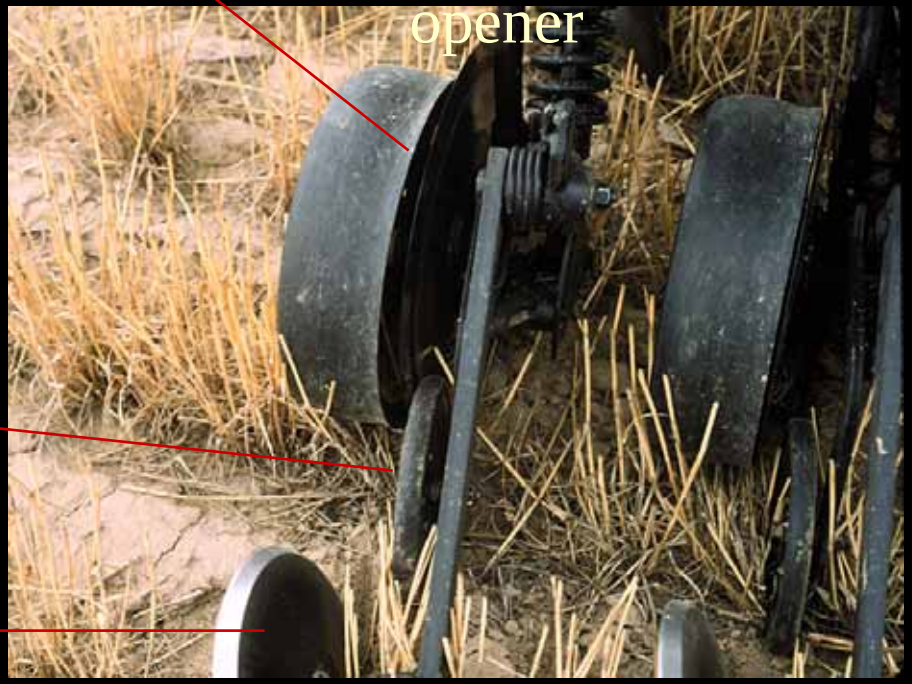
Spray overlap can be varied by raising or lowering boom — and by rotating boom.

