

Getting to the Bottom of Shallow Tillage

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UNIVERSITY OF MINNESOTA
EXTENSION
Driven to DiscoverSM

Vertical vs. Horizontal Tillage

Horizontal tillage

- Chisel
- Cultivator
- Strip tiller
- Ripper

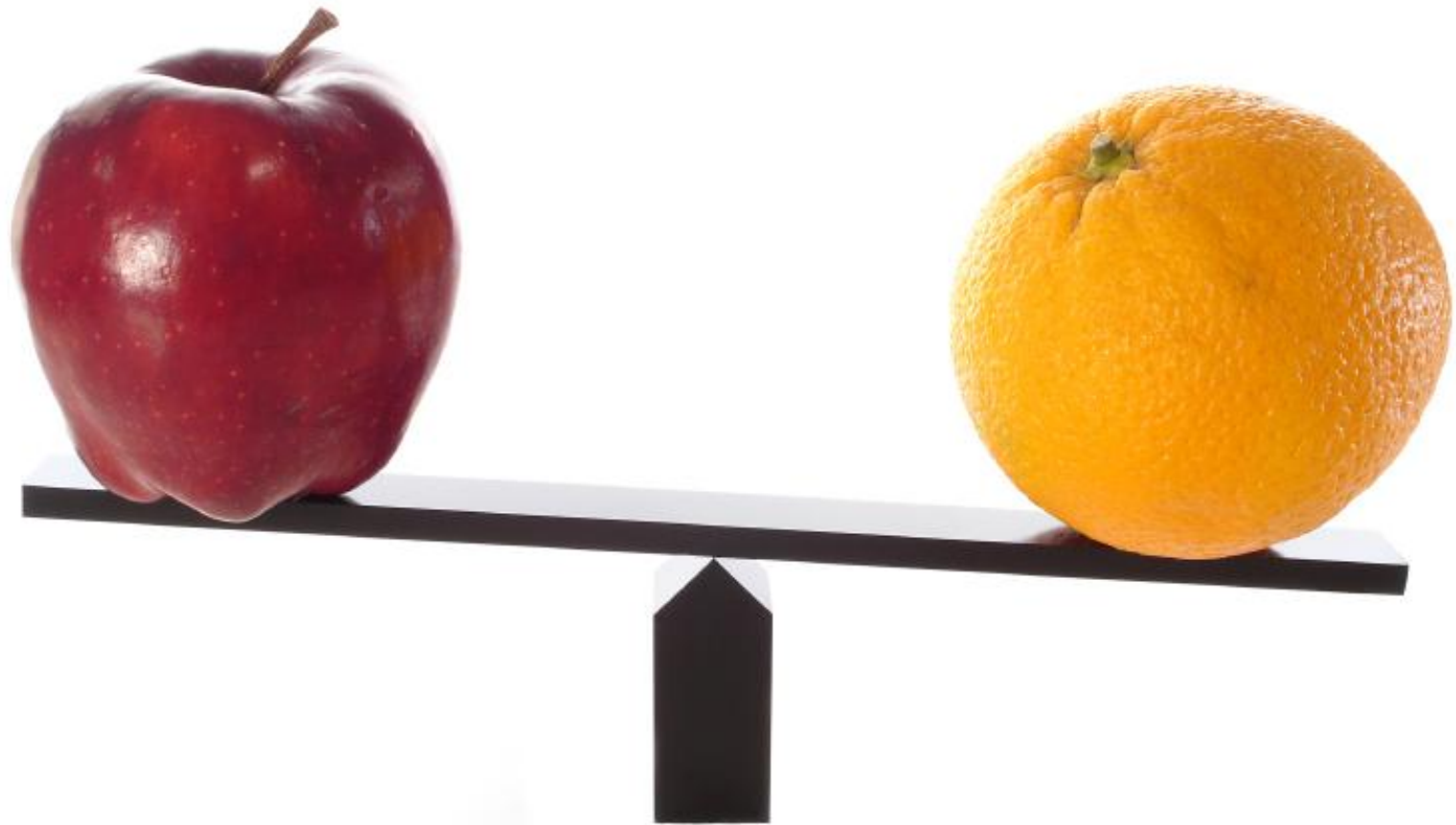


Vertical tillage

- Super coulter
