

Farm Machinery Pros & Cons

Ben Covington and Teresa Middleton

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Overview

- Understanding a typical corn/soybean growing cycle
 - What equipment is used and when
- Low Hanging Fruit – First step in understanding sustainability
 - How are nutrients being applied to your Farm
 - Who's doing it
- Common Equipment
 - “old school” – Cheap Reliable Effective
 - “Data Driven Tillage”- Applying the right amount on the right acre
- Opportunities for conservation “**Going Green**”
 - Cover Crops - Making them work for you and not the other way around



Where does the water flow?



Fall in Central Iowa

“So... where is my fertilizer and topsoil again?...”

Heavy spring rains can paint a different picture rather quickly



How far can we spread fertilizer?



Ice Breaker Demonstration

Need Two Volunteers

Rope 35' long

Two 5 gallon Buckets

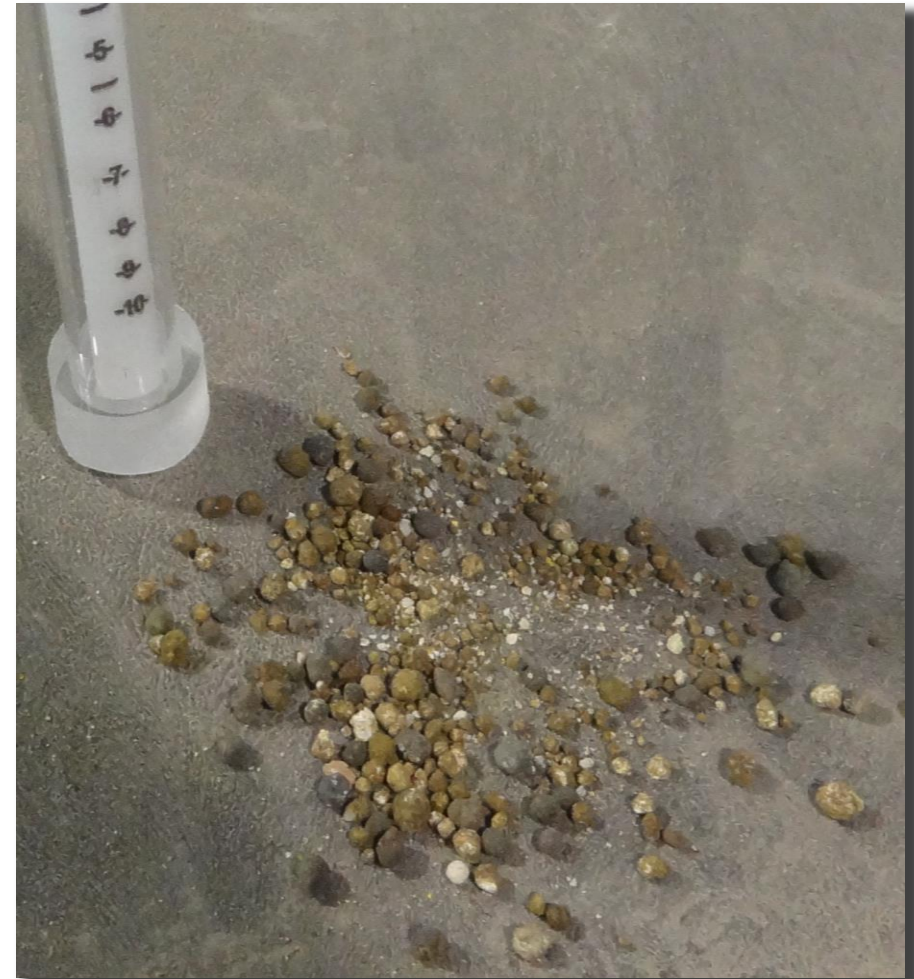
- Tennis Ball
- Whiffle Ball
- Ping pong Ball
- Golf Ball

Laws of Physics for Fertilizer Application

What determines how far a fertilizer particle is thrown?

1. Initial speed of the particle.
2. Initial height and trajectory of the particle.
3. Mass of the particle.
4. Shape of the particle.