Drill with coulter caddy



Single disk Openers

Gauge wheel and single disk opener



Firming wheel

Cast iron press wheel

Air Seeder

Reducing Soil Compaction

Paraplow

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

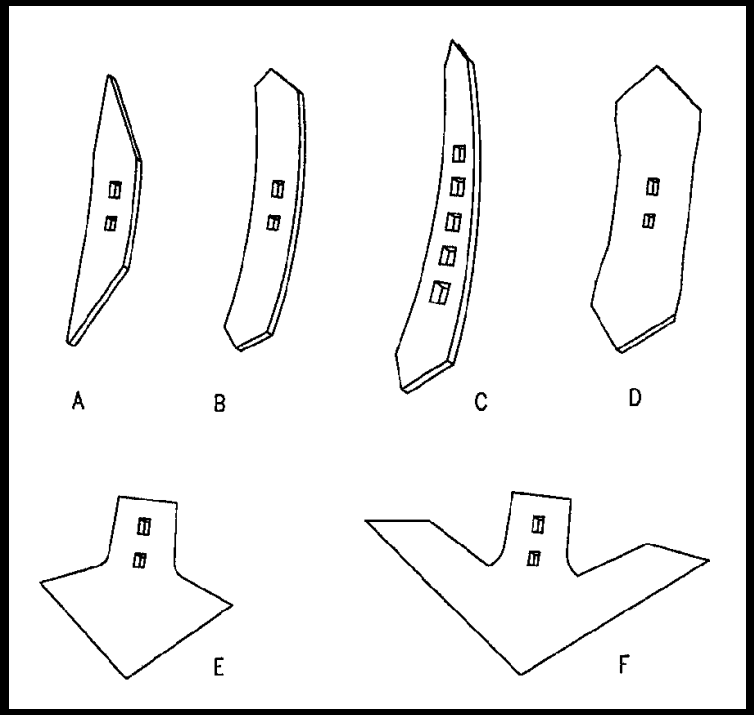
SHANK CHISEL

CASE

Mulch-till Primary operations

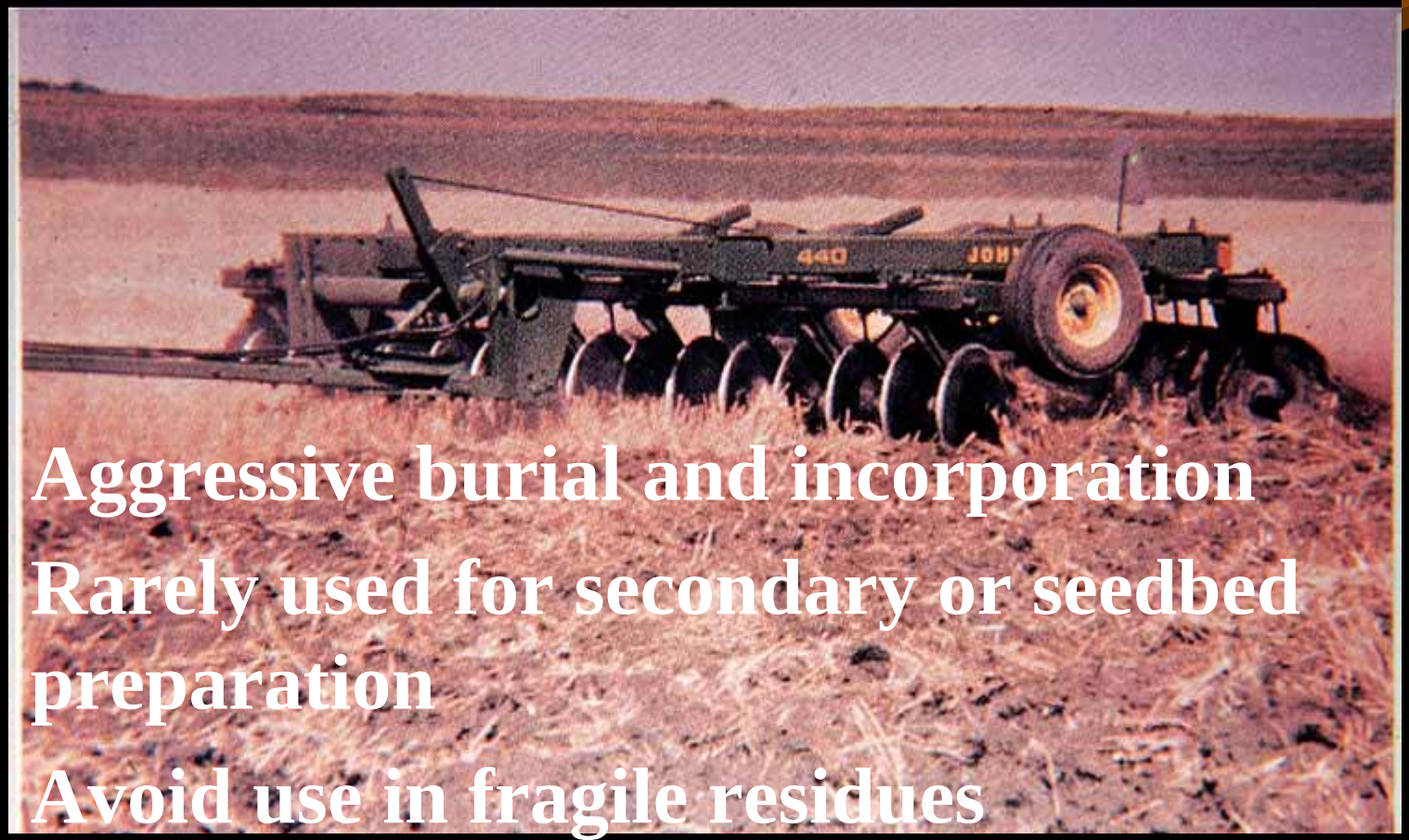
- To loosen and fracture the seedbed
- To cut, size and partially bury residue
- If too much is buried, it is difficult to bring back with secondary operations
- Typical machines
  - Chisel plows, disks, blade plows and in some cases, field cultivators

