



# Alternative weed management strategies

Mike Ostlie – Director - CREC

# Outline

- Harvest Weed Seed Control
- Electric weed control
- Biological control

# Harvest Weed Seed Control

- Destroy the weed seeds that travel with chaff in your harvester
- Mechanical or non-chemical method of weed control
  - Can provide a much needed mode of action to our cropping systems
- Proficient at destroying the glyphosate-resistant weeds in our region
- >90% of weed seeds destroyed that make it into the chaff
  - Most weed seeds germinate the year after dropping
  - It is similar to adding an extra weed control pass for the next year

# Harvest Weed Seed Control (HWSC)



Virginia Tech study on windrow burning



Chaff lining

\*Can meld with controlled traffic operations

# Australia-led effort (nearly 50% adoption of HWSC)



95 % effective

Michael Walsh – Weed Seed Destructor research

<https://www.weedsmart.org.au/>

# Installed on our Case 8120 seed machine





# Volunteer Barley

**With HWSC**

**Without**



# Harvest weed seed control success ? -Green foxtail



# Summary – Negatives with seed destructor

## Negatives:

- Weeds may shed seed prior to harvest – reduces the effectiveness of HWSC
  - Increased fuel usage – unclear the extent
  - Slower speed – 0.5 mph slower at harvest
  - Green material going through the machine
  - Extra wear parts on the harvester (hammermill)
  - Larger harvesters work better with SCUs
  - Have to harvest the weeds to get HWSC
  - It is loud
  - More time should be spent calibrating harvester – HWSC effectiveness only affects chaff portion
- 
- It is a move of necessity rather than desire

# Summary – Positives with seed destructor

## Negatives:

- First pass of weed control for the next season is completed without an additional pass
  - 70% reduction in weed population before a sprayer entered the field (green foxtail)
  - No till or organic producers especially benefit
  - May reduce herbicide costs in the long run
- Kochia, waterhemp, Palmer amaranth (and other pigweeds), foxtail sp. have >95% destruction rate
- Addition of the SCU has improved the spread of residue (for us)
- SCUs are available for all brands of harvesters
- Increases our rotation options
- May not be needed every year (recommended every 2 years)
  
- You can come view a unit at CREC in Carrington

# What's new in HWSC?

- \*Optical destructors

  - \*Directed Energy Flora Control (DEFC)

  - \*Directed Energy Unit (DEU)

- \*uses light and heat to destroy viability of seeds in the chaff portion of the harvester

- \*not commercially ready yet

# Electric weeding via tractor-mounted units

- \*Types of technology – PTO powered
  - Spark discharge (such as Weed Zapper)
  - Continuous Contact (such as Zasso)
- \*Typically targets weeds that are taller than the crop
  - good for integrated strategies such as controlling herbicide escapes
  - affects seed viability as well
  - inter-row electric weeding could improve results
    - targeting smaller weeds
    - weeds still exist in-row, but most of the area is covered
- \*Quite a bit of innovation in this space right now



Weed Zapper

The impact of electrocution treatments on weed control and weed seed viability in soybean  
-Weed Technology

Electrical weeding in agronomic row crops  
-Lynn Sosnoskie



# Electrical Discharge Systems

- The Weed Zapper™, Sedalia, MO
- Developed in 2018
- 200,000 watts
- Boom front-end mounted
- PTO driven generator
- Requires a 275 PTO HP tractor
- 2 to 6 mph
- Safety improvements