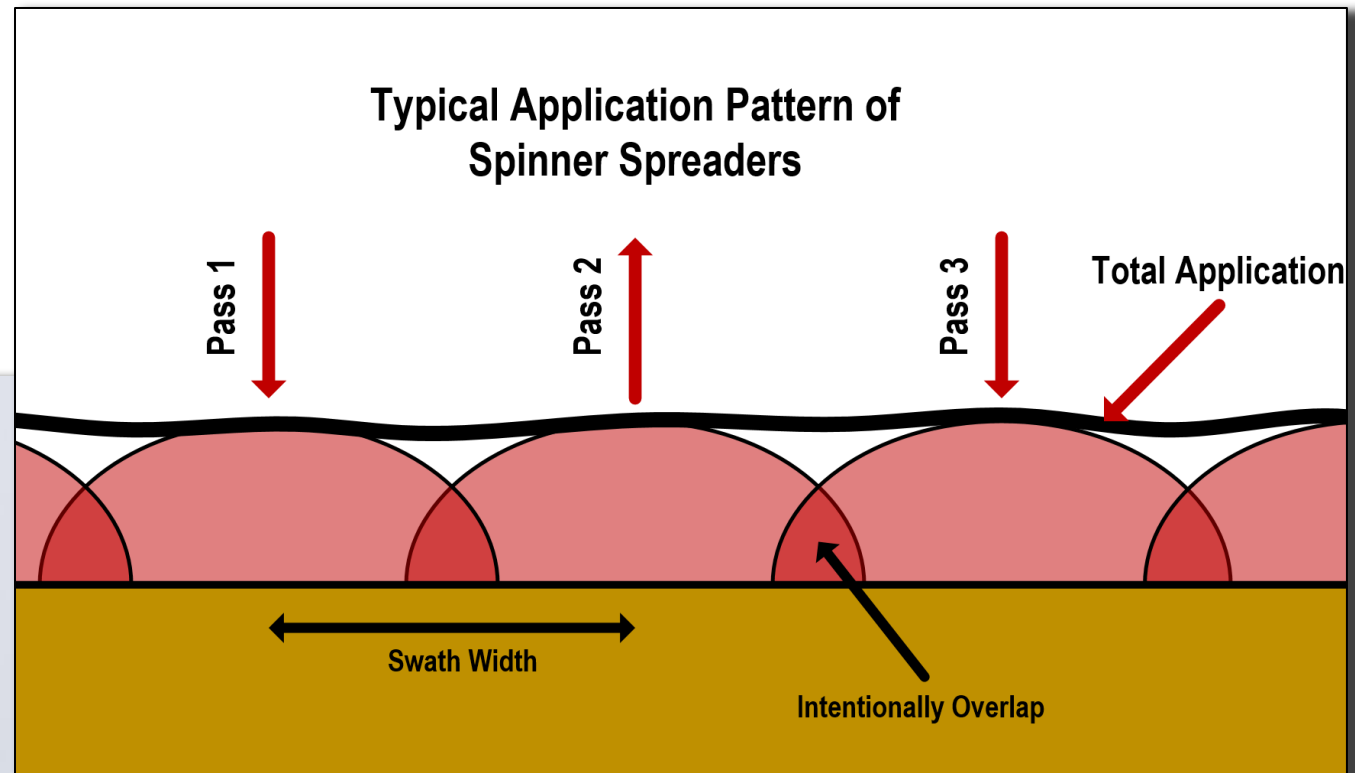
Routine Fertilizer Testing to Alert Changing Product Conditions



Spread Distribution Pattern with a Spinner Spreader

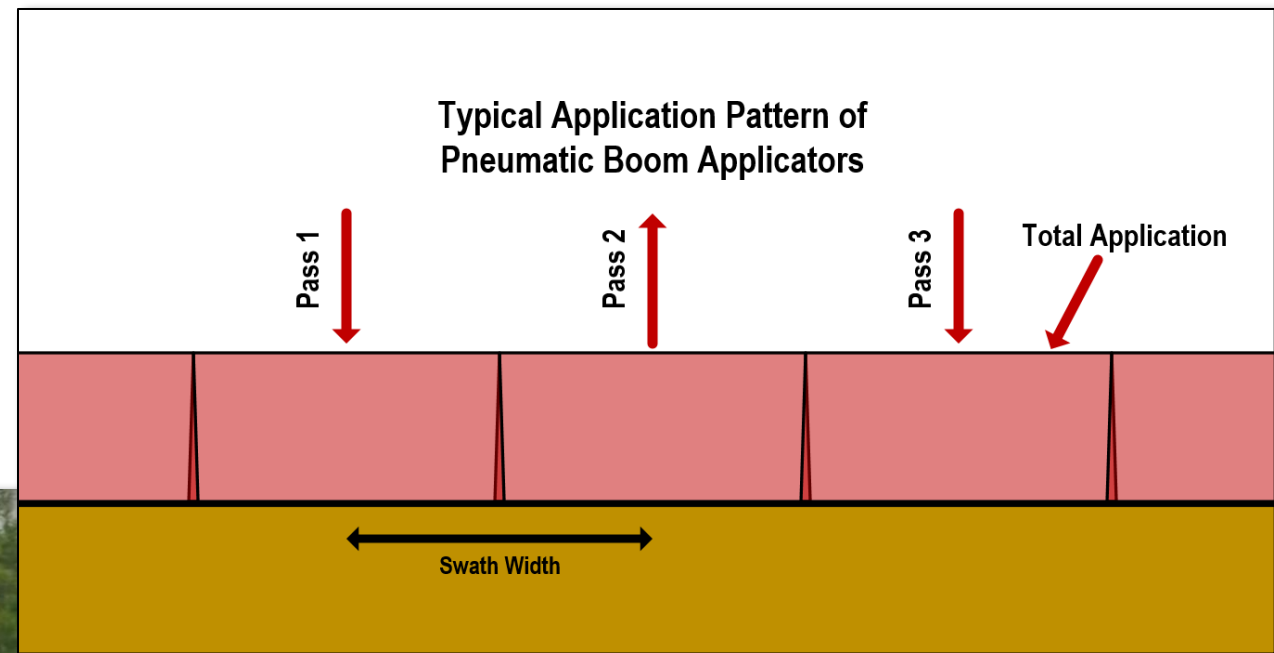


New Leader
L4500G4 Spreader



- Cost Effective and highly productive
- Low Maintenance
- Versatile box for multiple products
- Ease of operations