- Straight shank



Differences in Equipment





Coulter



Disk



Shank

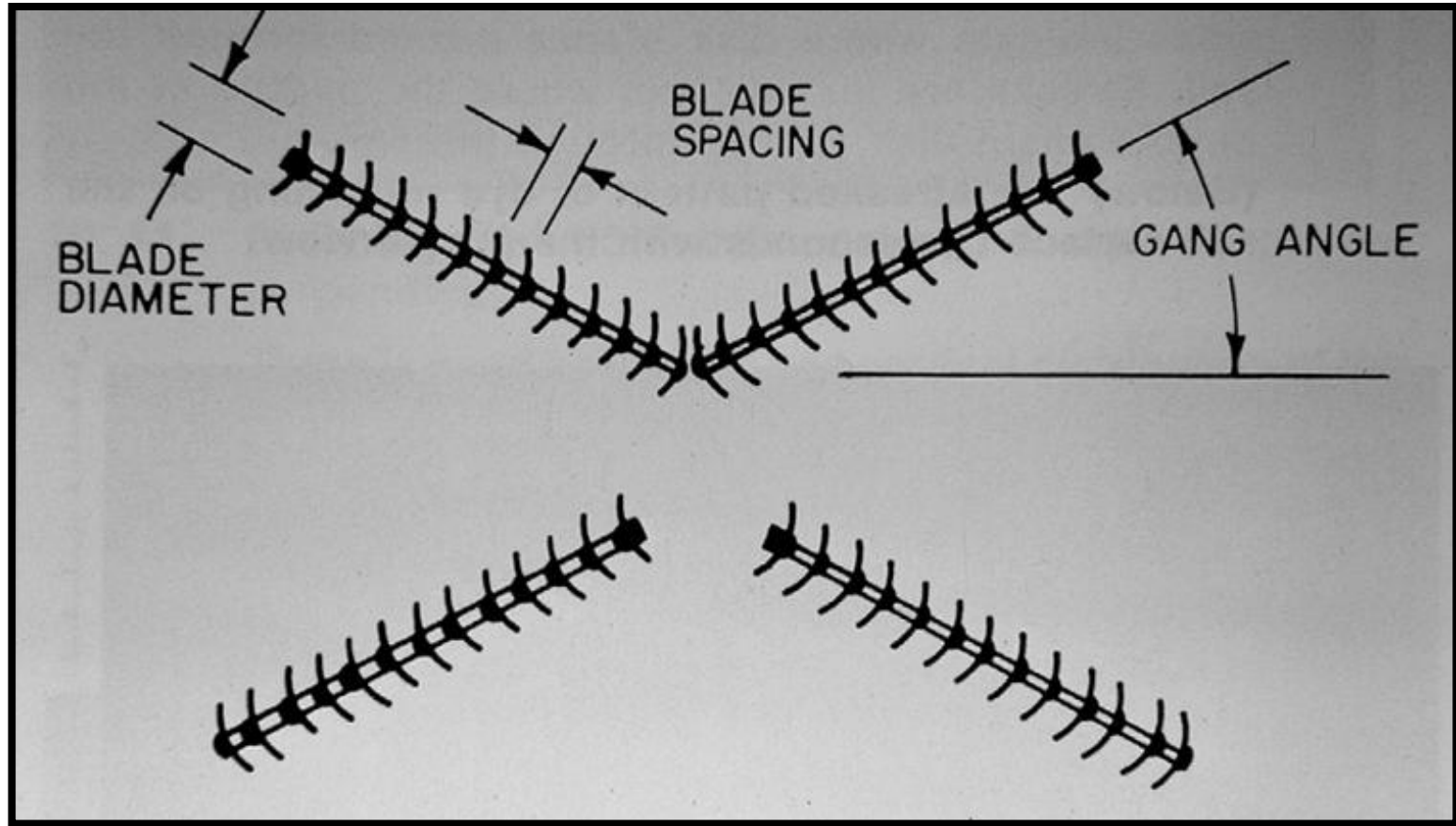
Purpose ~ mixing, depth and aggressiveness

Individual vs. Gang Mounted



Purpose ~ down pressure
and rocks

Straight **vs.** pitched **gangs**



Purpose ~ mixing, aggressiveness and area covered



Harrows,
Rolling Baskets,
...

