Dryland Soil Water Management

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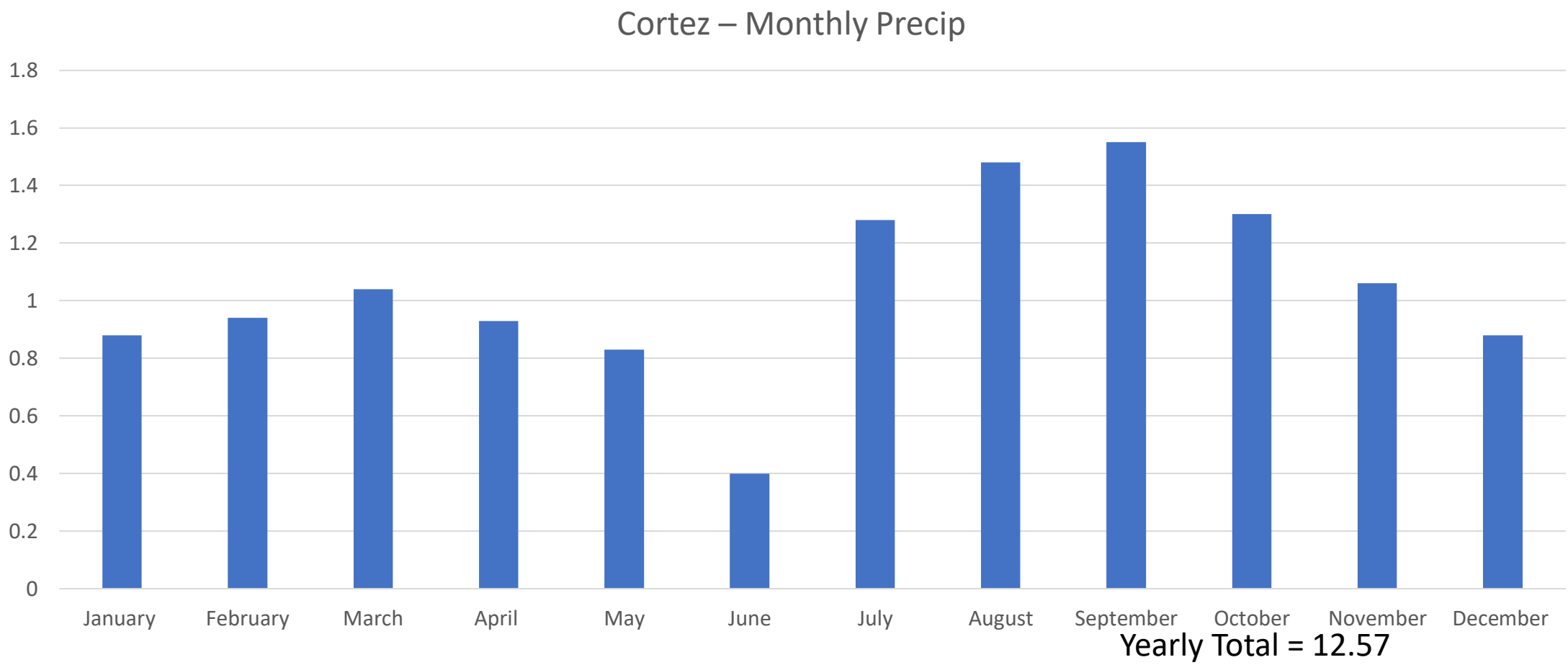
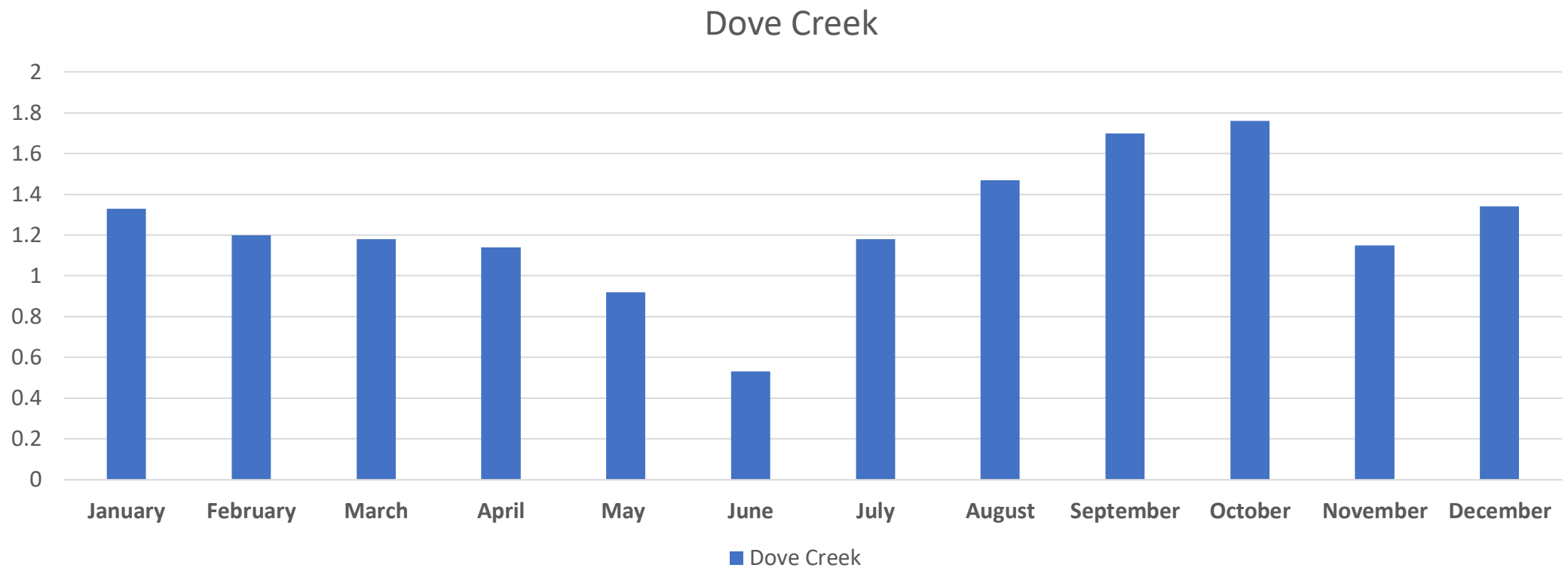
Capture the Water!