Spread Distribution Pattern with a Pneumatic Spreader



John Deere AB30
Pneumatic Spreader

- Fixed boom length
- Dual Sectional Control
- Ability to spread in windier conditions
- Ability to spread multiple products of variable densities
- Better Coverage and reduction of overlap
- Higher initial and Maintenance cost

Pneumatic Soil Applicator



- Individual Sectional Control
- Direct soil injection
- Ability to apply products of variable densities
- Higher initial and Maintenance cost
- Less productive than “floater” machine
- Dependent on soil condition for adequate application
- Allows for a reduction of nutrients

Are you setting your spring up for success? How does your field compare heading into spring?

Two fields approximately two miles apart
Madrid Iowa 2022



May 7th



May 10th

Moldboard Plow



“Old School” Tillage

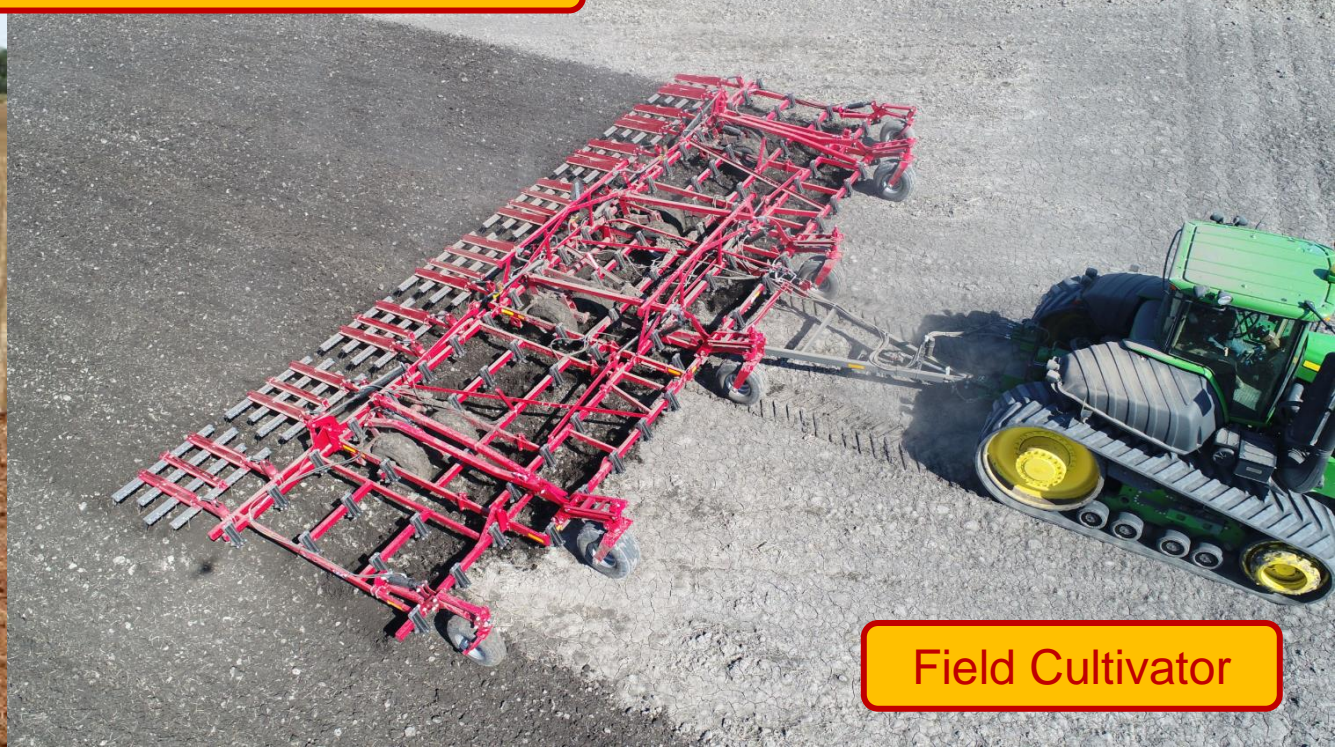
Offset Disk



Simple – Economical – Reliable - Effective



Chisel Plow



Field Cultivator

High Speed Disk

- **Hot Topic in the Ag Equipment market**
- Multi Season Tillage tool
- Standard concave blades typically notched or smooth
- Two blade gangs closely placed, blades are at opposing angles
- Tamping/pinning attachment sets soil and residue
- Sizes and incorporates residue
- Highly productive tool, operated at 9-11 mph
- Working tillage depths of 1" - 6"





Notice A Theme?



