

# Weed Control in Sugarbeet Grafton

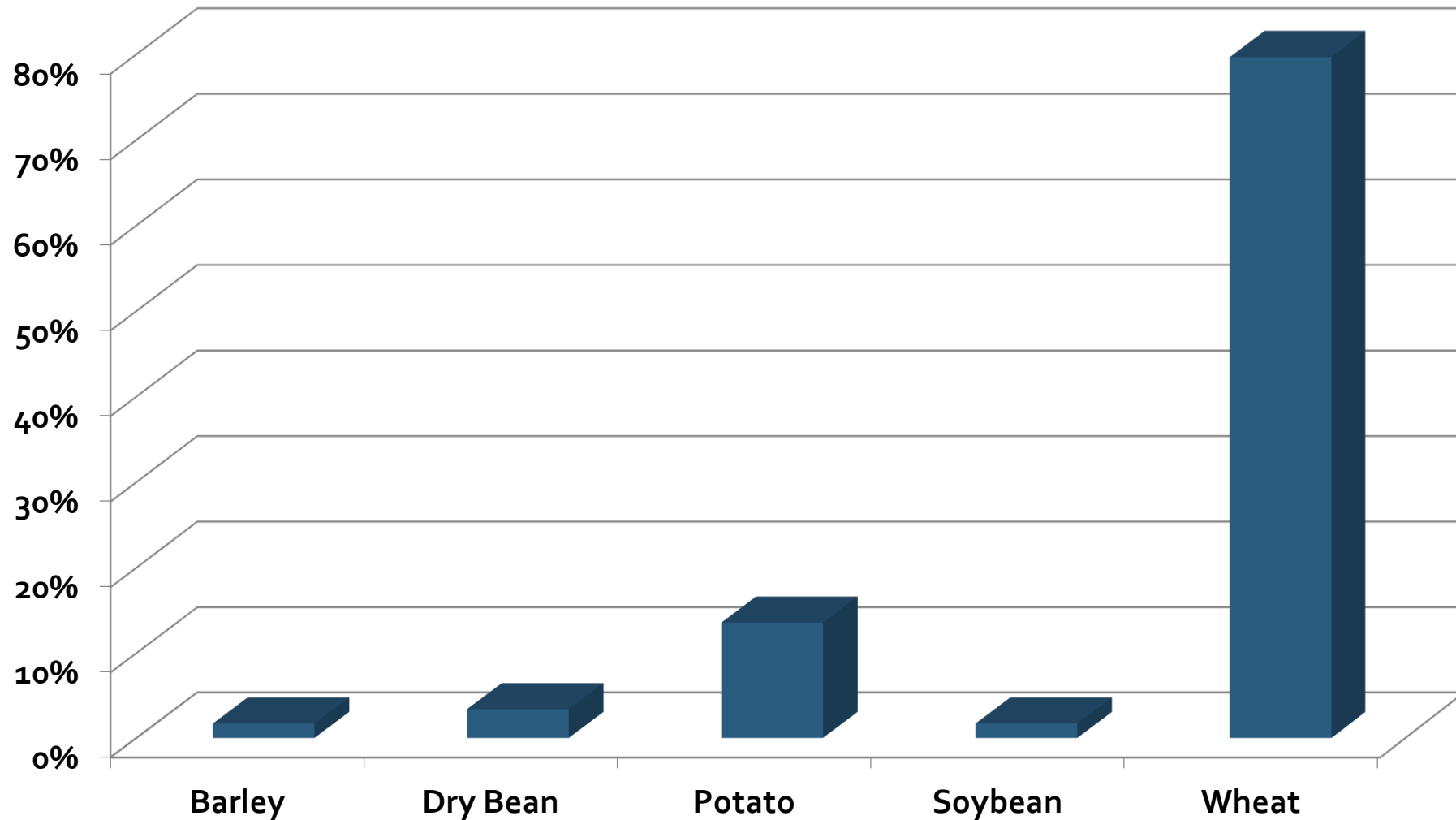
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# What crop preceded most of your sugarbeet acres<sup>1</sup>?