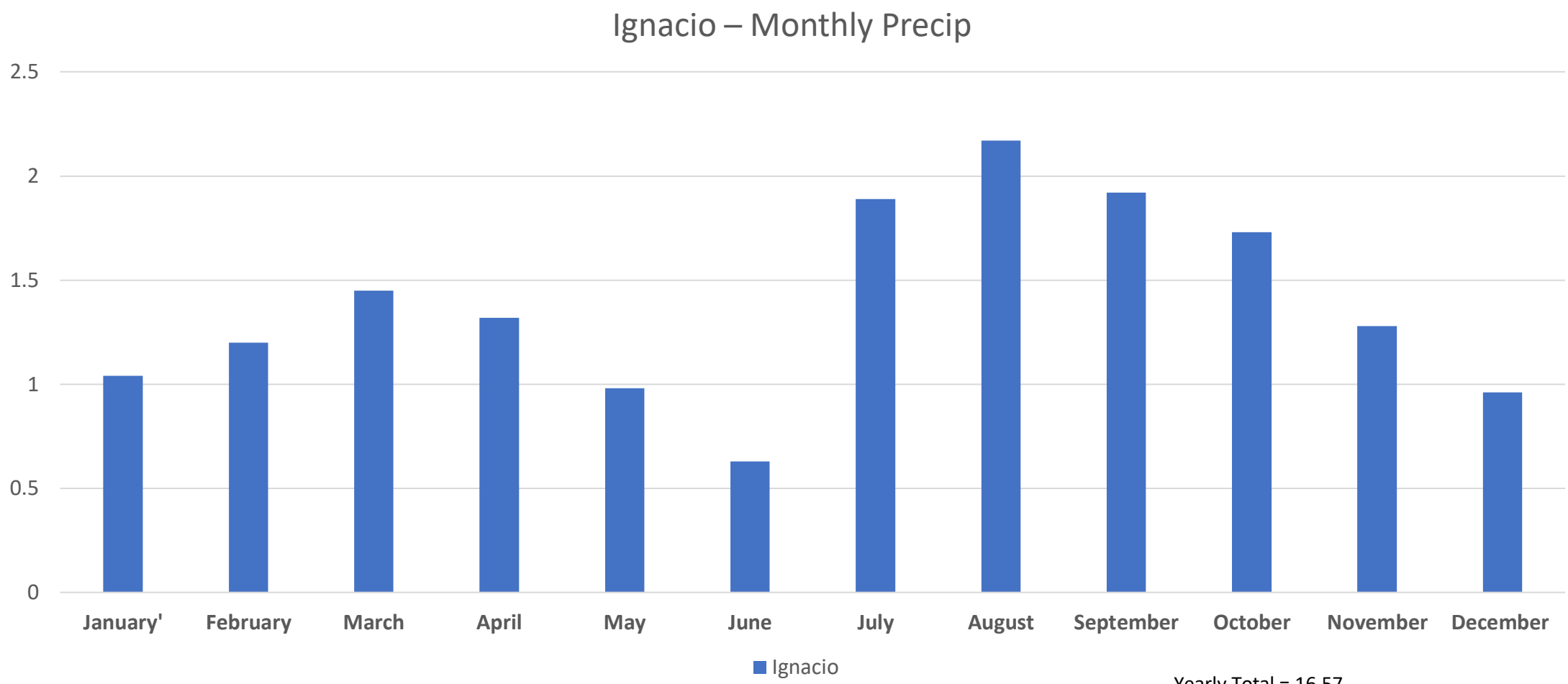
Yearly Total = 12.57

Capture the Water!



Yearly Total = 14.9

Capture the Water!



Yearly Total = 16.57

Cropping Strategies – Manage Soil Water

- Dryland Soil Moisture Management – 2 Major Tools
  - Tillage Strategies
    - Conventional tillage
    - Reduced Tillage
    - No-till (difference between no-till and never till)
  - Cropping Systems
    - What crop to plant
    - The sequence (rotation) – needs to be flexible

Cropping Strategies - Rotations

- Wheat
- Safflower
- Dry Beans
- Fallow
- Feed
- Other crops?
- Other considerations – weeds

Cropping Strategies - Rotations

- Wheat – Spring Planted Crop – Fallow (plant into stubble)

- Spring Crop – safflower/ Dry Beans/ sunflower/feed/corn/milo - drought tolerant
- Leave stubble standing over winter

Cropping Strategies - Rotations

- Grass – broadleaf-fallow
- Pittlekow, et al., reported a 2.5 bushel increase in soybeans in a 4 year rotation.
- Hansen, et al., in Colorado reported wheat-corn-fallow resulted in 20-40% increase in net farm income vs wheat-fallow.

Tillage Strategies

Tools:

Herbicides

Equipment

Tillage Strategies

- Conventional Tillage
  - Till every year
- Reduced Tillage
  - Till when necessary (weed issues/planting accommodations, ect)
- No-Till (never till vs flexible)

Tillage Strategies