DESIGNED TO CREATE A SMOOTHER SEEDBED FLOOR
Delivering Agronomic Performance

In-Line / No-till Ripper

- Also maybe called a “subsoiler”
- Fall Deep tillage tool
- Leave all the residue on the soil surface
- A straight or slightly wavy blade slices residue leading the standard
- Standard or “Shank” is thin/narrow steel that holds the tillage point, typically firmly mounted or spring tripped
- Points are designed to fracture and lift soil 10”-18” below soil surface



Variable Intensity Tillage

“Data Driven Tillage”

- Geospatial Mapping
- “On the Fly” machine control
 - Depth
 - Soil-Residue Incorporation
 - Field finish / seedbed quality
- Input Decisions
 - Previous Crop type
 - Yield
 - Soil types
 - Elevation



Applies to Combination Rippers and Vertical Tillage tools

Vertical Tillage

- Multi season tillage tool
- Slight concavity on the blades
- Ripple/Wavy edge loosens soil and small weeds
- Designed to cut and lift soil and residue
- Little to no horizontal soil movement
- Herbicides, nitrogen and residue stays in the top 2-3 inches of the profile



0 Degree Gang

4 Degree Gang

Vertical Tillage

Adjustable gang angles allows for variable levels of incorporation

8 Degree Gang

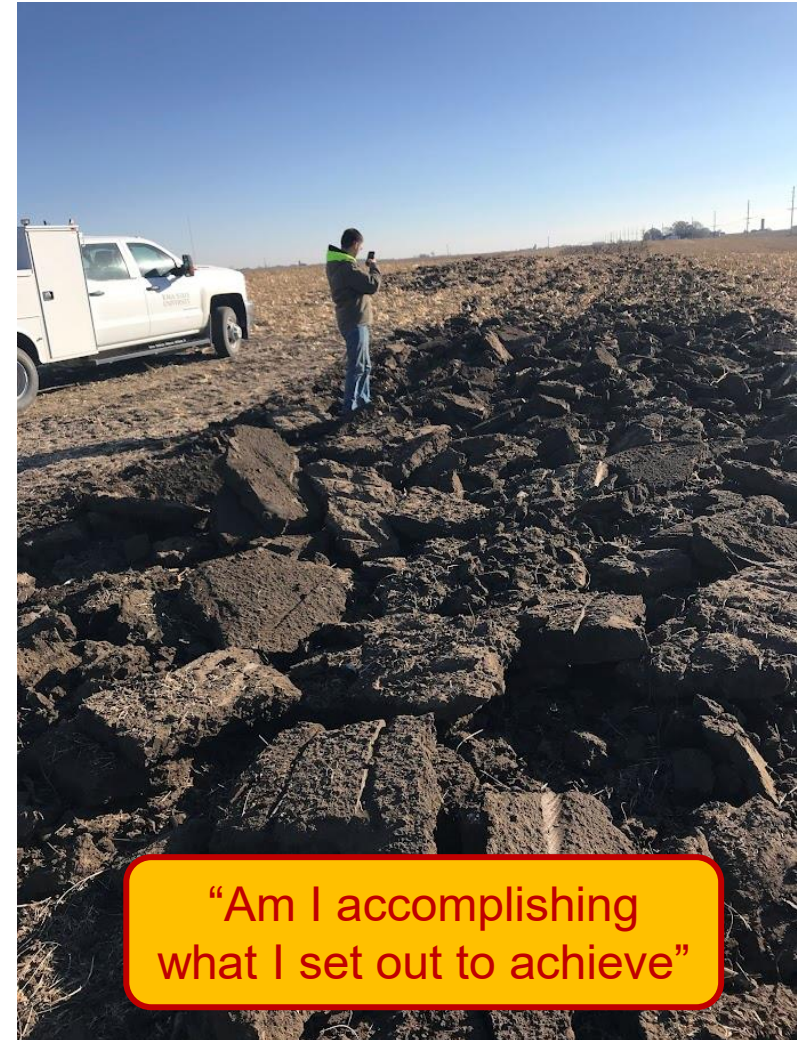
12 Degree Gang

Adjustable Combination Ripper

- Also maybe called a “disk ripper”
- Fall Deep tillage tool
- Large concave blades cut and mix residue
- Standard or “Shank” is parabolic in shape, designed to lift and mix soil and residue
- Points are designed to fracture and lift soil 10”-18” below soil surface
- Disks, standards, and closing systems are independently adjustable
- Surface residue can be varied with this style tool



“With Great Power Comes Great Responsibility”