Purpose ~ finishing and smoothing

Vertical Till



Classified as mulch till
(shallow, full field tillage)

Benefits of Vertical Tillage:



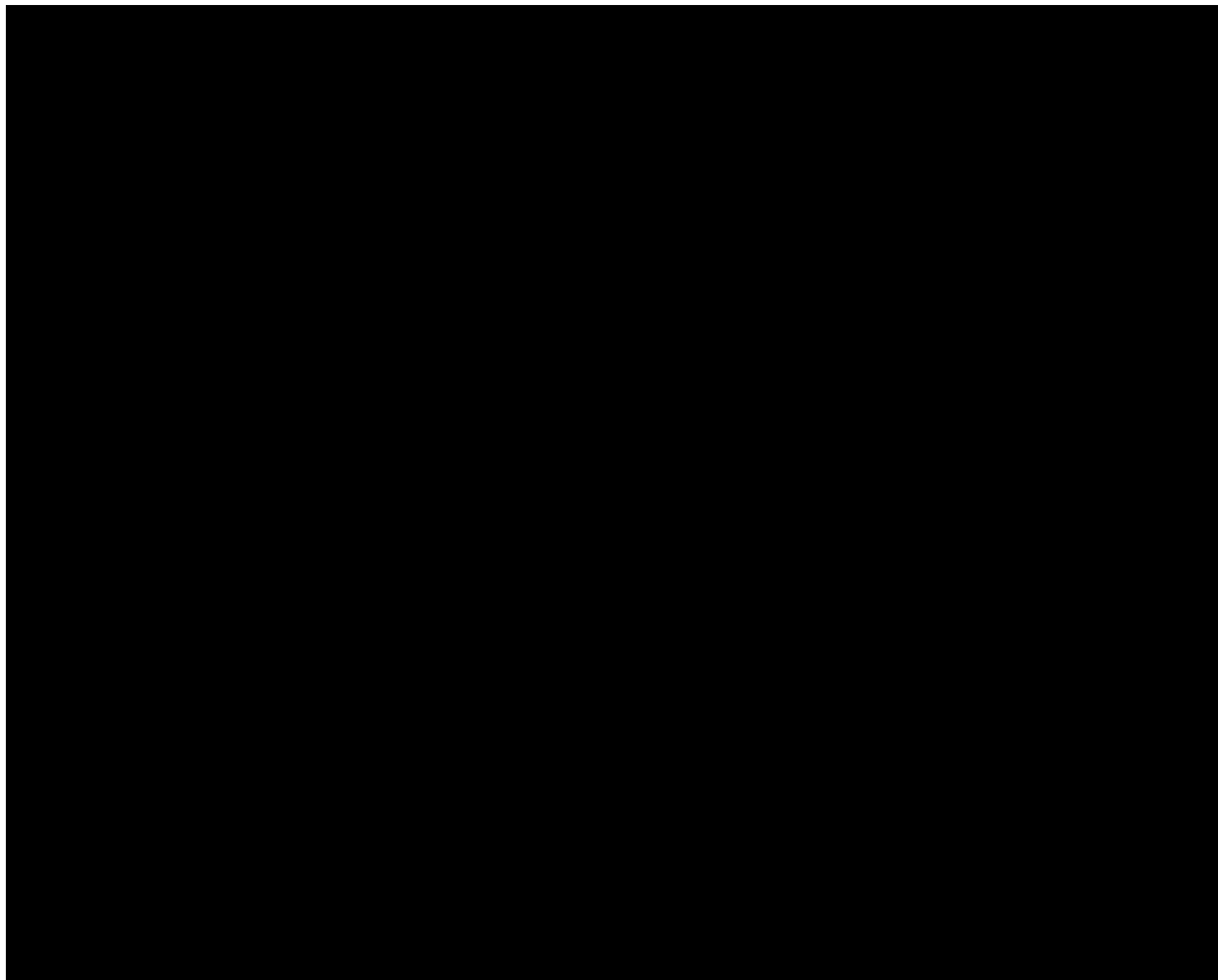
Can get into **wet** fields



Chops and
sizes residue



Leaves some residue intact



Primary *and* secondary tillage





Speed - 7 to 10 mph

Vertical Tillage Requirements:

10 hp per foot

More for hills, dry soil, ...