<sup>1</sup>Turning Point Survey of Growers; conducted at the 2018 Sugarbeet Growers Seminar, Grafton







# Wild oat and green foxtail resistance testing

## Table is number of resistant populations

### Wild oat (27 samples)\*

Puma: 23  
Axial: 14  
Assure II: 21  
Select: 0

Everest: 26  
GoldSky: 27  
Varro: 27  
Raptor: 12

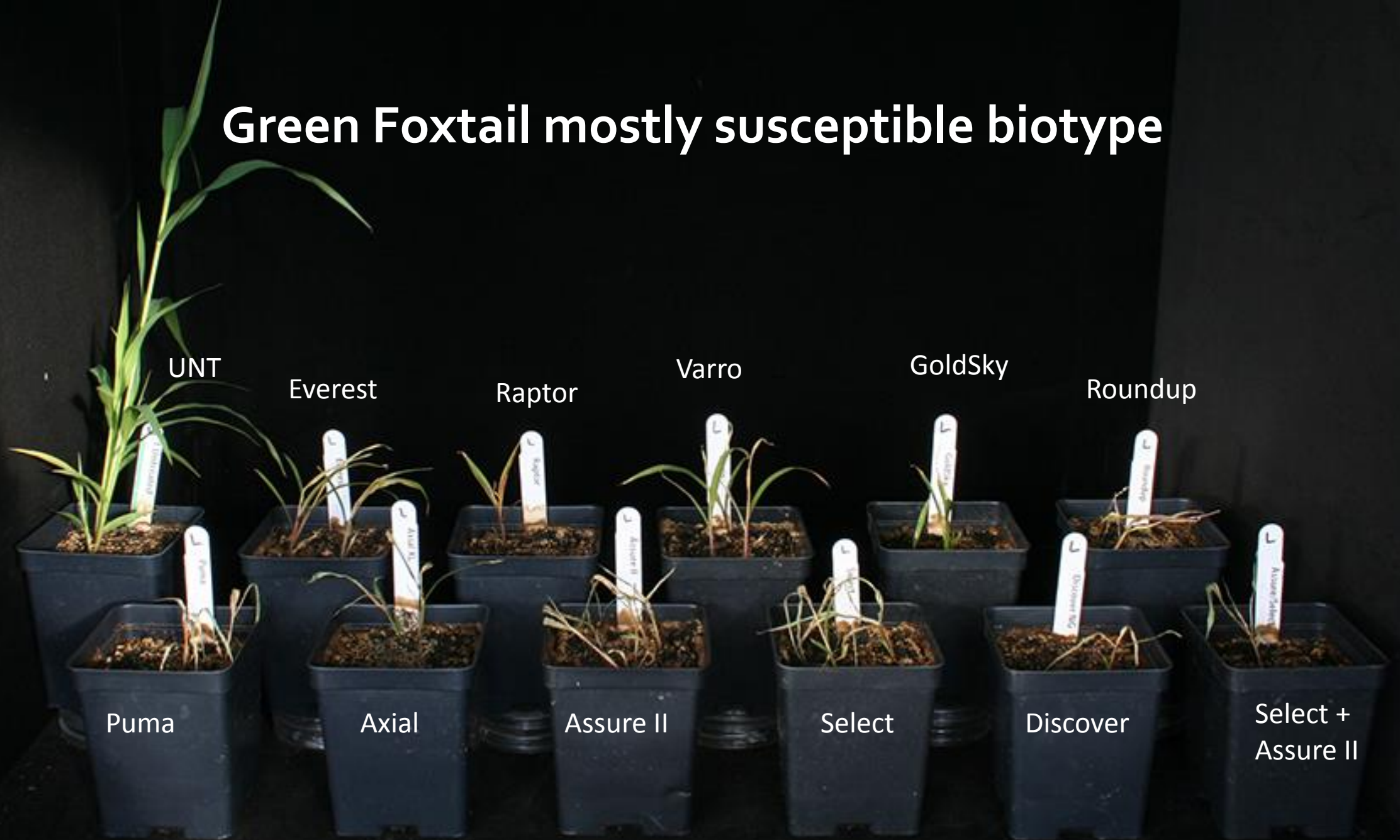
### Green foxtail (16 samples)\*

Puma: 14  
Axial: 10  
Assure II: 11  
Select: 1

Everest: 2  
GoldSky: 2  
Varro: 2  
Raptor: 0

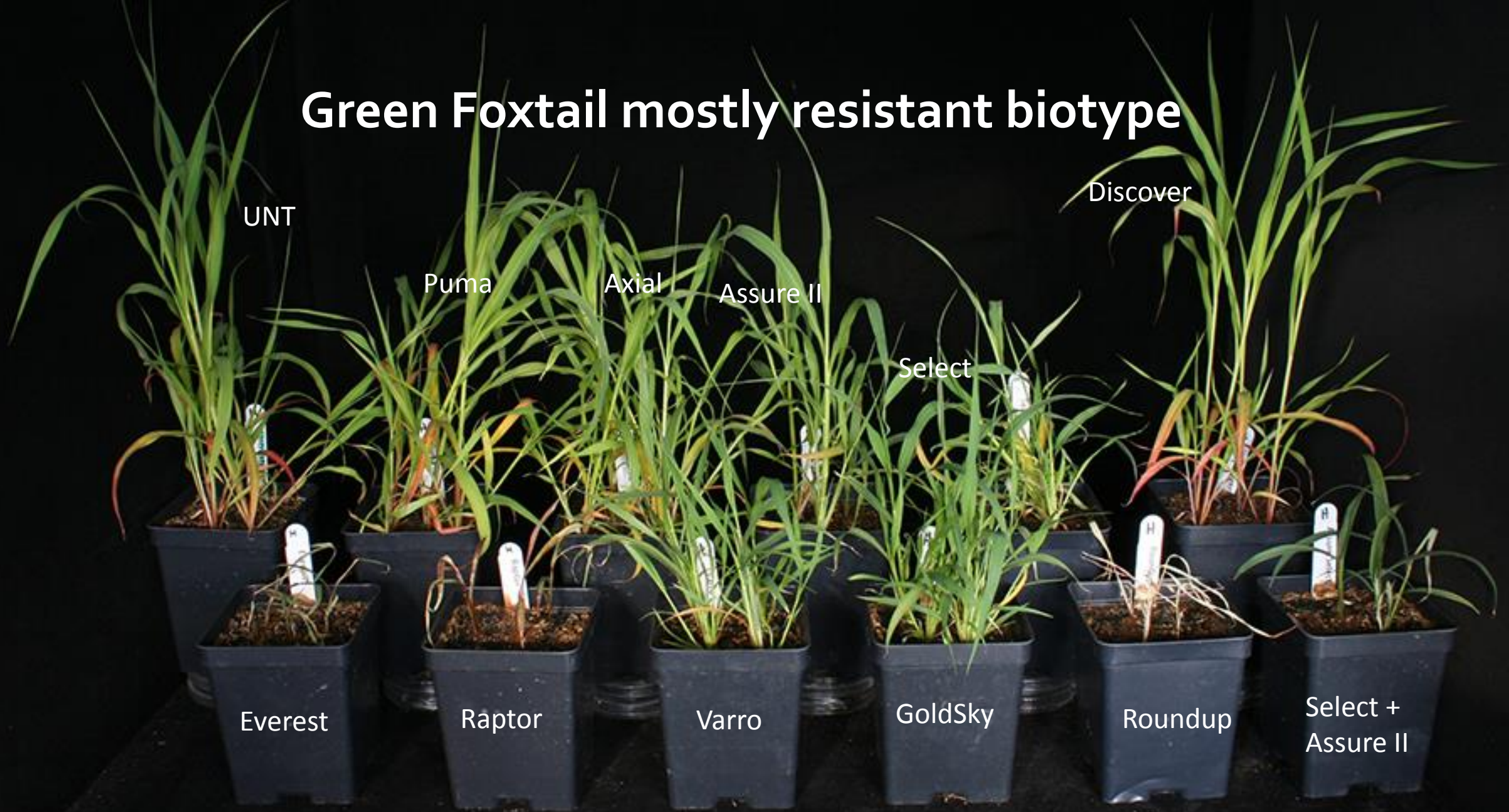
\*samples submitted and tested by Dr. Brian Jenks. Samples from NE North Dakota and NW Minnesota

