

Control of escape waterhemp in sugarbeet

Thomas Peters, Alexa Lystad, and David Mettler

North Dakota State University and
University of Minnesota and
Southern Minnesota Beet Sugar Cooperative

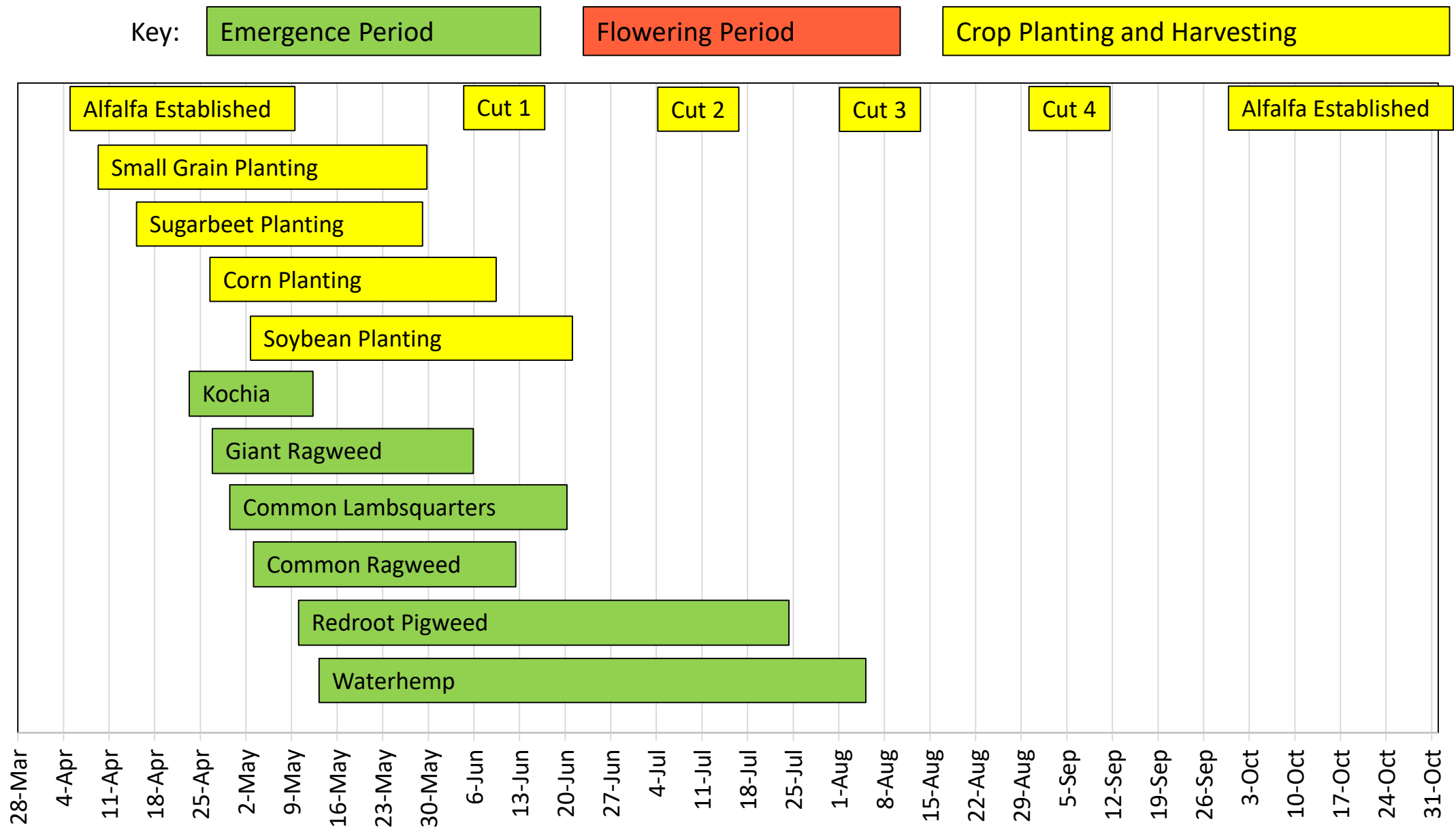
NDSU

EXTENSION

UNIVERSITY OF MINNESOTA
EXTENSION

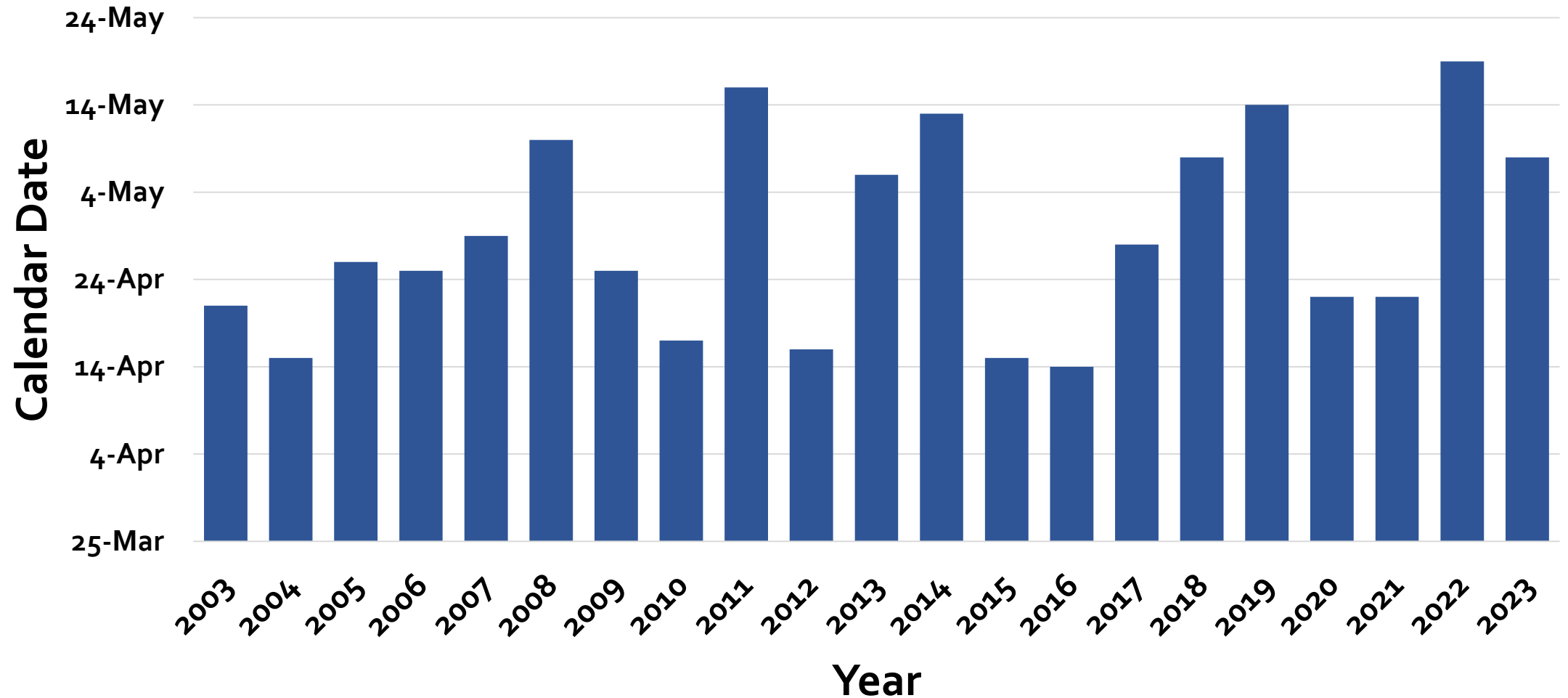
I have three wishes every spring: 1) plant sugarbeet in April; 2) 1-inch of rain after PRE application; and 3) complete and uniform sugarbeet stands