Challenges for VT
~ ***Incorporation***

Fertilizer incorporation



Weed pressure

ST

VT



VT in Dry Soil

Disk

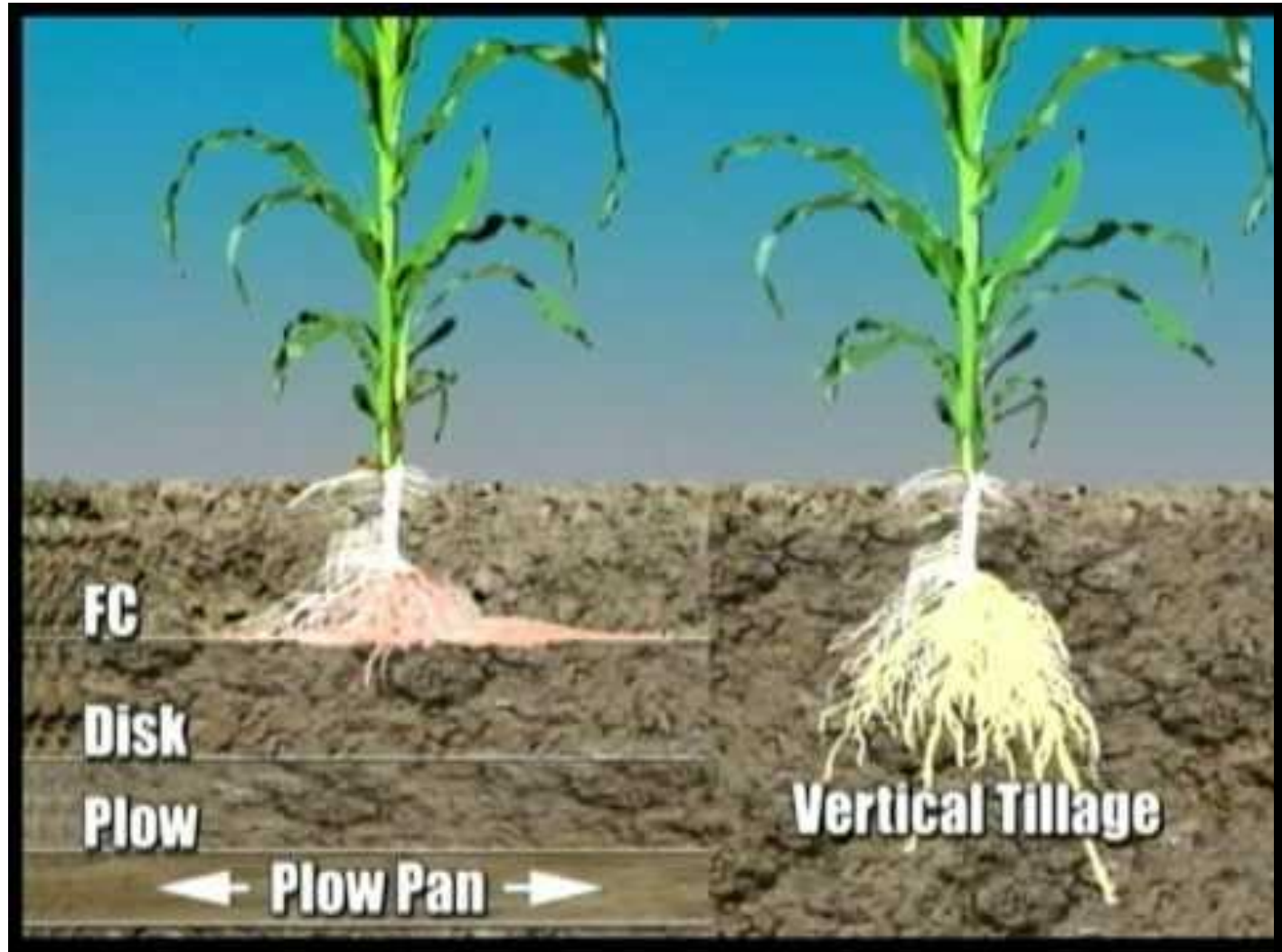


September, 2012

Wavy Coulters

* 1 inch of rain in 3 months, late July to October, 2011

Breaking up Compaction?