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**

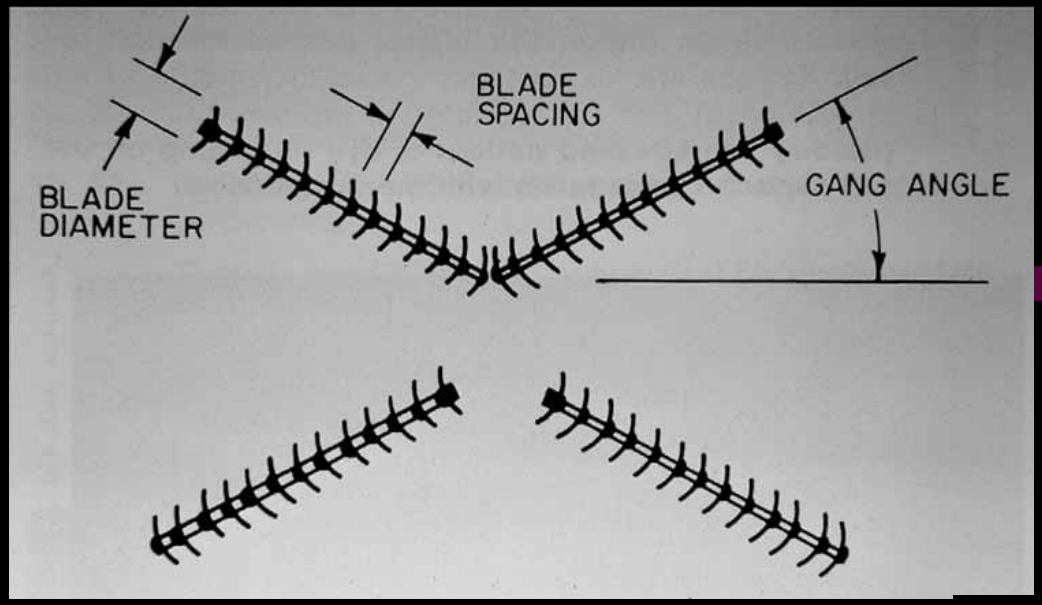
Blade Plows

- 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

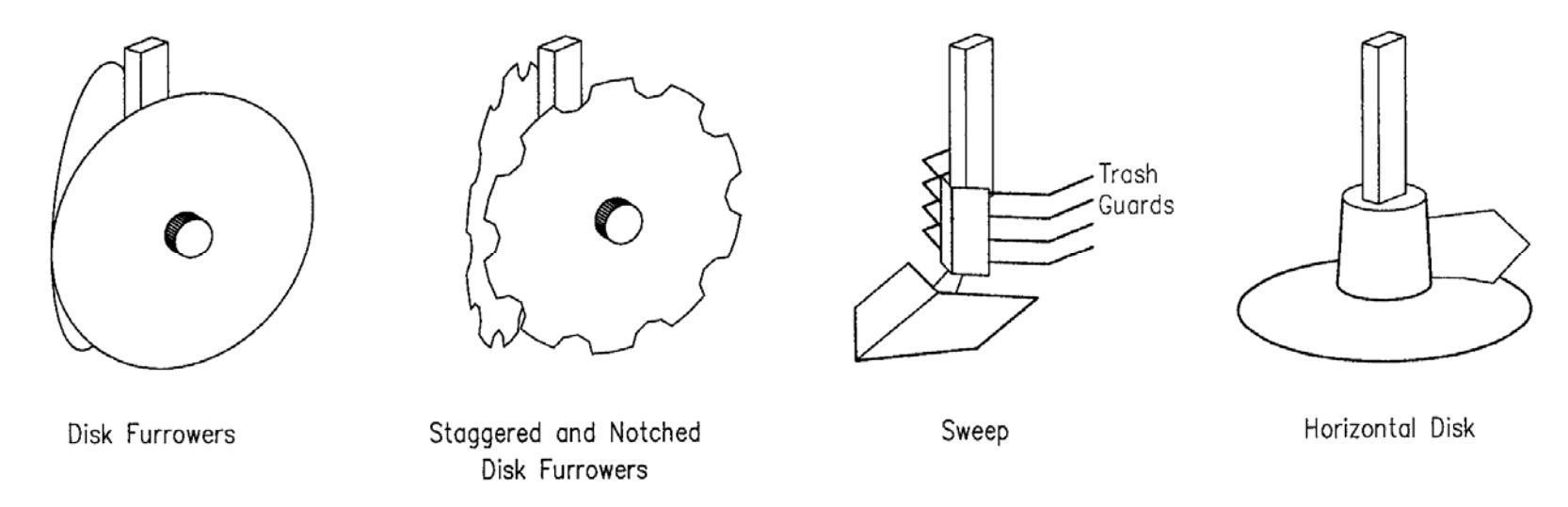
- Similar to strip-till except planting is done on a ridge
- Ridges are rebuilt with row cultivation
- Ridges are preserved until the next planting season