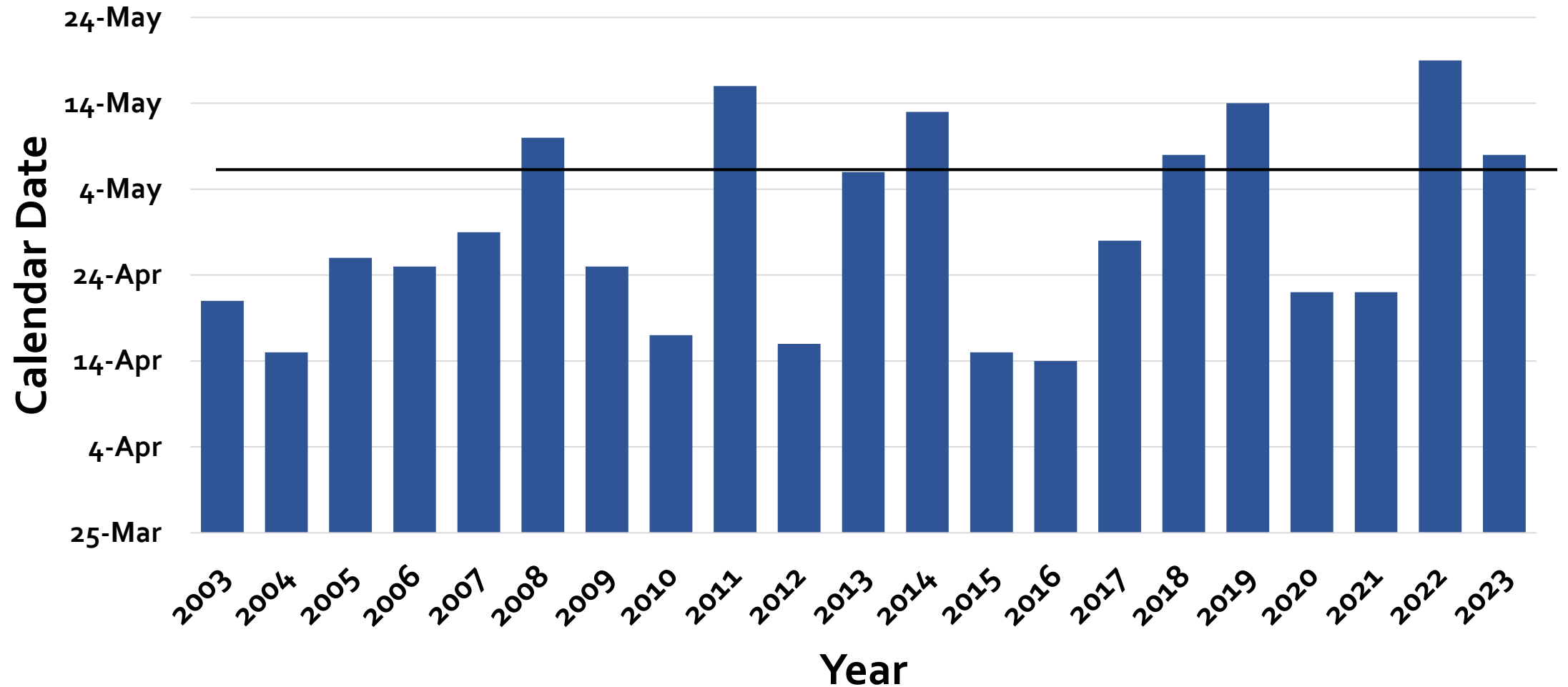


Adapted from Werle et al. 2014, Goplen et al. 2017, Weedometer 2008

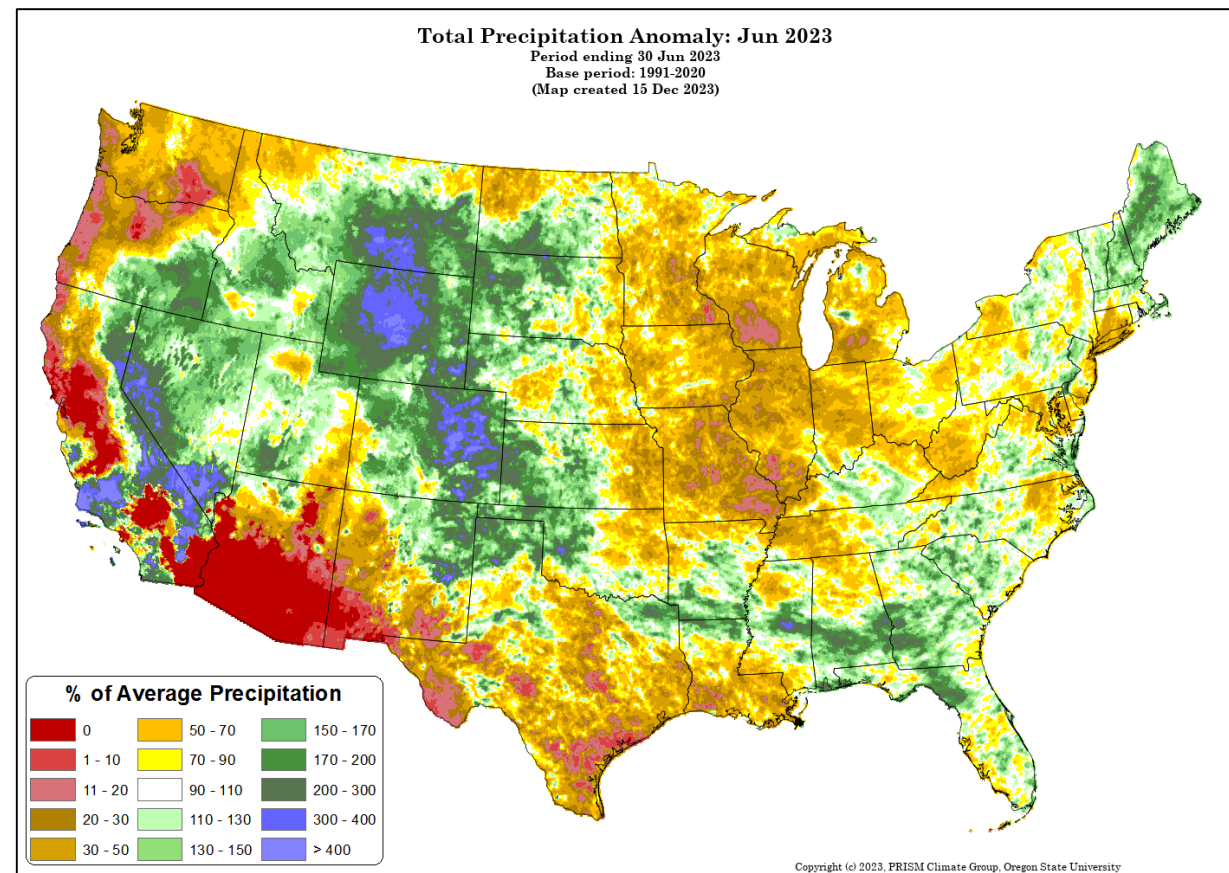
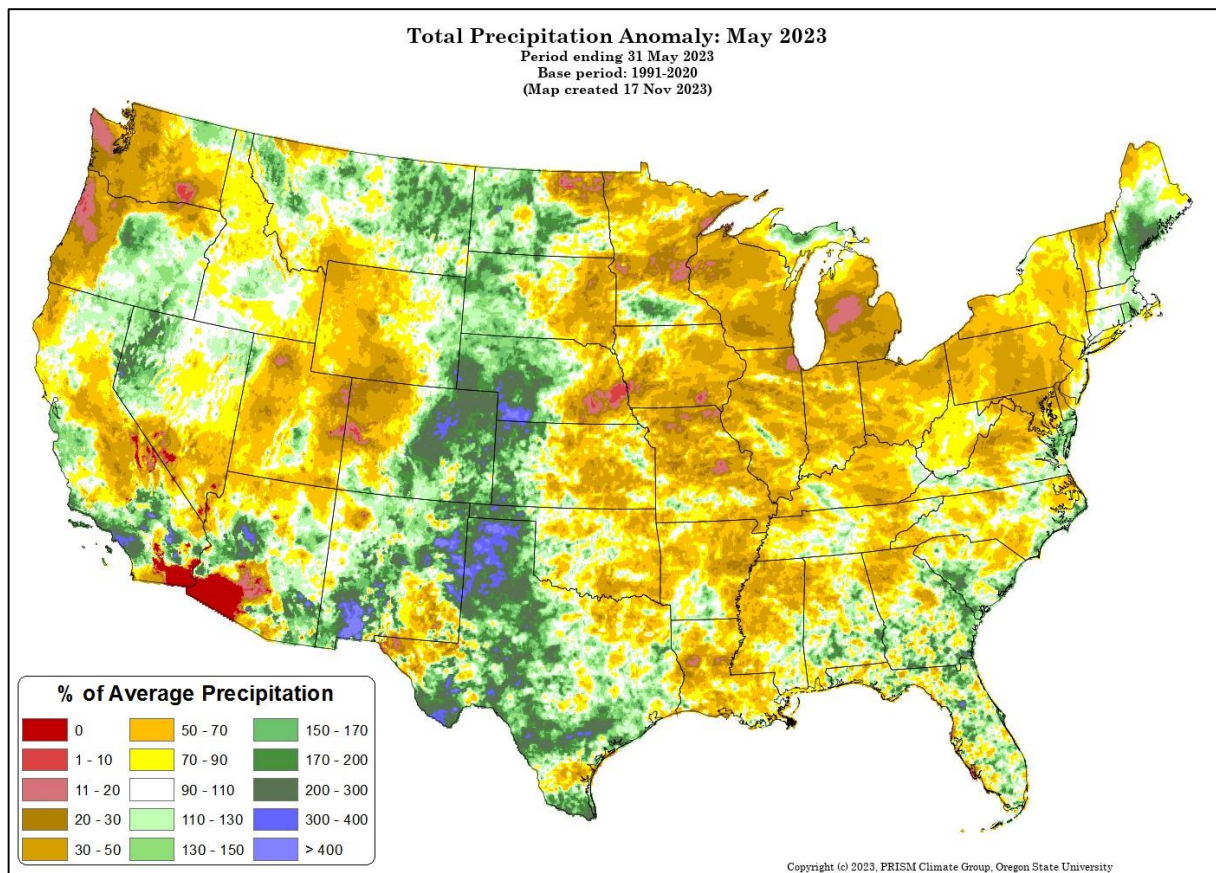
Average sugarbeet plant date, Southern MN Beet Sugar Coop, 2003 to 2023