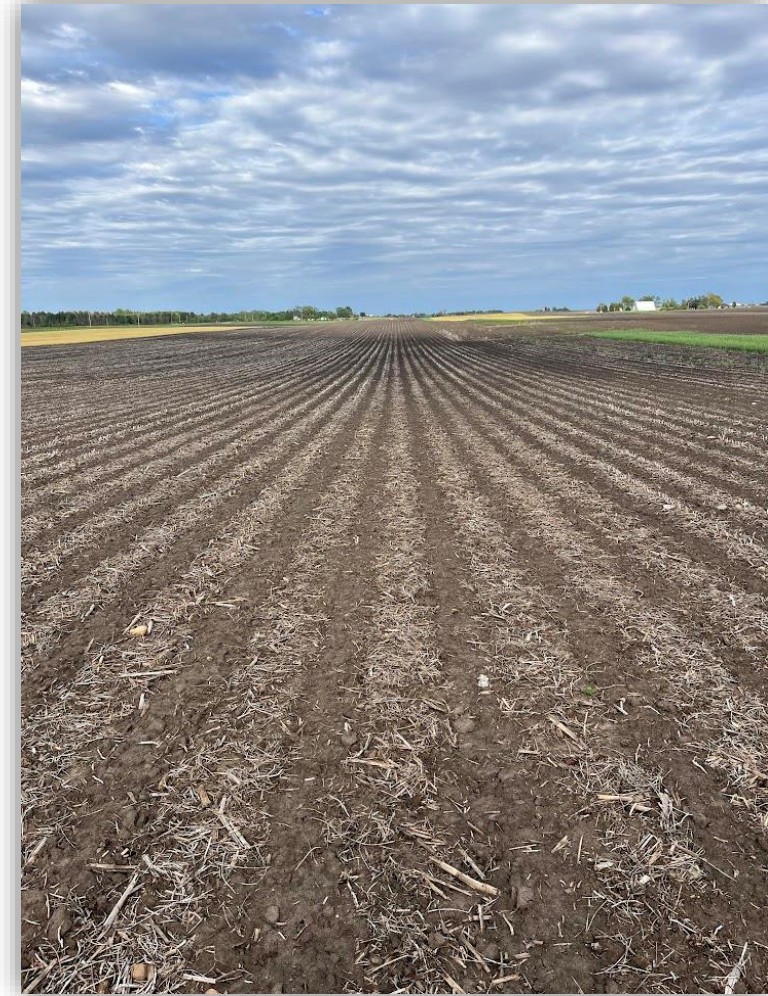


Strip Till

- Multi Season Tool
- Tills directly in the path of next crop
- Relies heavily on controlled traffic and automated guidance
- Some tools have the ability to apply Nutrients directly in the tilled soil zone
- Can replace several other pieces of agricultural equipment
 - Fertilizer Spreader
 - Ripper
 - Field Cultivator