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

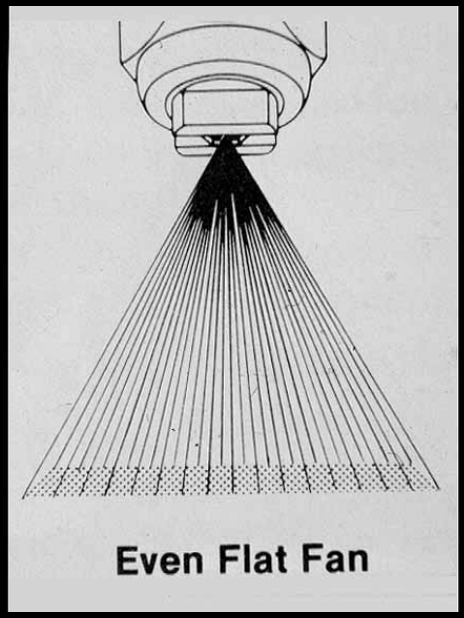
- A row cleaning device is required to skim the top 1 -2 inches of the ridge
- Disk furrowers, staggered notched disk furrowers, sweeps with trash guards and horizontal disks are available



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

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- 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
- worksheets

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

Admin... Close

lp, press F1 R2_NRCS NRCS simple SCI rev030304 mosesmaster05030

RUSLE2 Version 1.17.1.0 (May 6 2004)

File Database Edit View Options Window Help

Auto update

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

Graphic

Rel. row grade, % 100

Long-term natural rough., in. 0.24

Normally used as a rotation? Yes

Duration, yr 1

Build new rotation using this management Open

Rotation builder for this management open

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	Corn, grain	112			
10/10/2	Harvest, killing crop 50pct standing stubble					

Finished calculating

R2_NRCS | NRCS simple SCI rev030304 | mosesmaster050304

Auto update

Profile: OHCBWWNT*

STEP 1: Choose location to set climate: Location USA\Ohio\Franklin County

STEP 2: Choose soil type: Soil ...nklin049_Co_OH\MIB2 Miamian silty clay loam, 2 to 6 percent slopes, eroded\Miamian silty clay loam 85%

STEP 3: Set slope topography: Slope length (along slop 150 Avg. slope steepness, % 6.0

STEP 4a: Select base management Base management CMZ 16\b.Mullti-year Rotation Templates\Corn Fall Plow - Soybeans Fall Plow

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

Management seq

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

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

Graphic

Hel. row grade, %

Long-term natural rough., in. 0.24

Normally used as a rotation? Yes

Duration, yr 2

Build new rotation using this management Open

Rotation builder for this management open

Operations | Info

Management Operations

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		

Profile: Soil conditioning...

Wind & irrigation-induce 0

SCI OM subfactor -0.40

SCI FO subfactor -0.13

SCI ER subfactor -3.6

STIR value 114.6

Soil conditioning index (SCI) -0.9

Results | Additional Results

Soil loss for cons. plan, t/ac/yr 12

T value, t/ac/yr 4.0

Surf. res. cov. values open

Soil conditioning index Soil conditioning index

Finished calculating

R2_NRCS_Fld_Office | NRCS simple SCI 122003 | mosesmaster

start | RUSLE2 Version 1.15.... | Microsoft PowerPoint ...

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.