Average sugarbeet plant date, Southern MN Beet Sugar Coop, 2003 to 2023



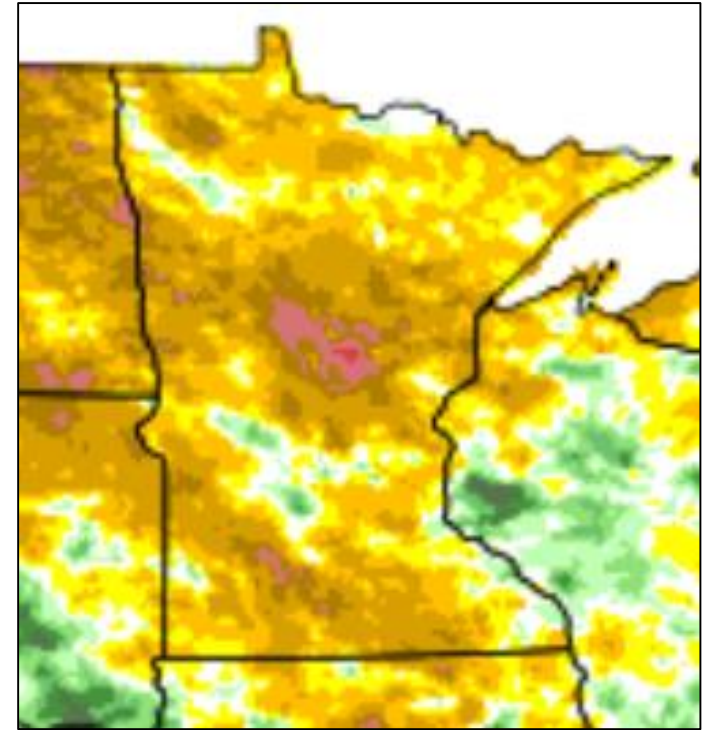
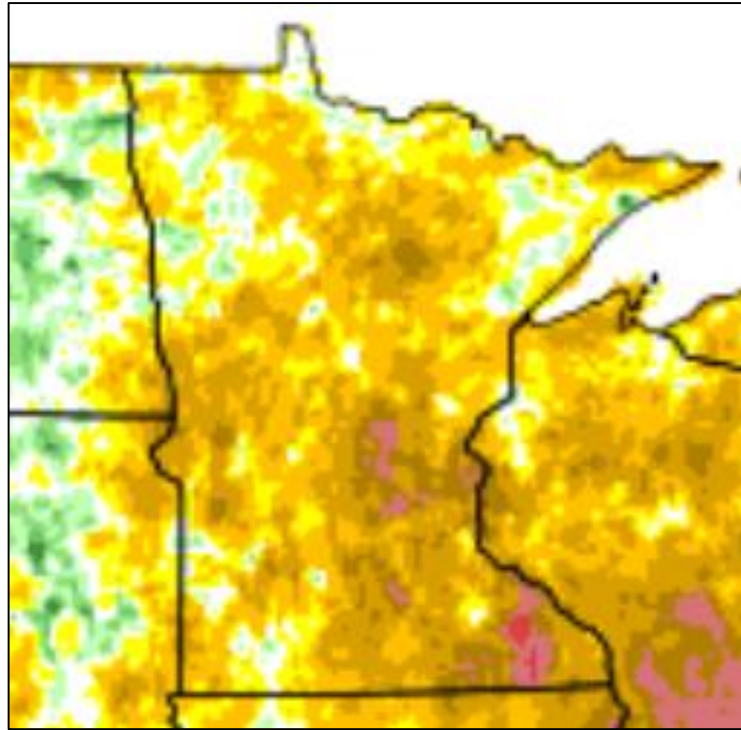
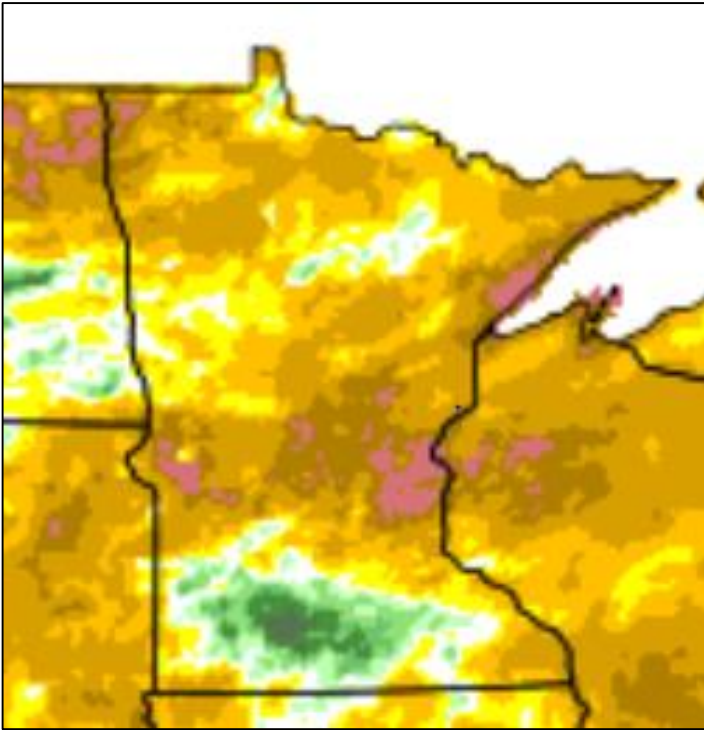
Rainfall in May and June did not favor incorporating PREs