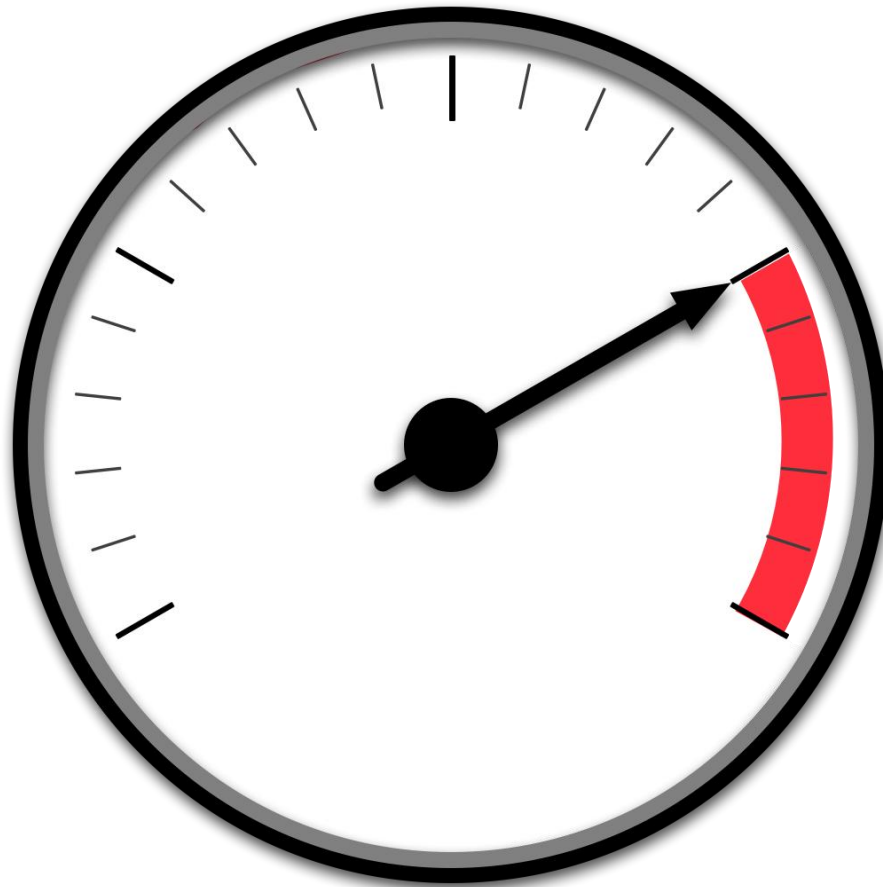




Vertical Tillage Management

Get up to Speed!

- Too slow - won't get enough mixing
- Too fast - float up out of ground





In Line VT?

Field Cultivator





Even Seed Bed Prep



3-4" Depth

Even mixing
of soil



Good fertilizer
and weed
incorporation

Challenges:

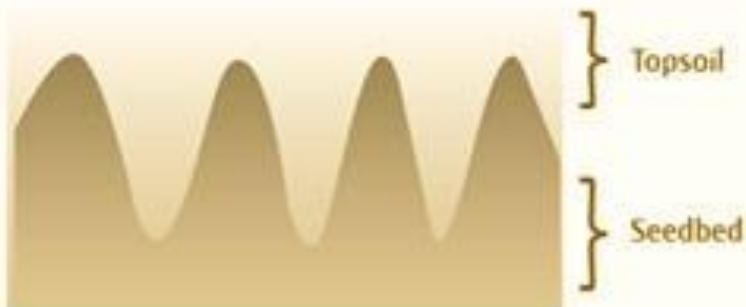
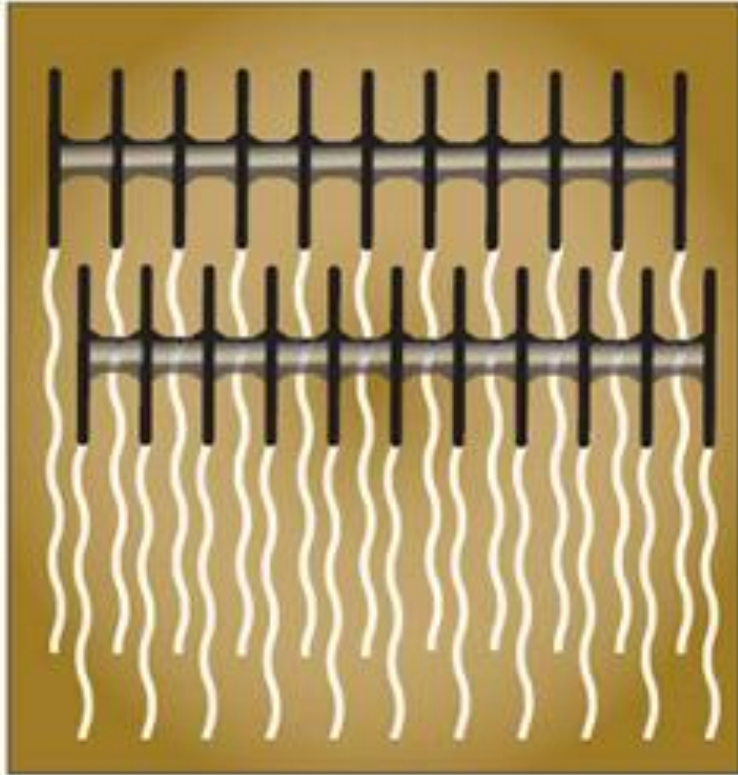
30% residue remaining



Smearing in a Wet Soil



Shallow Disk



Levels and firms the seedbed



Great at sizing residue and clods

Too good



Buries more residue than other
2° tillage tools



Challenges for a Disk

- Loss of soil structure
- More compaction
- Less residue



Disks in Dry Soil



Cons

Pros





Soil Finisher



Even
mixing of
soil and
residue

Chops and incorporates
a lot of residue



Benefits and Challenges of 2 Systems

- ½ disk
- ½ field cultivator



3 Year Tillage Research

- Fall of 2009
- Carlisle and Clarkfield, MN
- Looking at varying residue levels



Soybean Data - Clarkfield

	3 Year Soybean Average		
	Residue (% after planting)	Yield (bu/ac)	Cost (\$/ac)
Tillage Rotation			
Strip Till	64	50.8	\$14.60
Salford 2 Passes	49	51.3	\$19.72
Salford 2 Passes (prev. tillage chisel plow)	50	49.5	\$19.72
Chisel Plow + FC (prev. tillage disk rip)	50	49.6	\$20.48
LSD (0.10)	*	NS	---

Corn Data - Clarkfield

	3 Year Corn Average		
	Residue (% after planting)	Yield (bu/ac)	Cost (\$/ac)
Tillage Rotation			
Strip Till	43	153.8	\$14.60
Salford 2 Passes	26	156.0	\$19.72
Chisel Plow + FC (prev. tillage Salford)	29	151.5	\$20.48
Disk Rip + FC (prev. tillage chisel plow)	32	153.3	\$28.15
LSD (0.10)	*	NS	---

Corn Data - Carlisle

2 Year Average		
	Residue	Yield
Tillage Rotation	(%)	(bu/ac)
Field Cultivation (prev. tillage NT)	37.3	157.2
Strip Till (prev. tillage NT)	62.3	163.7
Salford at 3" Depth (prev. tillage VT)	60.0	145.3
Summers Super Coulter at 1" (prev. tillage VT)	73.7	134.5*