Strip Tillage





**Strip Tillage In Action
typically tills 1/3 of the field**



Split Application Nitrogen



Planting Green



Advanced Steps in Conservation

Controlled Traffic NoTill

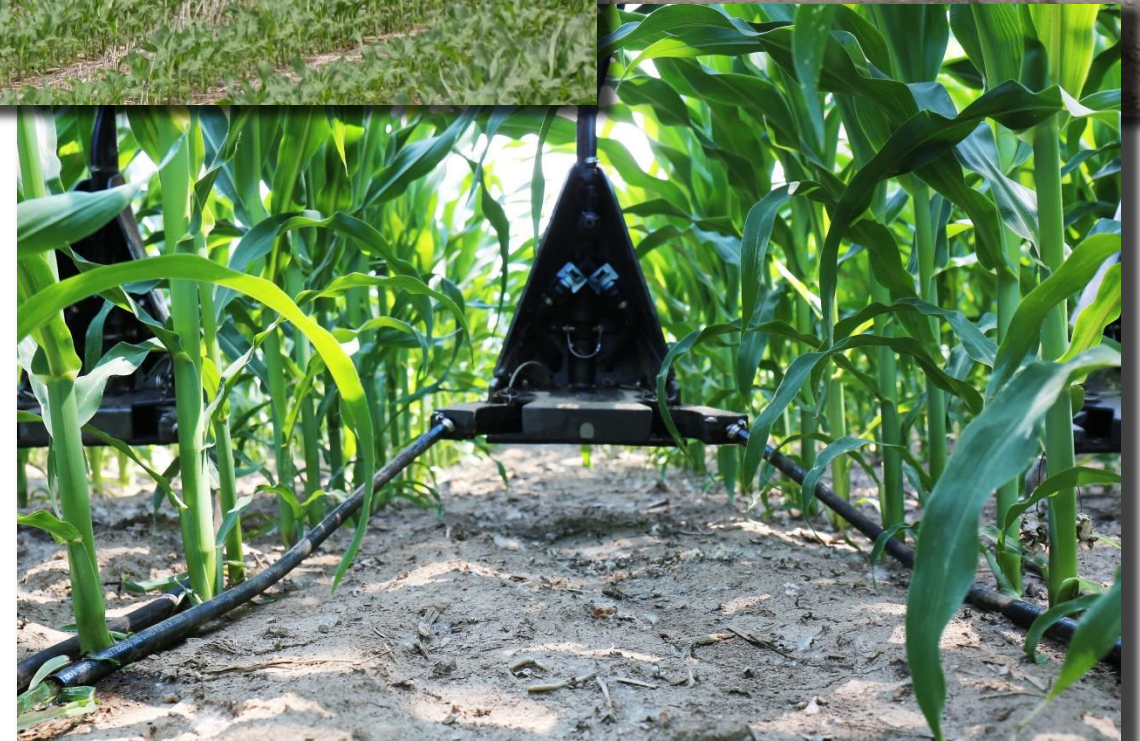


Pre-Harvest Cover Crop Establishments



In Season Nitrogen

- Spinner Spreaders offer a low maintenance method to cover large acres quickly
 - Application quality depends on environmental conditions and product
- Y-drops are an effective method of applying in season nitrogen
 - Better accuracy and product placement
 - Longer working window for crop height
 - High maintenance systems requiring constant supervision



In Season Nitrogen

June 6th 2018



June 21th 2018



If your going to be split applying nitrogen know the risks

July 11th 2018



Going Green - Aerial Application

- Application can be made from an airplane or high clearance sprayer
- In season cover crops are an excellent way to get growth established prior to harvest
- Application service might be offered from local coop
- Does not damage primary crop
- Low stress on land owner (typical application in offseason - August)
- Dependent on timely rains to establish seed soil contact and germination



Going Green – Tillage / Seeding Method

- Better germination and emergence than aerial application
- Timing dependent on finishing crop harvesting
- Application can be broadcasted and lightly incorporated with disc or vertical tillage tool
- Drilling/air seeding reduces seeding amount
- Diversified crop rotations to minimize disease pressure



Planting Into a Cover Crop

- Extremely effective way to manage weed outbreaks
- Controls wind and water erosion
- Can be tricky for first time users
- Planting Equipment might need to be upgraded (down force, row cleaners and closing system)



Equipment: Planters

Row Cleaners



Downforce and Margin Example



DOWNFORCE the force that is applied to the row unit by the air bag circuit
150lbs

Weight of Row Unit
100 lbs

MARGIN - Amount of additional down force applied to a row unit above and beyond what is required for penetration and to achieve full planting depth

Resistance from soil
200 lbs

$$150 + 100 = (250 - 200) = 50 \text{ lbs Margin}$$

Equipment: Planters

- No till
 - Make sure row cleaners/coulters/closing wheels are well maintained
 - Make sure downforce is appropriate
 - Consider residue management, uniform distribution is important
 - Can make many planters work as long as the planter is able to:
 - Cut and handle residue
 - Penetrate soil to correct seed depth
 - Establish proper seed to soil contact
 - Close the seed trench

Opportunities for Conservation Wrap-Up

- Correct timing and amount of nutrients
 - Make sure they are being applied and placed correctly
 - Just ASK!!
- Less Tillage
 - If not less tillage, be thoughtful of the end goal
 - Are we making a pass to fill in tire tracks, alleviate compaction, or incorporate residue
- Reduce N loss
 - Is split application something that would fit into your farming operation
 - Do you have a backup plan if the weather does not cooperate
- Cover crops
 - Plant them earlier / Terminate them later
 - Consider a mix



Management Comparisons 2022

- Eight 10 acre fields with commercial equipment
- 4 Management Styles:

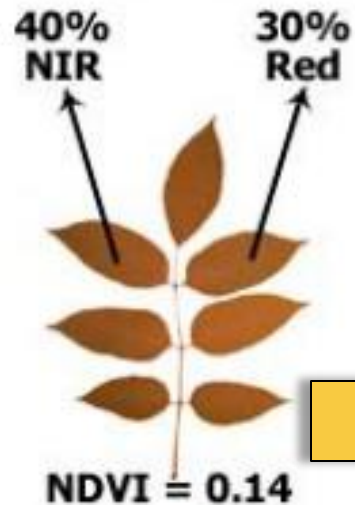
	Conventional Till / Low Tech	Vertical Till	Strip Till	No Till + Cover Crop
N	180 lb N Fall Anhydrous	60 lb N at planting + 120 lb N sidedressed	60 lb N at planting + 120 lb N sidedressed	60 lb N at planting + 120 lb N sidedressed
Tillage	Field Cultivator	Vertical Till	Strip Till with P&K	None
Planter Type	Drop Tube	Exact Emerge + 2x2	Exact Emerge + 2x2	Exact Emerge + 2x2
Traffic Mgmt	None	Controlled Traffic	Controlled Traffic	Controlled Traffic