Courtesy of Daryl Ritchison, Director of the North Dakota Agricultural Weather Network (NDAWN)
Prism (<https://prism.oregonstate.edu/comparisons/anomalies.php>).

Departure from Normal, May, June and July, 2023

Comparison, 1991 to 2020



Courtesy of Daryl Ritchison, Director of the North Dakota Agricultural Weather Network (NDAWN)
Prism (<https://prism.oregonstate.edu/comparisons/anomalies.php>).

Waterhemp Control Program in Sugarbeet

Planting Date	Recommendation
Sugarbeet plant in April or May	PRE. Dual Magnum at 0.5 to 1.0 pt/A, ethofumesate at 3 to 7.5 pt/A or Dual Magnum at 0.5 to 0.75 pt/A plus ethofumesate at 2 to 3 pt/A
	Split lay-by application (early postemergence / postemergence). Chloroacetamide herbicides applied at 2-lf sugarbeet fb 6- to 8-lf sugarbeet
June	Continue to scout fields for waterhemp. Control escapes with Ultra Blazer (Section 18ee), Liberty with the Redball™ 915 hooded sprayer (24c), or inter-row cultivation
July	Electric Discharge Systems (WeedZapper™)
August / September	Hand remove waterhemp

Ethofumesate in 2024

Group 15

Ethofumesate products for sugarbeet production

- Nortron, Bayer CropScience
- Ethotron, UPL NA Inc.
- Ethofumesate 4SC, Farm Business Network
- Nektron, Atticus, AG
- Maxtron 4SC (3.78 lb/G), ALBAUGH, LLC

Ethofumesate in 2024

Group 15

Ethofumesate products for sugarbeet production

- Nortron, Bayer CropScience
- Ethotron, UPL NA Inc.
- Ethofumesate 4SC, Farm Business Network
- ~~Nektron, Atticus, AG~~
- Maxtron 4SC (3.78 lb/G), ALBAUGH, LLC

Chloroacetamides in 2024

Group 15

Dimethenamid

- Outlook, BASF

Acetochlor (encapsulated)

- Warrant, Bayer CropScience
- Enversa, Corteva agriscience

S-metolachlor

- Dual Magnum, Syngenta Crop Protection, LLC
- EverpreX, Corteva
- Medal, Syngenta Crop Protection, LLC
- Brawl, TENKOZ, Inc.
- Moccasin, UPL NA Inc
- Charger Basic, WinField United

Outlook, S-metolachlor or Warrant applied at the 2- If stage

- The Section 3 label states Warrant, S-metolachlor products and Outlook application at the 2-If sugarbeet.
- SM Growers frequently ask about timing Outlook, especially when rain is in the forecast.
- My question is “Do you have a full stand?”
- I have always wondered about Outlook impact on stand.

Sugarbeet stands in response to treatment, Drayton ND, 2023

Treatment PRE ¹	Treatment POST	Rate	Sugarbeet Stand ²
		(fl oz/A)	(Num per 100 ft row)
No	Outlook/ Outlook	12 / 12	80 b
No	Dual Magnum / Dual Magnum	18 / 18	140 a
No	Dual Magnum / Outlook	18 / 12	143 a
No	RUPM ₃ +etho / Ultra Blazer	25 + 6 / 16	135 a
Yes	Outlook/ Outlook	12 / 12	100 ab
Yes	Dual Magnum / Dual Magnum	18 / 18	122 ab
Yes	Dual Magnum / Outlook	18 / 12	135 a
Yes	RUPM ₃ +etho / Ultra Blazer	25 + 6 / 16	144 a

¹ Ethofumesate + Dual Magnum, PRE

²Stands collected on 4- to 6-lf sugarbeet

Sugarbeet stands in response to treatment, Drayton ND, 2023

Treatment PRE ¹	Treatment POST	Rate	Sugarbeet Stand
		(fl oz/A)	(Num per 100 ft row)
No	Outlook/ Outlook	12 / 12	80 b
No	Dual Magnum / Dual Magnum	18 / 18	140 a
No	Dual Magnum / Outlook	18 / 12	143 a
No	RUPM ₃ +etho / Ultra Blazer	25 + 6 / 16	135 a
Yes	Outlook/ Outlook	12 / 12	100 ab
Yes	Dual Magnum / Dual Magnum	18 / 18	122 ab
Yes	Dual Magnum / Outlook	18 / 12	135 a
Yes	RUPM ₃ +etho / Ultra Blazer	25 + 6 / 16	144 a

¹ Ethofumesate + Dual Magnum, PRE

²Stands collected on 4- to 6-lf sugarbeet

Waterhemp control, Moorhead and Blomkest MN, 2022.^a

Trt	Etho or Etho + DM PRE	Herbicide Treatment ^b	Moorhead, MN	Blomkest, MN
			%	%
1	No	PM ₃ + etho + Outlook / PM ₃ + etho + Outlook	89 b	36 e
2	No	PM ₃ + etho + Warrant / PM ₃ + etho + Warrant	96 ab	54 bc
3	No	PM ₃ + etho + Outlook / PM ₃ + etho + Warrant	99 a	51 cd
4	Yes	PM ₃ + etho + Outlook / PM ₃ + etho + Outlook	99 a	43 de
5	Yes	PM ₃ + etho + Warrant / PM ₃ + etho + Warrant	99 a	49 cd
6	Yes	PM ₃ + etho + Outlook / PM ₃ + etho + Warrant	99 a	54 bc

^a90 days after plant at Moorhead and 59 days after plant at Blomkest

^bDestiny HC plus Amsol liquid AMS at 1.5 pt/A plus 2.5% v/v.