# Green Foxtail mostly susceptible biotype



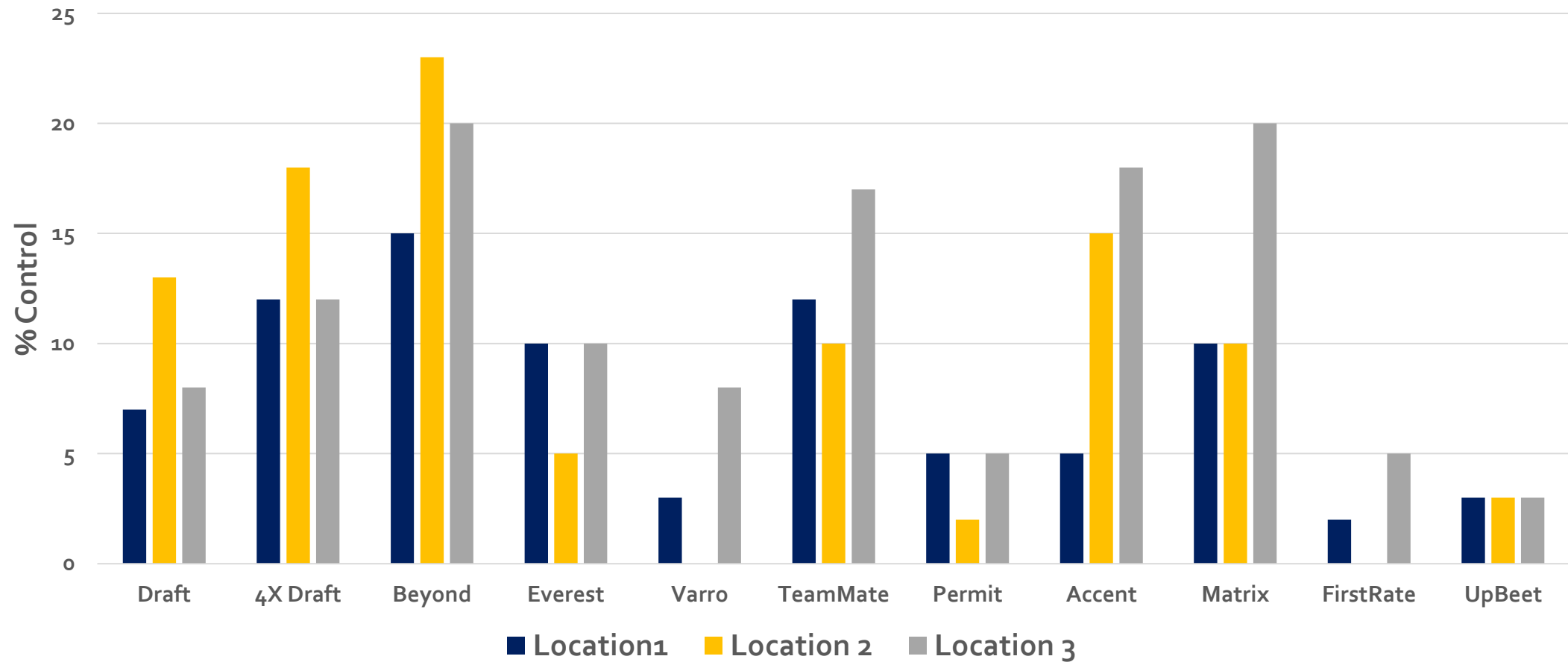
Slide from Brian Jenks, North Central Research and Extension Center, Minot