Aug 4, 5 DAT



Aug 7, 8 DAT



Aug 11, 12 DAT



Untreated

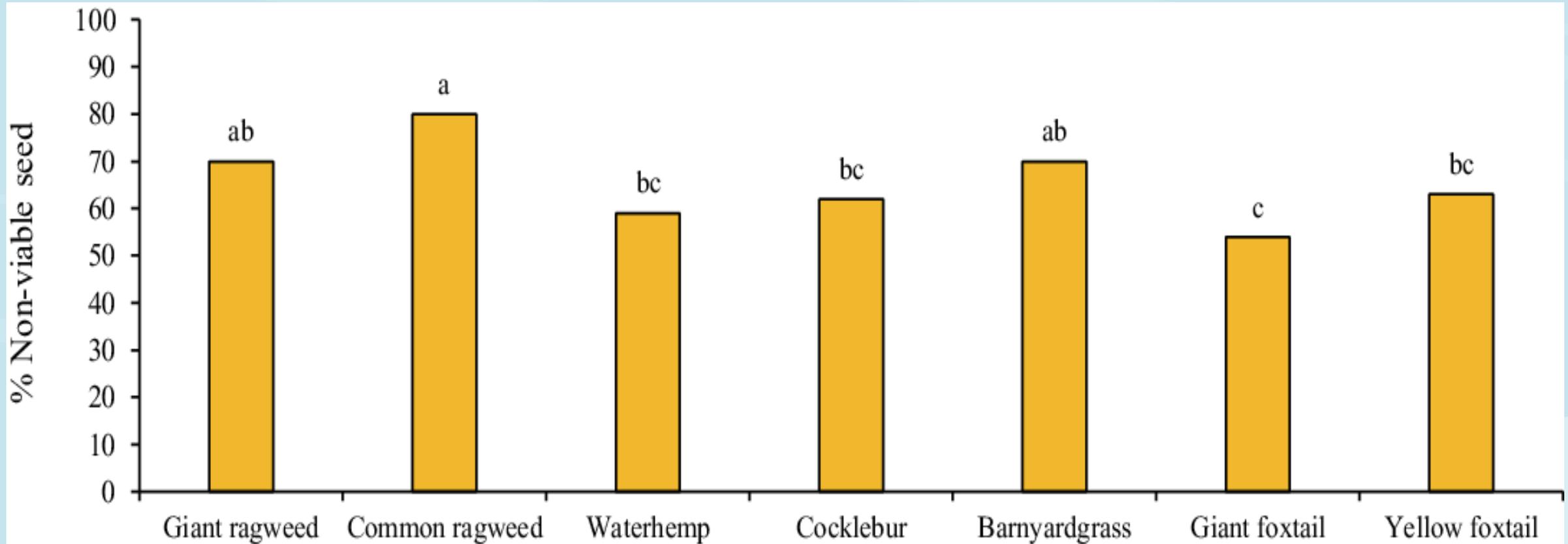
Treated



# Waterhemp injury assessment, Blomkest, MN 2023

Date	Days after treatment	Height control	Necrosis wound length (inch from flower tip)		Dead plants	Observations
			Range	Average		
August 4	5	36 to 46 inch	8 to 13	10.4	10	Flowers/stems below canopy
August 7	8	36 to 46 inch	8 to 16	10.5	<10%	Regrowth from leaf axis; lower branch growth; waterhemp again above sugarbeet canopy
August 11	12	36 to 46 inch	9 to 19	11.2	<10%	Waterhemp above sugarbeet canopy; majority actively regrowing from lower and middle axil

# Electrocution reduces the number of viable seed that are returned to the soil seedbank



# Corn cover crop/herbicide combinations

## Strategy:

Plant cover crops for soil health or animal utilization purposes

Planting cover crops into corn is one of the surest ways to establish a cover crop in ND

Plant around V5 (whenever a planter barely can get through)