Waterhemp control from ethofumesate at 5 pt/A PRE, Moorhead, MN, June 10, 2022

Ethofumesate PRE



No Preemergence



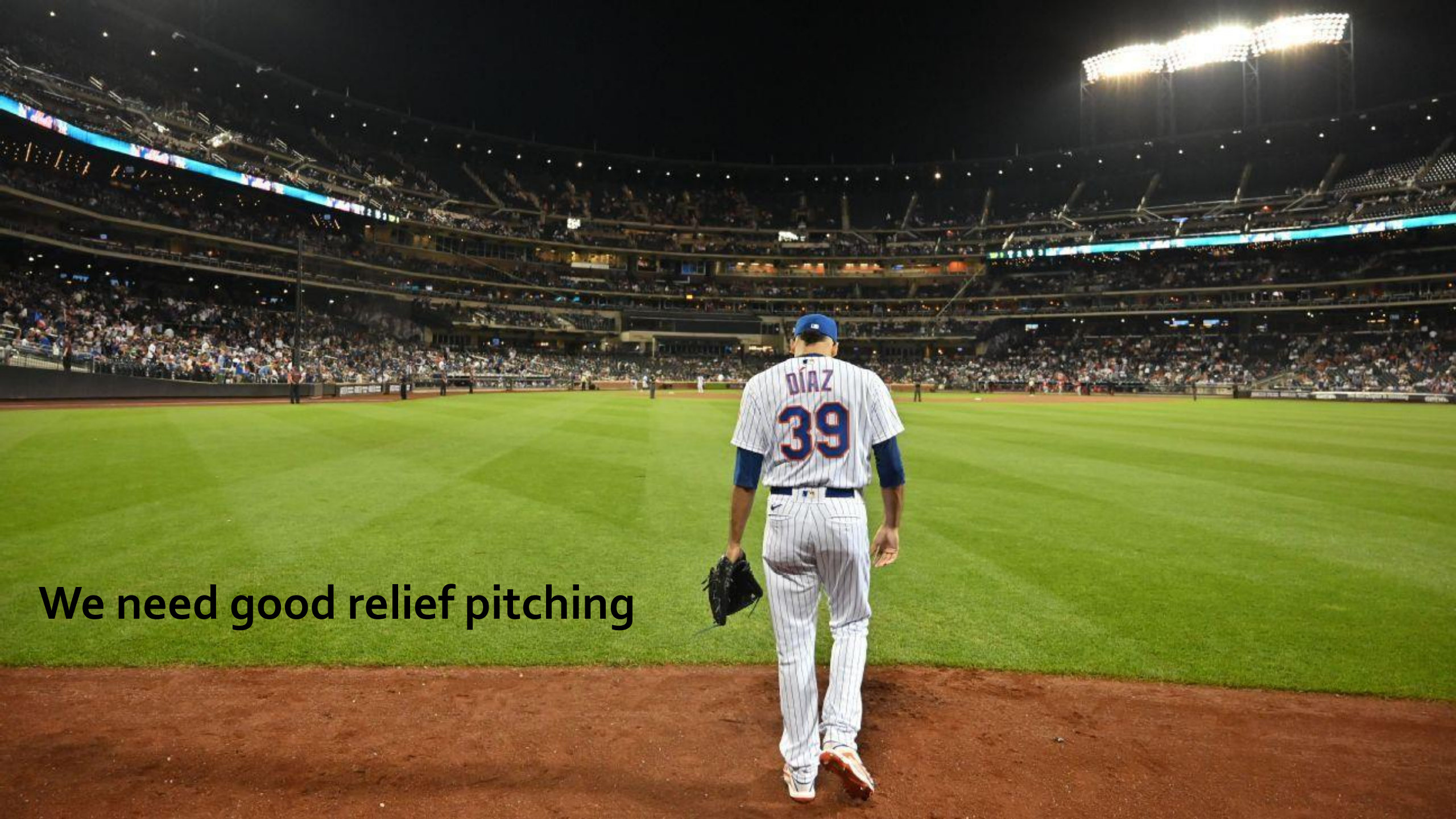
Images courtesy of Aaron Sawatzky, ACSC

Waterhemp control, Moorhead and Blomkest MN, 2022.^a

Trt	Etho or Etho + DM PRE	Herbicide Treatment ^b	Moorhead, MN	Blomkest, MN
			%	%
1	No	PM ₃ + etho + Outlook / PM ₃ + etho + Outlook	89 b	36 e
2	No	PM ₃ + etho + Warrant / PM ₃ + etho + Warrant	96 ab	54 bc
3	No	PM ₃ + etho + Outlook / PM ₃ + etho + Warrant	99 a	51 cd
4	Yes	PM ₃ + etho + Outlook / PM ₃ + etho + Outlook	99 a	43 de
5	Yes	PM ₃ + etho + Warrant / PM ₃ + etho + Warrant	99 a	49 cd
6	Yes	PM ₃ + etho + Outlook / PM ₃ + etho + Warrant	99 a	54 bc

^a90 days after plant at Moorhead and 59 days after plant at Blomkest

^bDestiny HC plus Amsol liquid AMS at 1.5 pt/A plus 2.5% v/v.



We need good relief pitching

Waterhemp Control Program in Sugarbeet

Planting Date	Recommendation
Sugarbeet plant in April or May	PRE. Dual Magnum at 0.5 to 1.0 pt/A, ethofumesate at 3 to 7.5 pt/A or Dual Magnum at 0.5 to 0.75 pt/A plus ethofumesate at 2 to 3 pt/A
	Split lay-by application (early postemergence / postemergence). Chloroacetamide herbicides applied at 2-lf sugarbeet fb 6- to 8-lf sugarbeet
June	Continue to scout fields for waterhemp. Control escapes with Ultra Blazer (Section 18ee), Liberty with the Redball™ 915 hooded sprayer (24c), or inter-row cultivation
July	Electric Discharge Systems (WeedZapper™)
August / September	Hand remove waterhemp



Waterhemp emerged, image, May 22

Does PowerMax control waterhemp in Grant and Kandiyohi Counties, MN?

Treatment	Rate	Herman, 2014	Lake Lillian, 2017	Lake Lillian, 2017
	fl oz/A	-----count/area-----		
Roundup PowerMax	28	101	192	116
Control	0	432	727	792



Control plot, Jun 6



PowerMax at 28 fl oz/A

Number of waterhemp per meter square, June 6, 2017, Lake Lillian, MN

YES. 77% control at Herman and 76% control at Lake Lillian

Increasing the rate or repeat applications does not improve control



Schmoll Farms
Lake Lillian, MN

General Considerations

What Type of shovels?