Detriment of Shallow Tillage



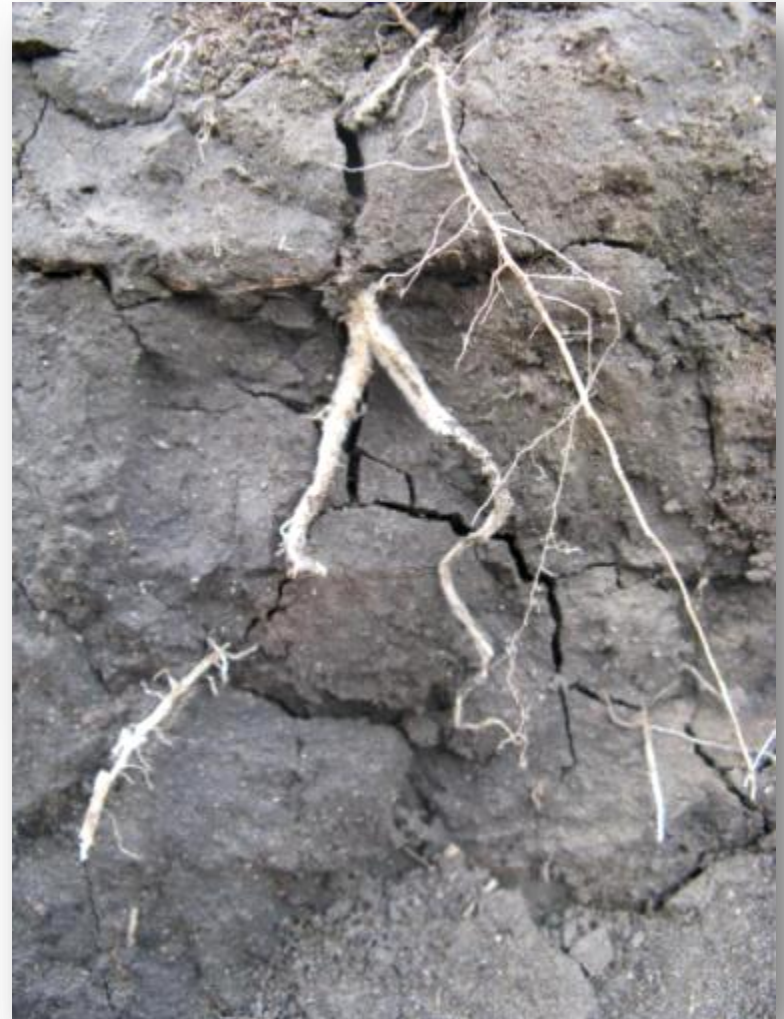
Soybean Data - Carlisle

	Residue	Yield
Tillage Rotation	(%)	(bu/ac)
No Till (prev. tillage Field Cultivation)	81.0	57.7
No Till (prev. tillage Strip Till)	78.3	56.9
Salford VT (prev. tillage VT)	70.0	57.8
Summers Super Coulter (prev. tillage VT)	71.0	58.1
LSD (0.10)	7.2	NS

Importance of Good Soil Structure



Soil structure is your
#1 defense against
future compaction



Create Soil Structure by:

- Build or maintain organic matter
- Maintain >30% residue coverage
- Increase crop rotation
- Add organic inputs
(compost, livestock and green manure, cover or companion crops)

Destroy Soil Structure by:

- Tillage (recreational, aggressive)
- Tight crop rotation
- Compaction
- No carbon or residue input
(ex. burning)



Kansas State Pilot Study

	Bulk Density		Infiltration (mm/hr)	Corn Yield (bu/ac)
	0 - 2"	2 - 4"		
Vertical Till	1.13	1.29	21.4	167.1
No-Till	1.21	1.30	44.0	165.9
P Value/T test	0.08	NS	0.04	NS

VT at 2" depth - Case 330 Turbo Till

NT field since the 1980's (beautiful soil properties)

No density increase below the depth of tillage (2")