usually end of June

using a drill or planter >>> than broadcast in ND

Broadcast with a ground applicator > than aerial applicator

Spray herbicide 10-14 days before planting

-1.5 growth stages earlier



## Shade – Lentils – poor tolerance



# Shade – Flax – poor tolerance



# Shade – Rye – medium tolerant



# Shade – Oats – medium or more tolerant



# Shade – Crimson Clover – medium tolerant



# Shade – Radish – medium tolerant



# Shade– Turnip – medium or more tolerant



# Benefits the following season



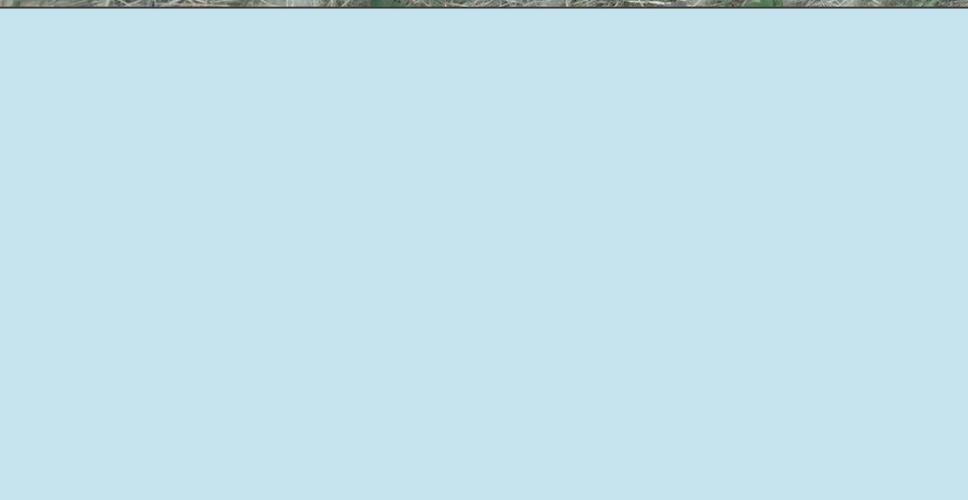
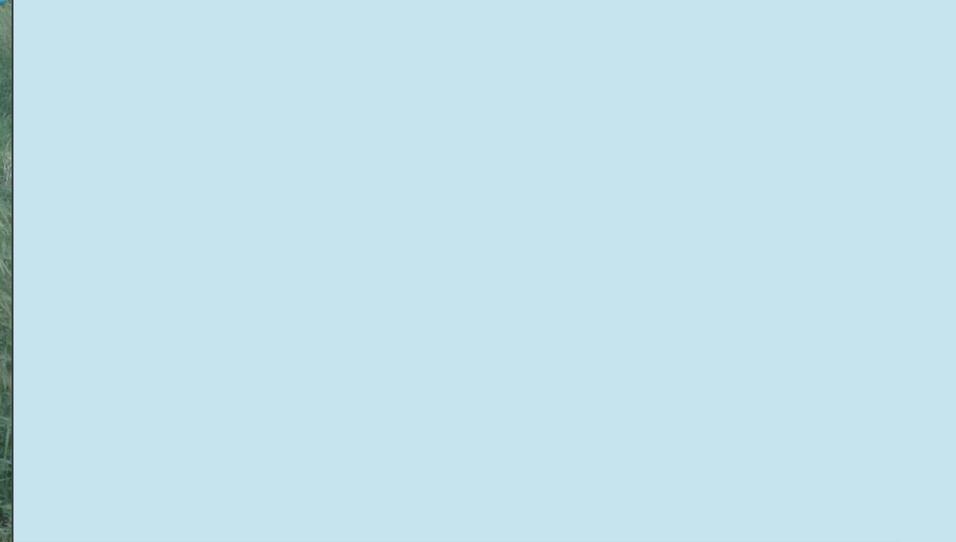
# Risk of Cover Crop Injury from Corn Herbicides

Treatment	Turnip	Radish	Rye	Oat	Lentil	Crimson Clover	Flax
Atrazine	HR	HR	LR	LR	MR	HR	LR
Dual II Magnum	LR	LR	LR	LR	LR	LR	LR
Callisto	HR	MR	LR	LR	HR	LR	LR
Atz + Dual + Callisto	HR	LR	LR	LR	HR	MR	LR
Status	LR	MR	LR	LR	HR	LR	LR
Armezon	HR	LR	LR	LR	LR	LR	LR
2,4-D	LR	LR	LR	LR	HR	LR	LR
Widematch	LR	MR	LR	LR	HR	HR	LR
Harness	LR	MR	LR	LR	MR	LR	LR
Laudis	LR	LR	LR	LR	LR	LR	LR