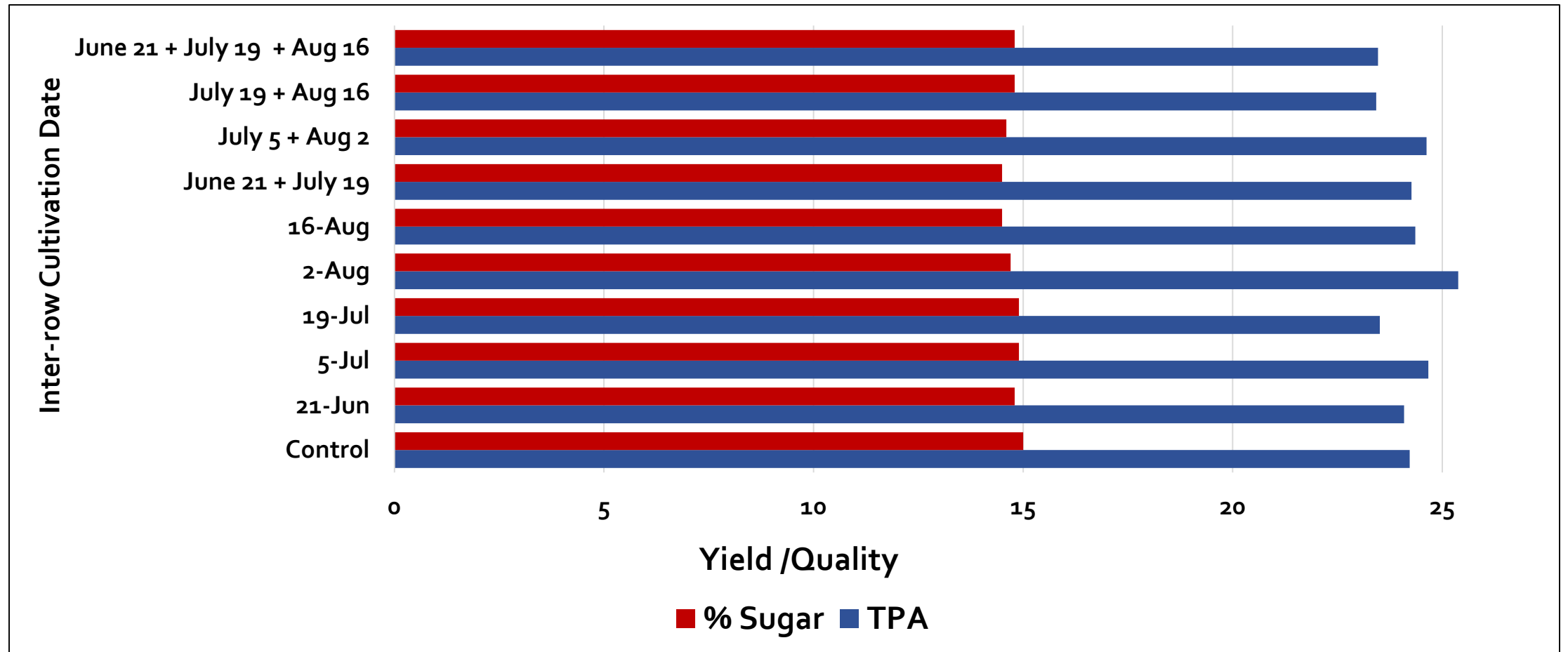
- Sweep and s-tine style shovels are effective for weed control
 - Target waterhemp less than 6-inch; less than 4-inch is even better
 - Speed is dependent on conditions and crop size
 - Cultivation is not an effective for incorporating soil residual herbicides (Haugrud and Peters)



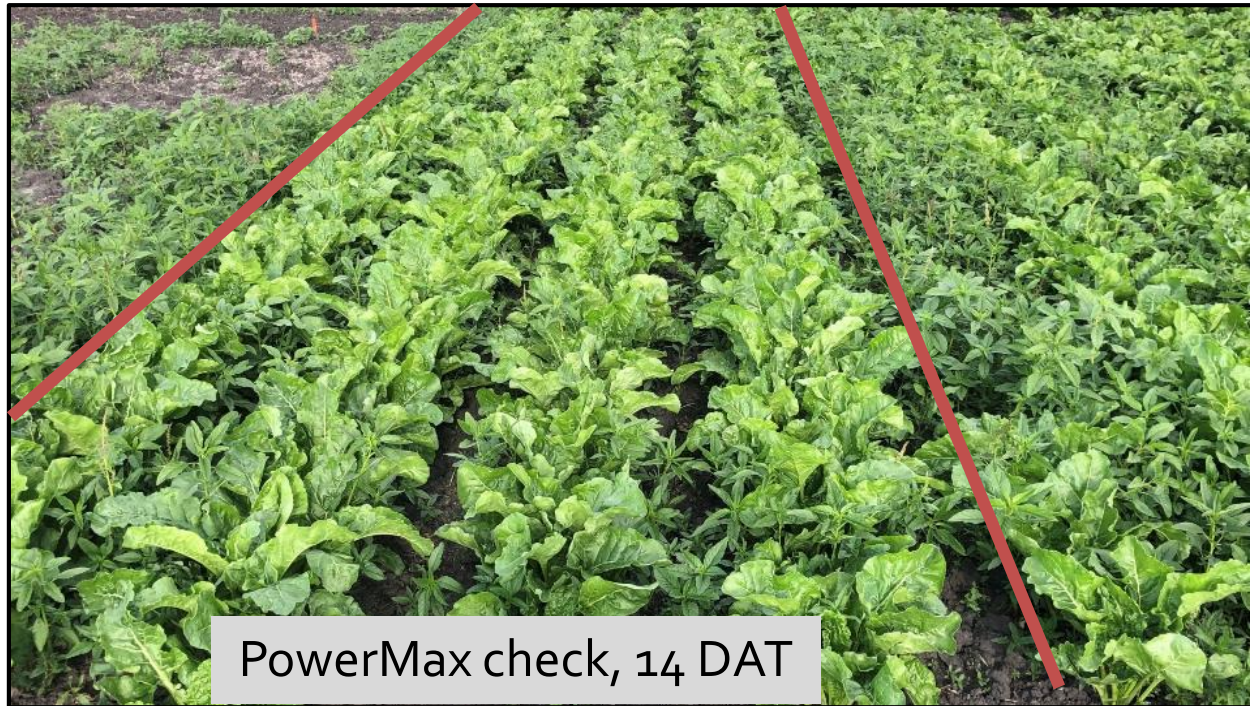
Situation	Sweep	S-tine
General weed control	Set ½ to ¾ inch deep	Set deeper to get soil movement action
Waterhemp, 4-6-inch	Cut the weed	Bigger waterhemp will work around the shovel
Weeds and residue management		Bigger weeds or residue may accumulate between shovels

Cultivation timing had no effect on sugarbeet yield across environments in 2018

Root yield and % Sugar were NS at 0.05



Waterhemp control and sugarbeet injury in response to treatment, Moorhead, 2020







Ultra Blazer + NIS



Ultra Blazer + PowerMax3

Hendrum, MN
4 DAT



Ultra Blazer + COC



PowerMax3 / PowerMax3

Sugarbeet injury and yield components in response to treatment, across locations, 2022

Treatment	Rate	Necrosis	Growth Reduction	Sucrose	Recoverable Sucrose
	--fl oz/A--	--%--	--%--	--%--	--lb/A--
Ultra Blazer + NIS ^a	16 + 0.25%	12 b	11 cd	16.4	8,452 ab
PowerMax3 + Ultra Blazer + AMS ^c	25 + 16 + 2.5% v/v	22 b	24 a	16.3	8,155 b
PowerMax3 + NIS / PowerMax3 + NIS ^d	25 / 25	0 c	5 d	16.4	8,788 a

^a Prefer 90 non-ionic surfactant

^b Prime Oil, Winfield United, St. Paul, MN.