Where to **Try** Vertical Tillage

- Sizing residue and introducing air
- Wet Spring or Fall

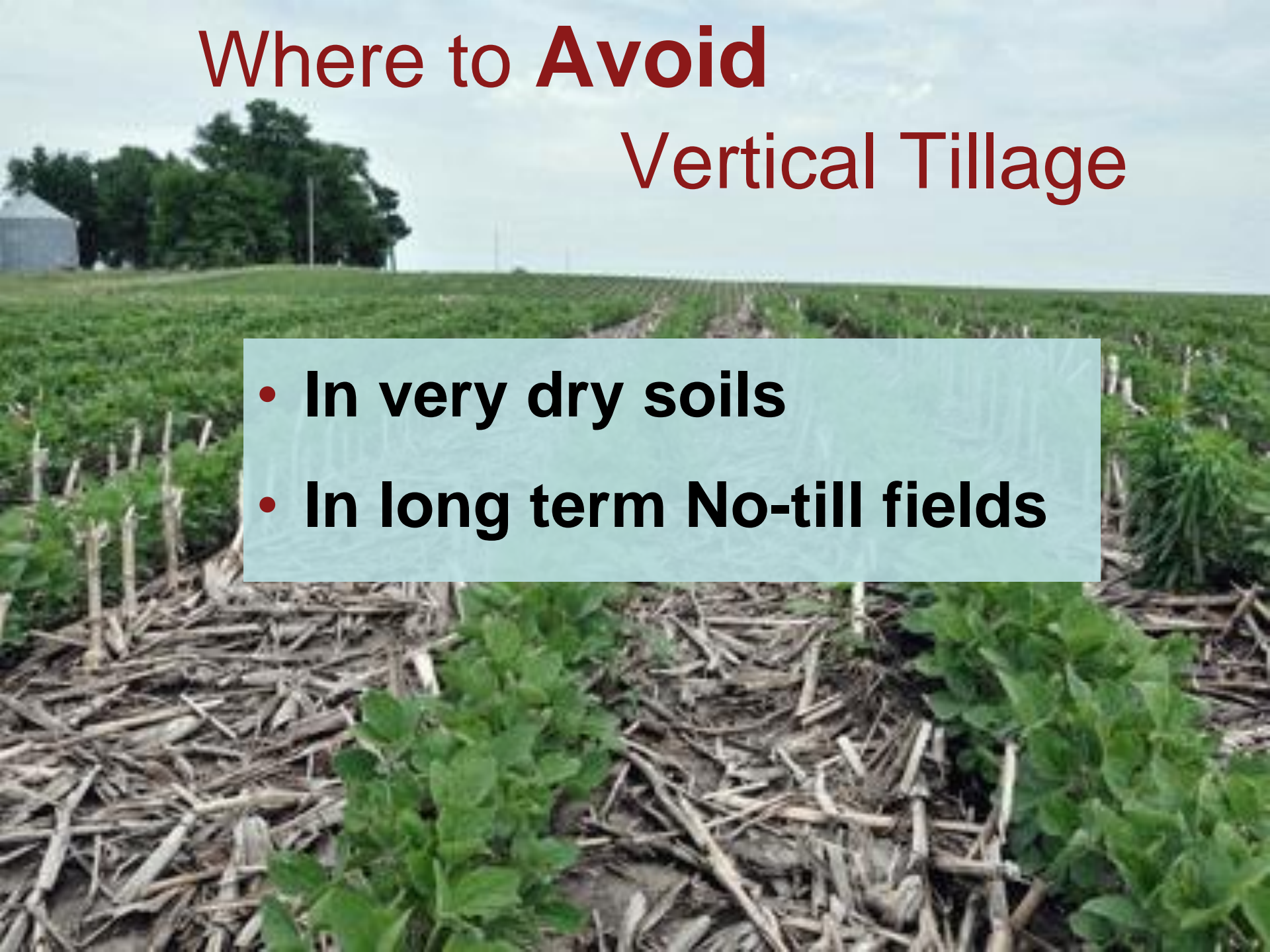


Where to Try Vertical Tillage

- Decrease residue build-up in reduce till systems
- 50-60% of corn residue = good on slopes

Where to **Avoid** Vertical Tillage

- **In very dry soils**
- **In long term No-till fields**



Questions?