Management Comparisons 2022



Management Comparisons 2022: NDVI

Normalized Difference Vegetation Index

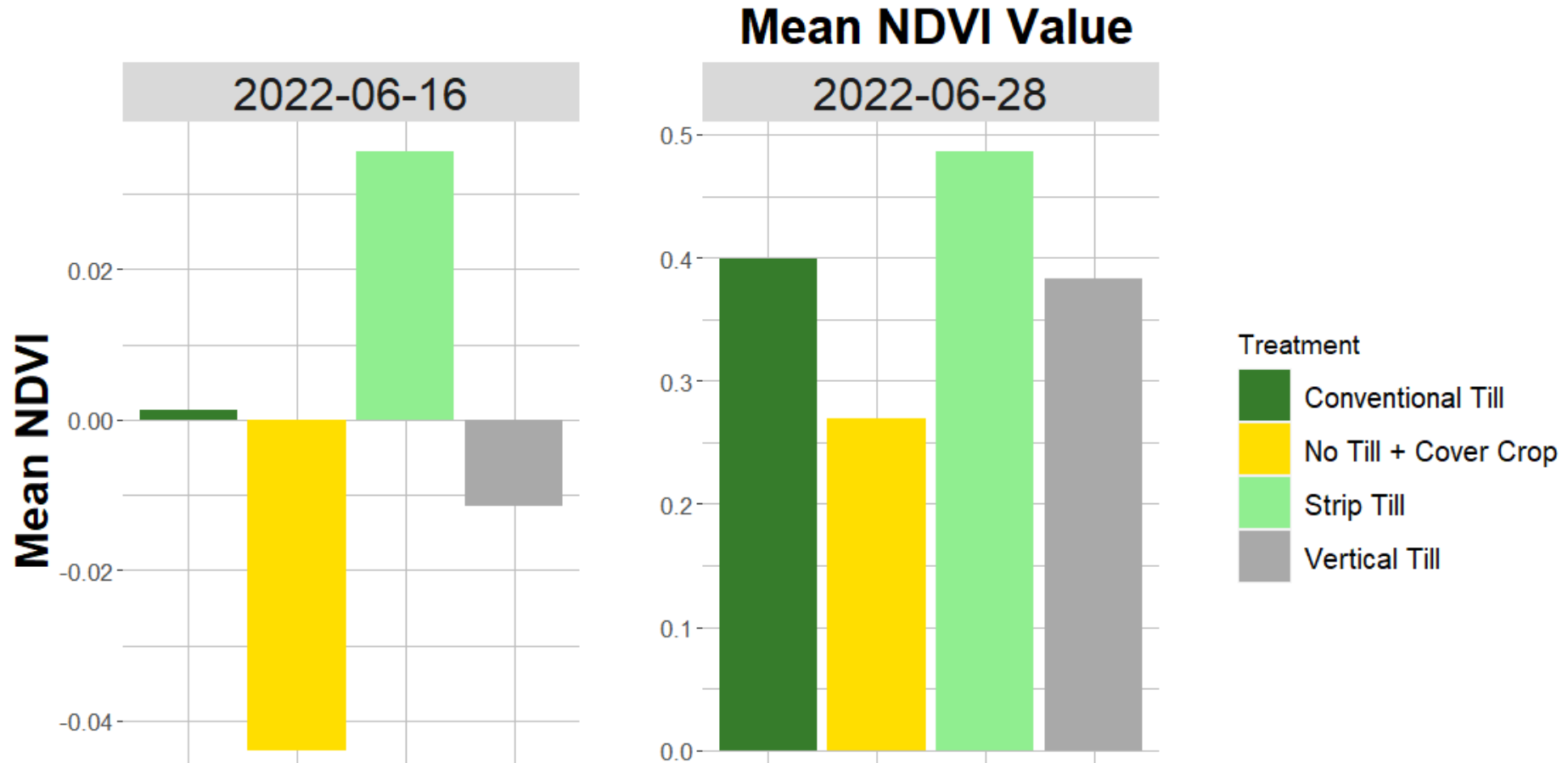


$$\text{NDVI} = \frac{\text{NIR} - \text{Red}}{\text{NIR} + \text{Red}}$$

NDVI is a measure of healthy green vegetation



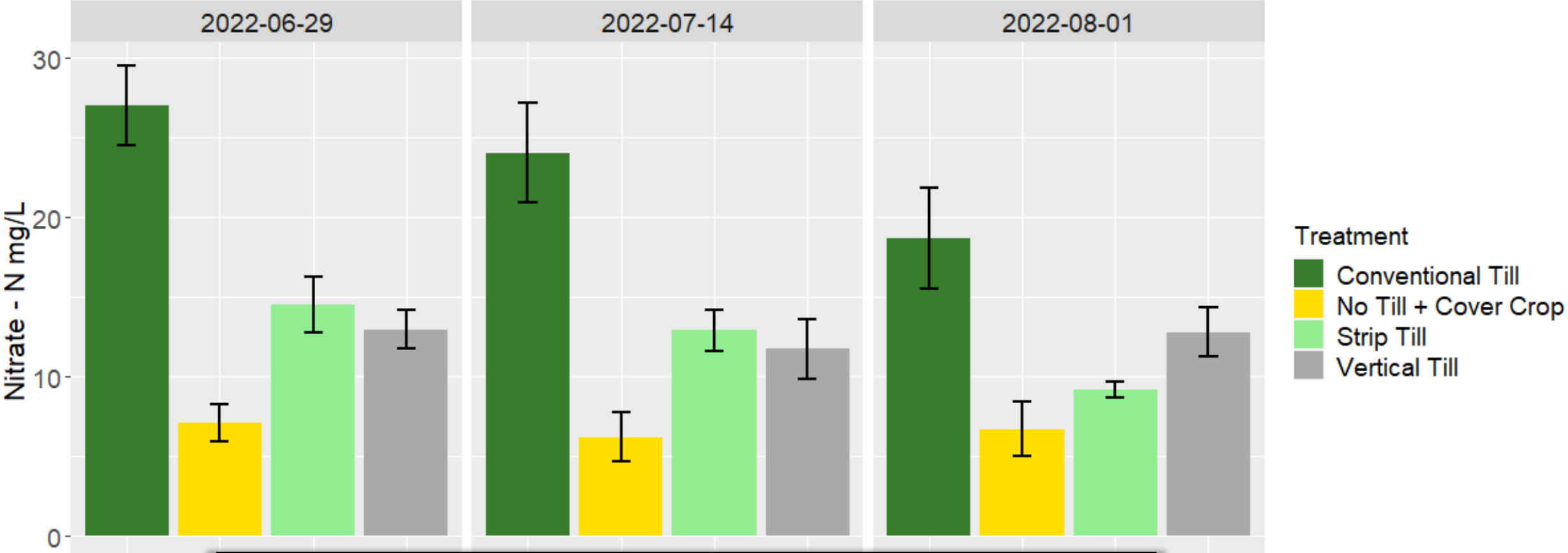
Management Comparisons 2022: NDVI