Partial Support from ND Corn Utilization Council

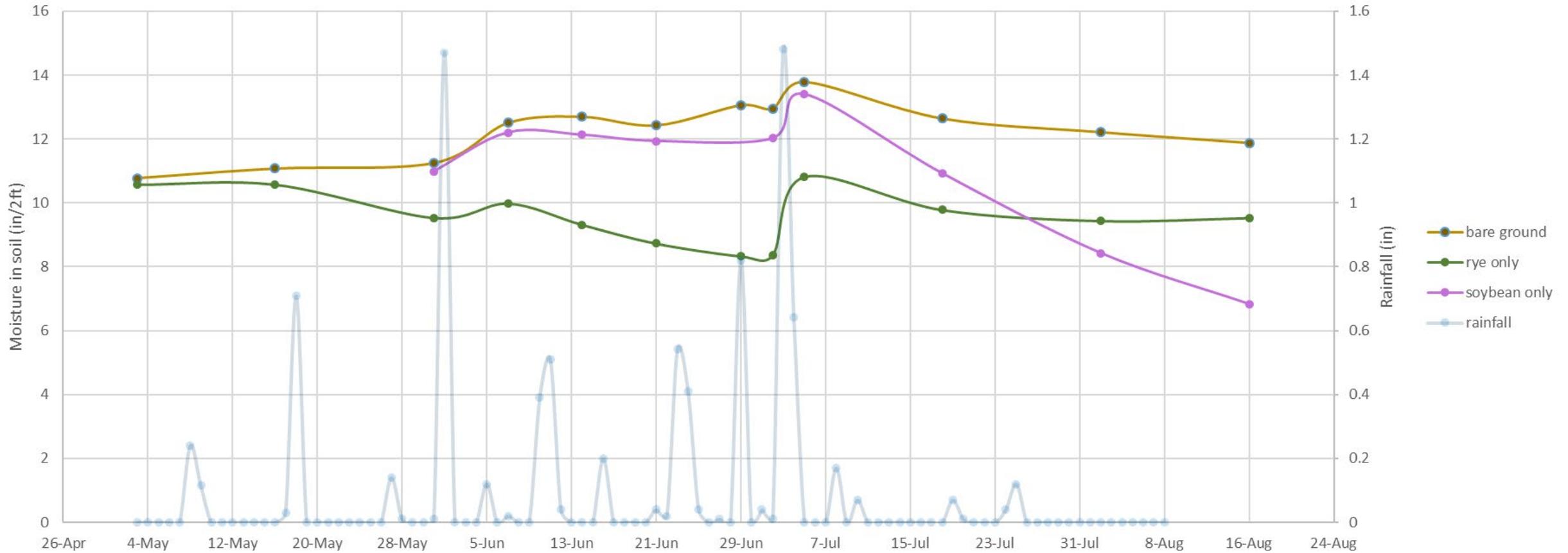
# Relay and Inter- cropping



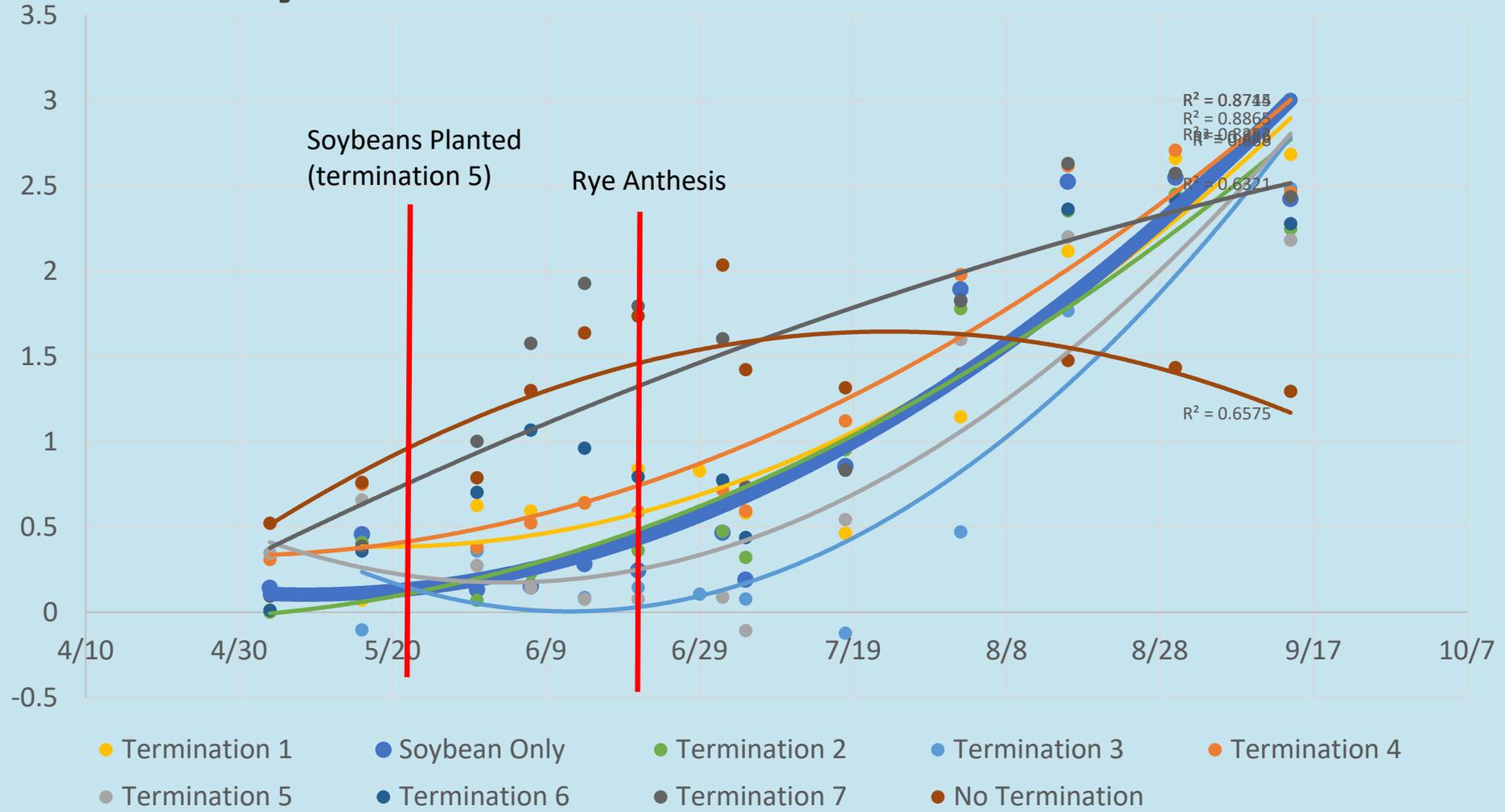


# Rye water use during the year

Soil moisture status comparison of bare ground, rye and soybean planted areas



# Water Deficit by Termination Time



# Rye varieties grouped by kochia suppression

- Most effective

- Hancock
- ND Dylan

- Moderately Effective

- Hazlet
- Rymin
- Aroostok

- Least effective

- Dacold



Important: all varieties cease weed suppression by anthesis

- Some varieties lose weed suppression even sooner (~boot stage)
- Rye serves no benefit to the cash crop after anthesis (early June)
  - But benefits increase by letting rye grow up to that point

Hancock



# Hazlet



Rymin



**Dacold**



# Aroostok



ND Dylan



# Effectiveness of rye on weeds

## Most effective

- Kochia
- horseweed

## Moderately Effective

- Foxtail sp.
- Pigweed sp.
- Ragweed sp. (maybe)

## No activity

- Legumes (soybean, dry bean, medic, etc)
- Mint (lanceleaf sage)

- Uniformity and biomass determine effectiveness
  - Drilling > broadcast
  - Varieties may be more effective due to biomass production
    - Also good for haying

# Dry bean herbicide by cover crop

Cover Crop	Herbicide	Cereal Stand p/l/a	Phytotoxicity %	Green Foxtail Control %