^c PowerMax3 and Amsol Liquid AMS, Winfield United, St. Paul, MN.

^d Prefer 90 NIS at 0.25%v/v.

Sugarbeet injury and yield components in response to treatment, across locations, 2022 and 2023

Treatment	Rate	Necrosis	Growth Reduction	Sucrose	Recoverable Sucrose
	--fl oz/A--	--%--	--%--	--%--	--lb/A--
Ultra Blazer + NIS ^a	16 + 0.25%	12 b	11 cd	16.4	8,452 ab
PowerMax3 + Ultra Blazer + AMS ^c	25 + 16 + 2.5% v/v	22 b	24 a	16.3	8,155 b
PowerMax3 + NIS / PowerMax3 + NIS ^d	25 / 25	0 c	5 d	16.4	8,788 a

Treatment	Rate	Necrosis	Growth Reduction	Sucrose	Recoverable Sucrose
	--fl oz/A--	--%--	--%--	--%--	--lb/A--
Ultra Blazer + NIS ^a	16 + 0.25%	26 bc	22 b	17.7	11,180 ab
PowerMax3 + Ultra Blazer + AMS ^c	25 + 16 + 2.5% v/v	48 d	43 cd	17.8	10,430 c
PowerMax3 + NIS / PowerMax3 + NIS ^d	25 / 25	1 a	2 a	17.8	11,639 a

^a Prefer 90 non-ionic surfactant

^b Prime Oil, Winfield United, St. Paul, MN.

^c PowerMax3 and Amsol Liquid AMS, Winfield United, St. Paul, MN.

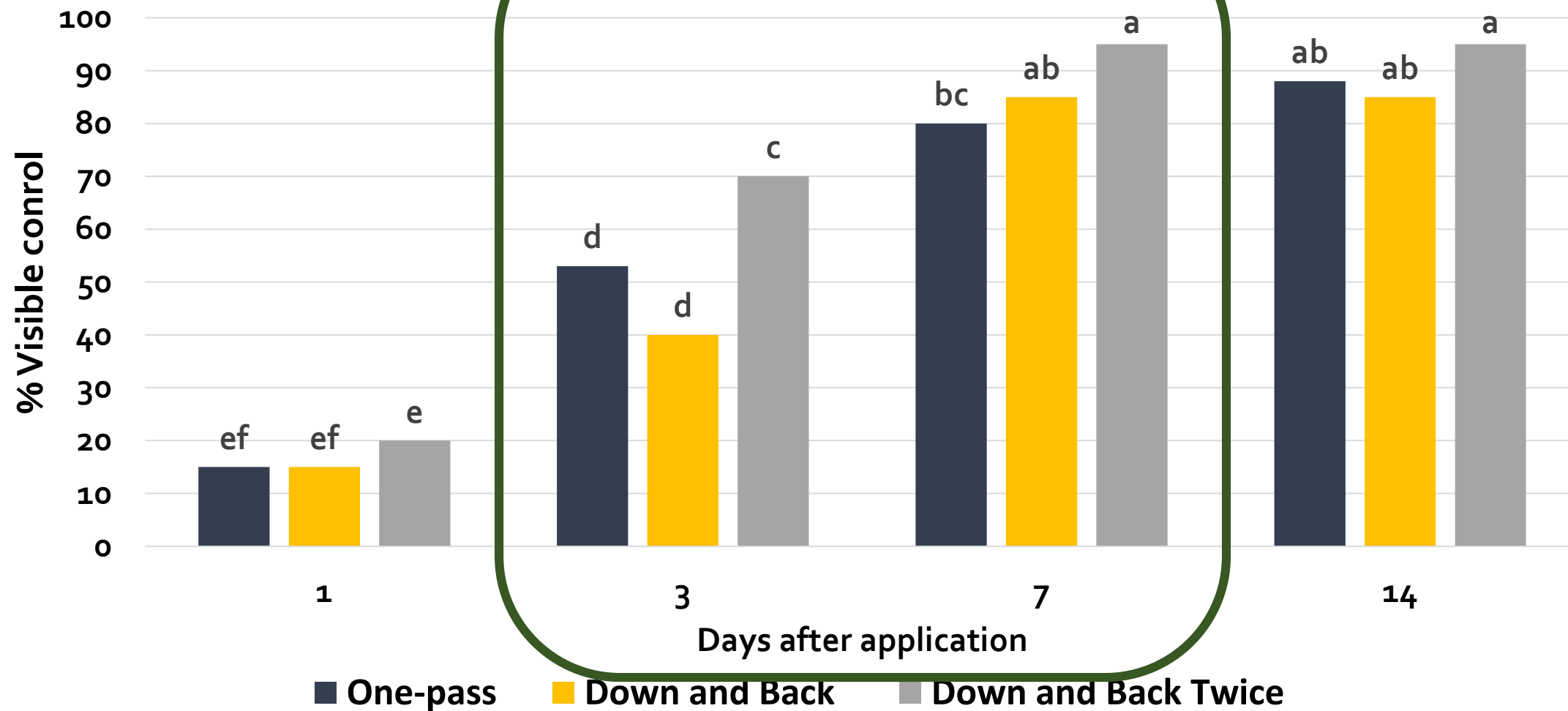
^d Prefer 90 NIS at 0.25%v/v.

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



Waterhemp control across treatment, Kragens, MN, 2020



Blomkest, MN, July 31, 2023



Waterhemp injury assessment, Blomkest, MN 2023

Date	Days after treatment	Height control	Necrosis wound length (inch from flower tip)		Dead plants	Observations
		inch	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