No Till + Cover Crop treatment lagged behind, while Strip Till had an early advantage

Management Comparisons 2022: Soil Water Nitrate

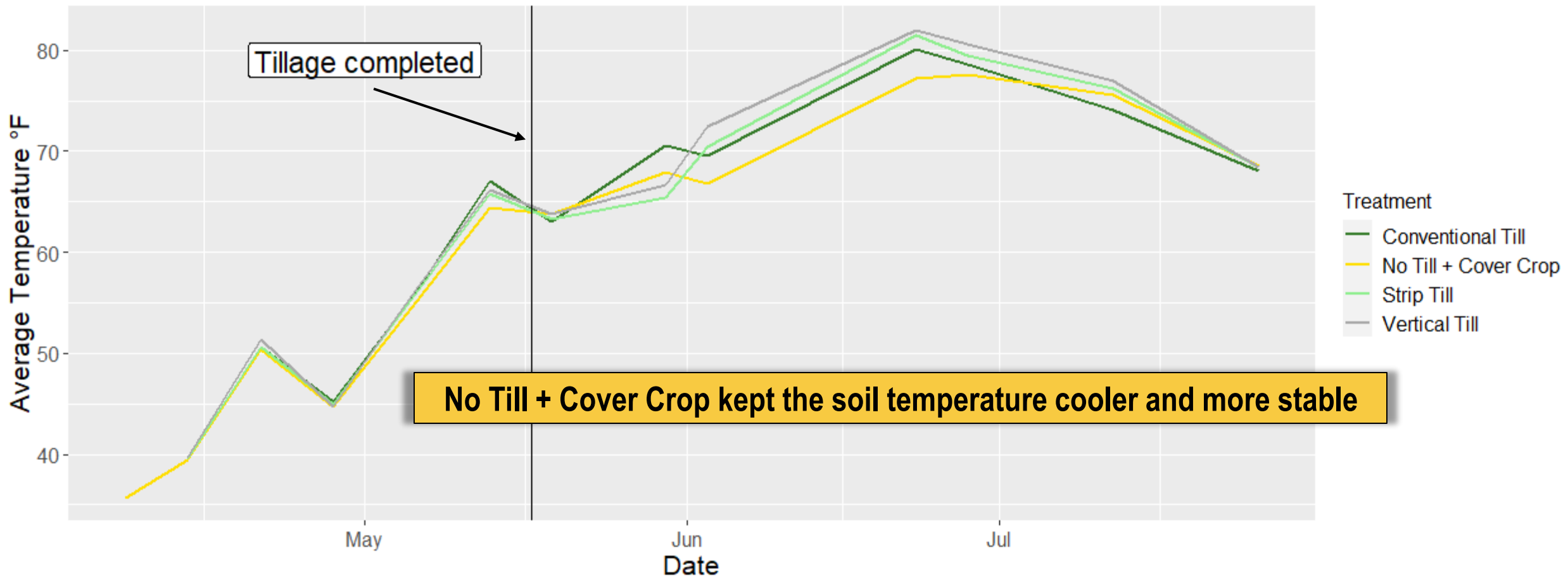
Lysimeter Nitrate



Fall anhydrous application led to more potentially leachable nitrate

Management Comparisons 2022: Soil Temperature

Average Soil Temperature over Time



No Till + Cover Crop kept the soil temperature cooler and more stable