Oats	Check	809352	0.0	3.8
Oats	Sonalan	671747	26.3	52.5
Oats	Treflan	843690	3.8	20.0
Oats	Dual II	888079	1.3	25.0
Oats	Outlook	798995	5.0	25.0
Oats	Prowl H2O	767923	11.3	55.0
Oats	Spartan Elite	722054	0.0	18.8
Barley	Check	915885	0.0	50.0
Barley	Sonalan	844863	3.8	90.0
Barley	Treflan	852261	0.0	61.3
Barley	Dual II	899609	2.5	63.8
Barley	Outlook	764963	5.0	65.0
Barley	Prowl H2O	775321	0.0	55.0
Barley	Spartan Elite	837465	0.0	53.8
Rye	Check	726493	0.0	3.8
Rye	Sonalan	630318	15.0	75.0
Rye	Treflan	793076	0.0	11.3
Rye	Dual II	847822	10.0	10.0
Rye	Outlook	821189	5.0	18.8
Rye	Prowl H2O	781239	6.3	55.0
Rye	Spartan Elite	856700	8.8	17.5
LSD (0.05)		145990	8.3	14.0

# Chickpea/flax intercropping

Seeding Rate	Pigweeds/meter
Chickpea 100	7.7
Flax 100	8.0
CP 66/ FL 66	3.3
CP 66/ FL 33	5.2
CP 33/ FL 66	4.0
CP 50/ FL 50	4.7
CP 100/ FL 100	3.7
CP 100/ FL 66	4.2
CP 100/ FL 50	3.7
LSD (0.05)	2.9

2019

		Ascochyta % severity
2x Fungicide	Chickpea Alone	33.8
	Chickpea Intercropped	18
No Fungicide	Chickpea Alone	60
	Chickpea Intercropped	29.5

2020

		Ascochyta % severity
2x Fungicide	Chickpea Alone	28.3
	Chickpea Intercropped	23.3
No Fungicide	Chickpea Alone	43.3
	Chickpea Intercropped	26.6



**Thank you!**

**Questions?**

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