Advantages vs Disadvantages of no-till

Benefits	Disadvantages
↓ Soil Erosion (wind/water)	Equipment
↓ Soil Compaction	
↓ Time for field activities	
↓ Fuel Costs ($4/a)	↑ Herbicide Costs
↓ Soil Water loss	
Healthier Soil (organic matter, soil carbon)	

Source: No Till Agriculture

Tillage Strategies

- 1990 – 6% of US Farmland was no till
- 2016 – 35 % of US Farmland is no till
- 1982 – 2003 USDA reported a reduction in soil erosion of 43% mostly due to reduced tillage
- 4% slope in field averaged 0.3 inches water runoff/yr with residue mngmt (Hansen, et al.)
- 4% slope in field averaged 3 inches of water runoff/yr without residue

Tillage Strategies

Tillage Strategies

- Hansen, et al., in Colorado reported a 25% decrease in soil erosion due to reduced tillage
- Peterson, et al., in Colorado reported water storage losses of 80% when no residue was left on soil surface (evaporation losses)
- Peterson reported soil water storage efficiencies increased to 50% using minimal tillage (strategic tillage)
- Following wheat harvest – use herbicides to control weeds and plant the spring crop into wheat stubble. Leave standing stubble into winter. Resulted in 3 inches of extra water capture in soils in the fall.

Tillage Strategies

- Tillage
  - Can cost 0.25 inches of water per pass
  - At 90 F. with wind the water loss can be as high as 0.5 inches per pass.