Aug 4, 5 DAT

Aug 7, 8 DAT

Aug 11, 12 DAT

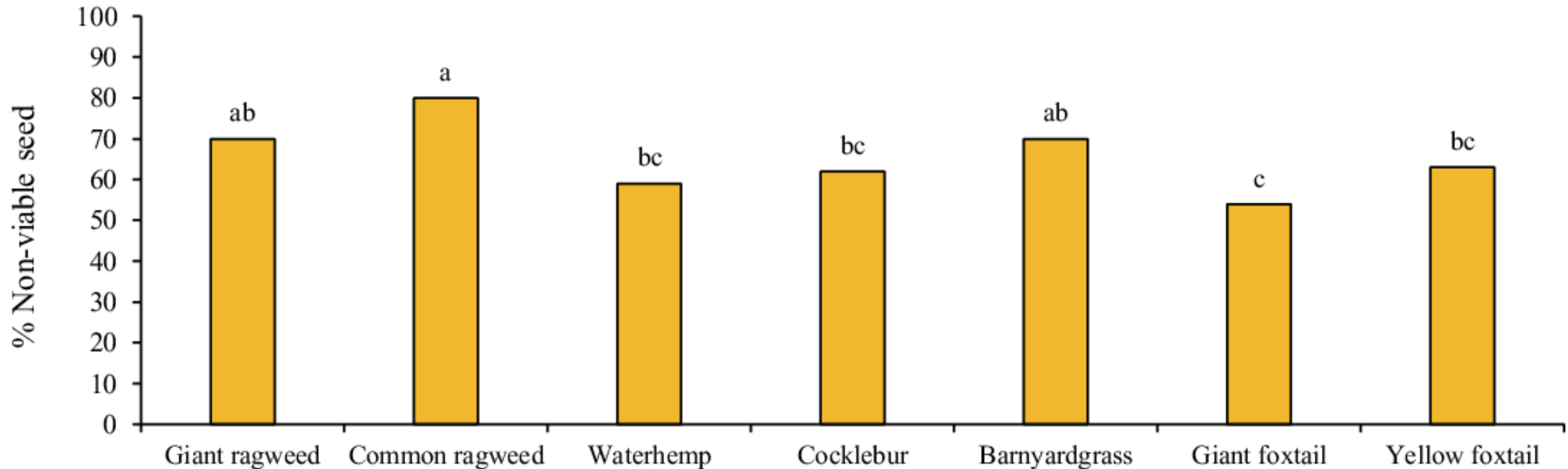
Untreated



Treated



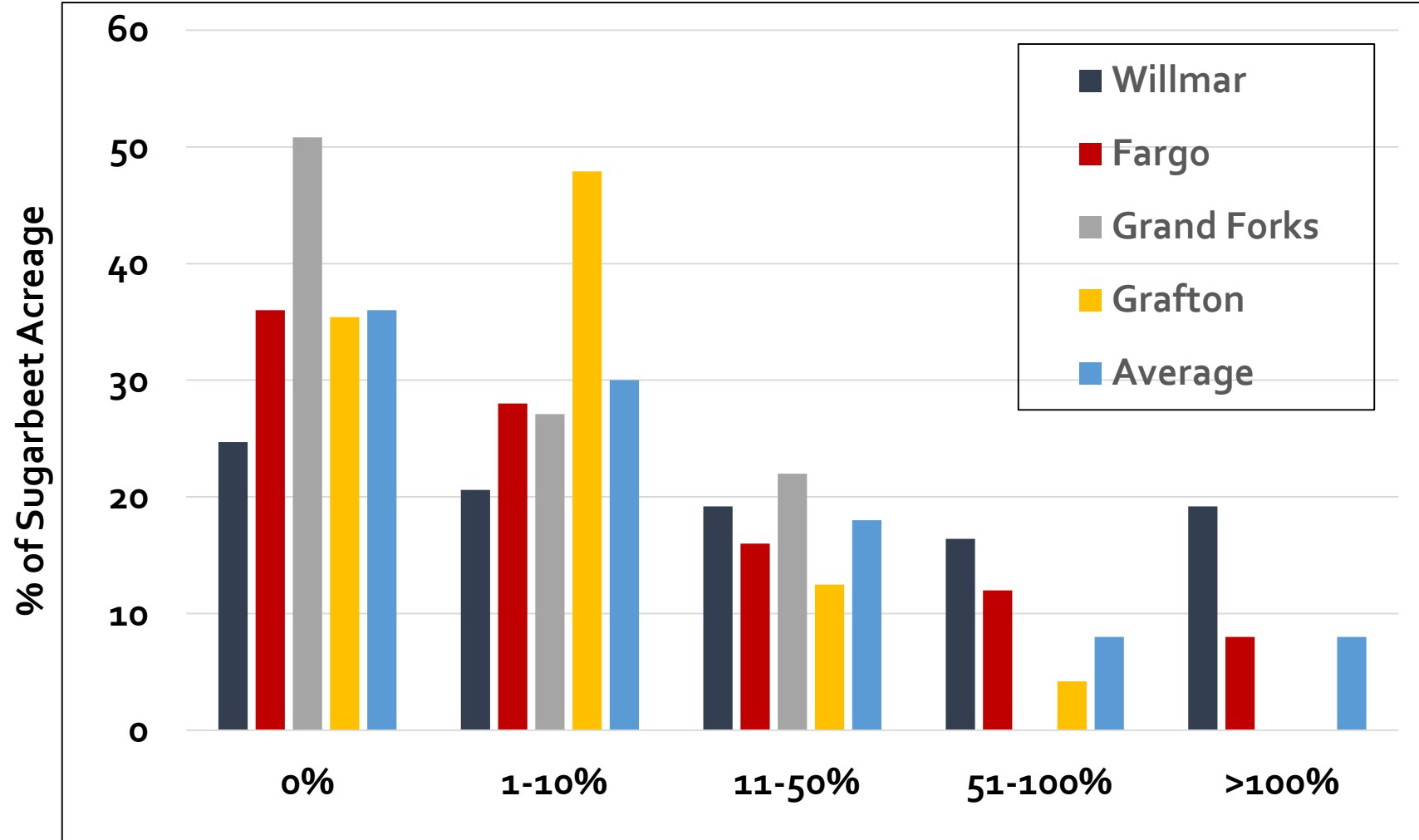
Electrocution reduces the number of viable seed that are returned to the soil seedbank



Schreier et al. 2022
Univ. of Missouri

Hand-weeding.^a

“our farm has turned to hand-weeding and it works excellent, but it can easily cost \$100/ac if you have weedy fields”



^aFrom survey at 2023
Grower Seminar

% of Acres Hand-weeded



See & Spray™ technology

- Camera system recognizes 'plant' is different from sugarbeet
- Artificial intelligence vs. Machine Learning
- AI is computer software that mimics human cognition to perform complex tasks.
- ML is an application of AI that uses algorithms trained on data to perform a task
- I hear possible field evaluation in sugarbeet in 2024
- I hear the system will be commercially available in sugarbeet in 2026
- What is our goal in sugarbeet?
- What herbicides; selective or non-selective



	SEE & SPRAY SELECT	SEE & SPRAY ULTIMATE	SEE & SPRAY PREMIUM
Fallow Use			
In-Season Use			
Traditional Broadcast Spray Application			
Targeted Spray Application*			
Single Tank			
Dual-Product Solution System/Split Tank			

Image from the John Deere website

Summary



- Layered soil residual herbicides starting with PRE are our best and most consistent program for waterhemp control in sugarbeet
- Control waterhemp escapes early as small waterhemp very quickly become bigger waterhemp
- Inter-row cultivation before the second layby application against waterhemp less than 4-inch
- Ultra Blazer mixed with glyphosate negatively affects yield components
- Electrocuting slows waterhemp; reduces seed production
- See & Spray is wait and see

Herbicides and The Endangered Species Act: What You Need to Know

- [What is the Endangered Species Act \(ESA\)?](#) ESA requires government agencies to ensure any actions they take don't threaten any species that have been federally listed as endangered or threatened. Outcome is a '**biological opinion**,' which determines if the proposed action would cause *jeopardy* or *adverse effects* to any listed species or habitat.
- [How does ESA affect herbicide use?](#) EPA oversees pesticide use. Pesticides, including herbicides can affect animals and plants and triggers an endangered species consultation.
- [Why am I hearing about ESA now?](#) EPA has not done required endangered species consultations. EPA had defended registrations to keep pesticides on the market. EPA is beginning to comply with ESA.
- [What may change?](#) New spray requirements on labels; such as those listed on the new Enlist One or Enlist Duo.
- [Why does complying with ESA matter to agriculture?](#) EPA has realized that having pesticide registrations that are constantly facing lawsuits is not a sustainable situation for agriculture.
- [Does agriculture have a say in it?](#) EPA has made draft plans available for public comment.

Thank you for your continued support

Tom Peters

- Extension Sugarbeet Agronomist and Weed Control Specialist
- thomas.j.peters@ndsu.edu
-   BeetWeedControl @tompeters8131
- 701-231-8131 (office)
- 218-790-8131 (mobile)



NDSU

EXTENSION

UNIVERSITY OF MINNESOTA
EXTENSION