  - Plowing – CO_2 loss was 400 lbs/a
  - No Till – CO_2 loss was 5 lbs/a

Tillage Strategies

Weed Management

Substitute spraying for tillage

Herbicide costs will increase

Glyphosate resistant kochia in southern Alberta, Canada, fall 2011

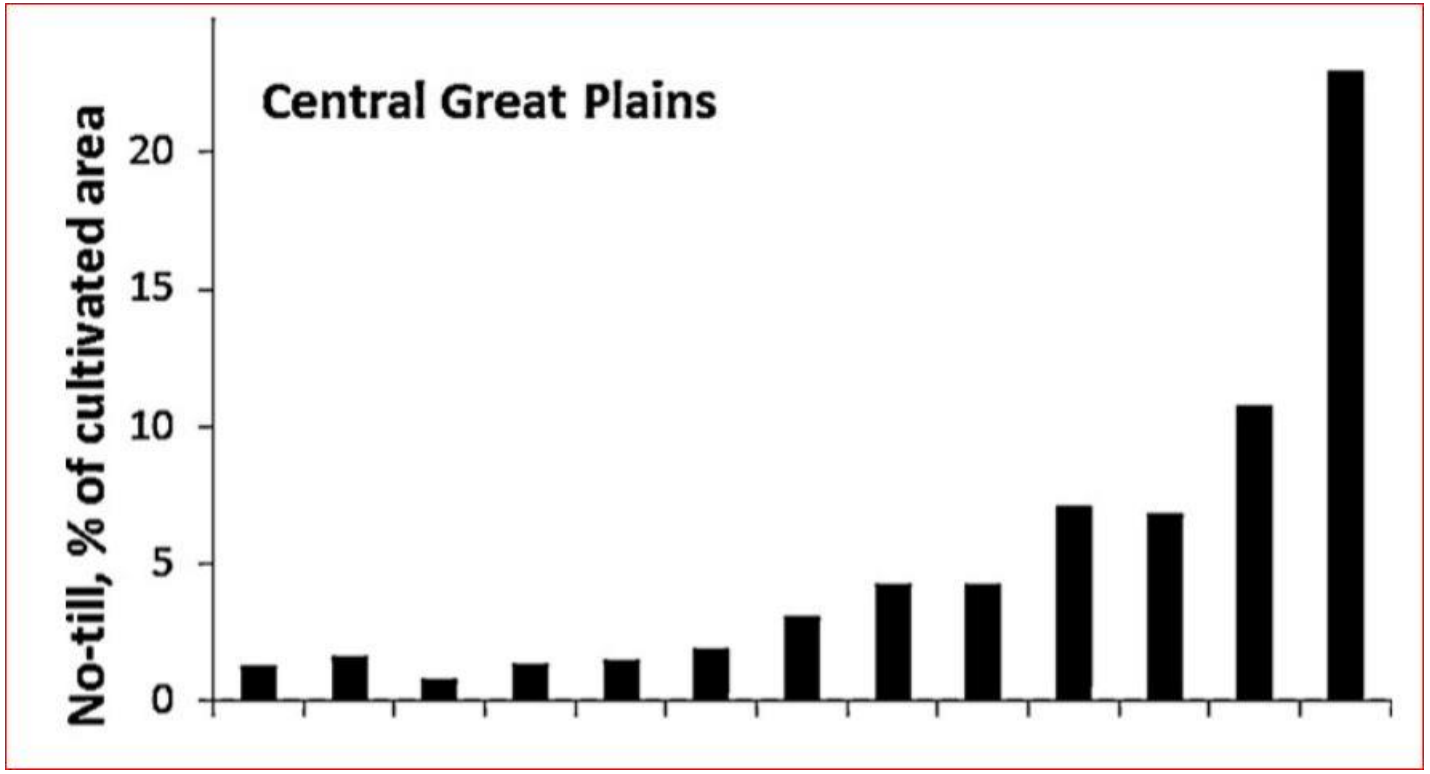
Table 1: Water losses from different operations 1 and 4 days after tillage.

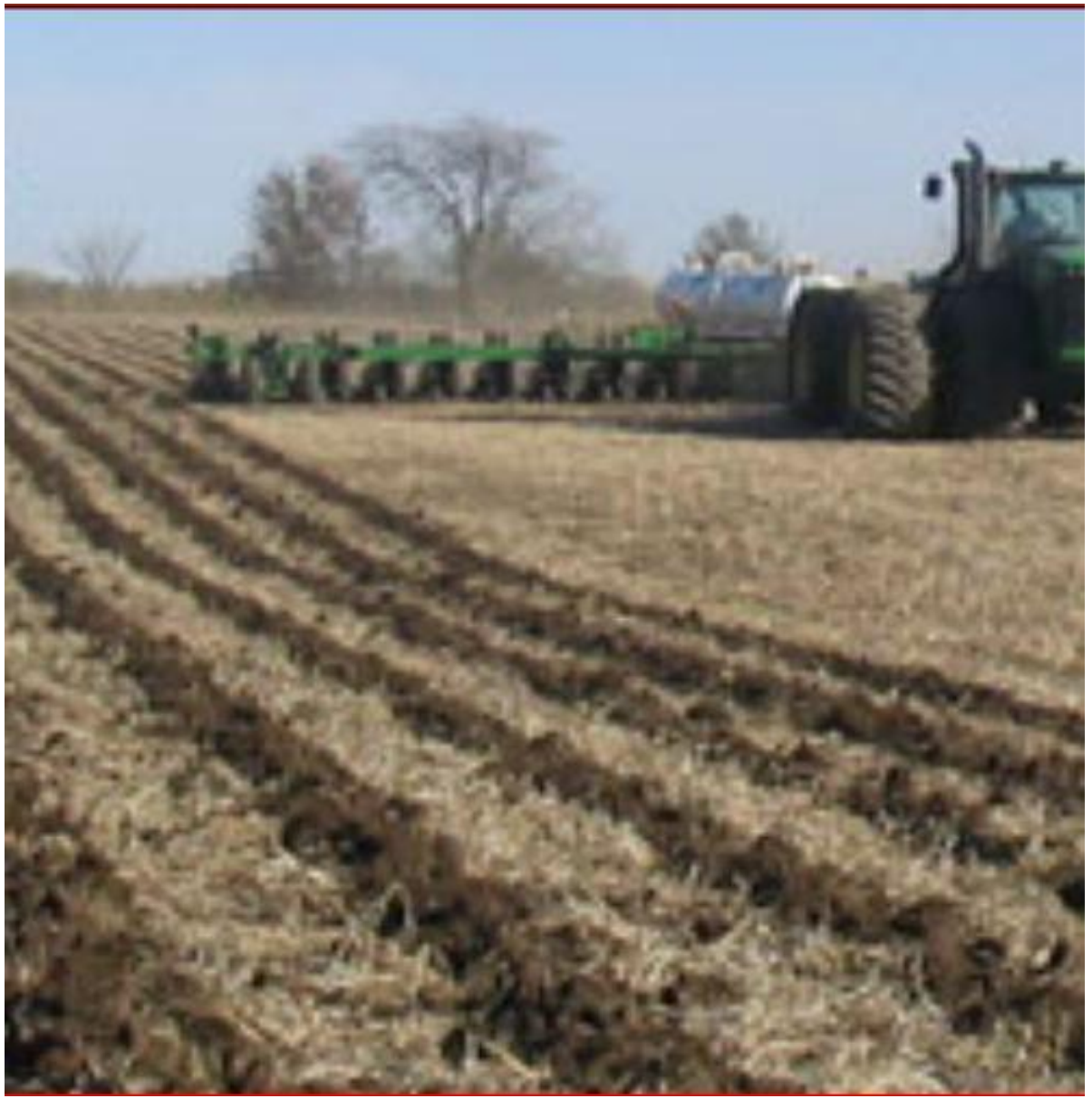
Operation	1 day	4 days
	— inches of water —	
One way	0.33	0.51
Chisel	0.29	0.48
Sweep plow	0.09	0.14
Rod weeder	0.04	0.22

Table 2: Percent residue lost after using different equipment.

Operation	% residue lost due to each operation
Spraying	0
Sweeps (24 inches)	10
Disk drills	20
Disk chisels	10
Rod weeder	15
Chisel plow – Straight points – Twisted Points	25 50
Tandem disk 3″ deep	80
Tandem disk 6″ deep	90
Moldboard plow	90-100
Overwinter weathering	15-25

No Till Acres over Time





Weed Control

Canada Thistle

- Curtail 2 pt/a – rosette stage
- Stinger .05 pt/a – rosette stage
- Glyphosate – 32 oz/a pre-bolting
- Dicamba – 1 pt/a fall after first fall frost

Field Bindweed

- 2,4-D ester 1.5 pts/a short term control
- Dicamba 1 pt/a late season (adjuvant)
- Facet L 22 oz/a plant wheat deeper than 1 inch
- Glyphosate 32 oz/a depending on formulation

Grasses

- Glyphosate 32 oz/a post weed emerge

Summary

- Capture Water!
  - Use Cropping Systems to Maximize Opportunities (Flexible, drought and heat tolerant crops)
  - Reduce Tillage Trips
  - Allow Crop Stubble to Remain Over Winter