# Green Foxtail mostly resistant biotype

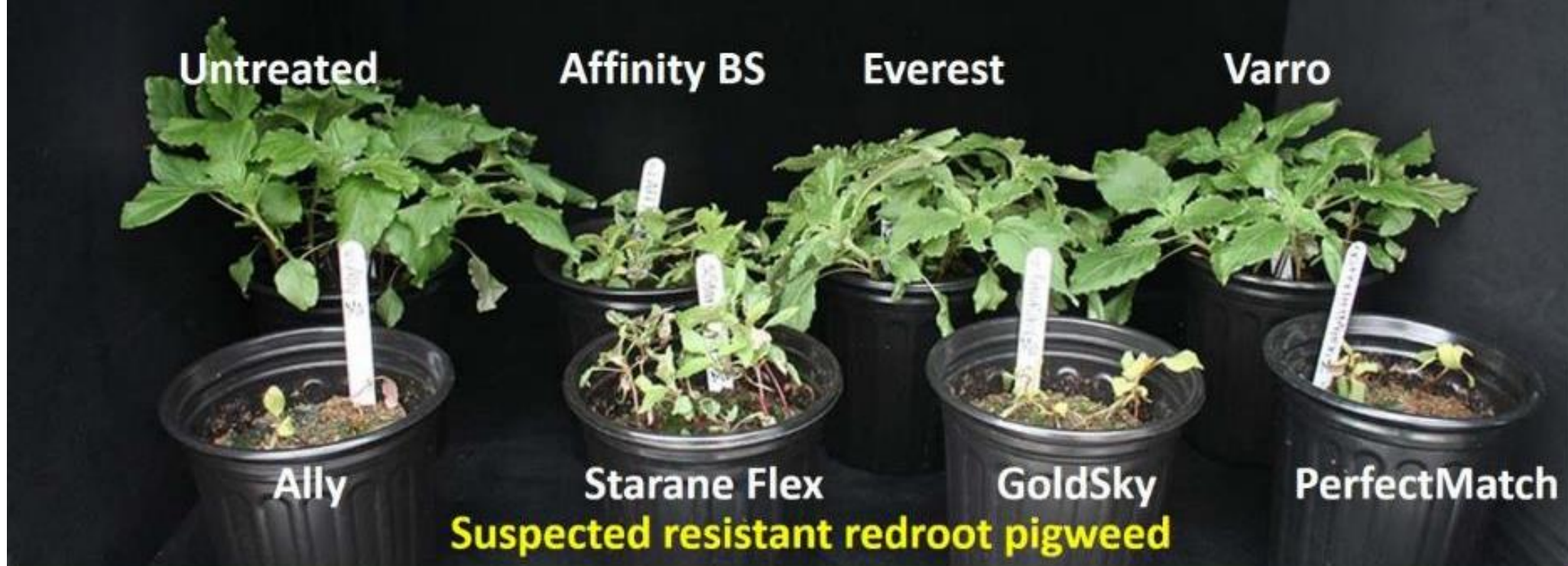




# ALS-resistant redroot pigweed control\* in northeastern North Dakota

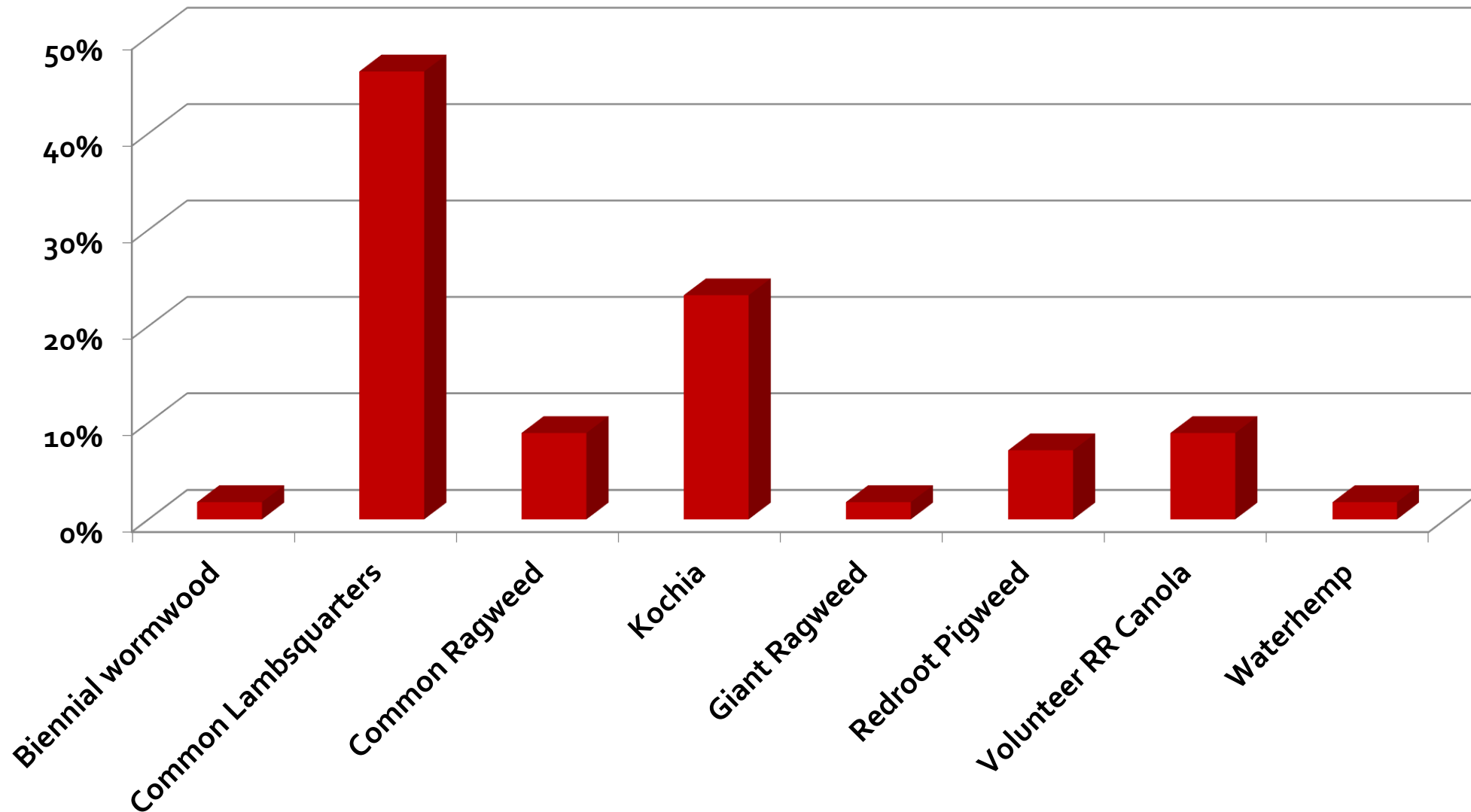


\*samples submitted and tested by Dr. Kirk Howatt. Samples from NE North Dakota



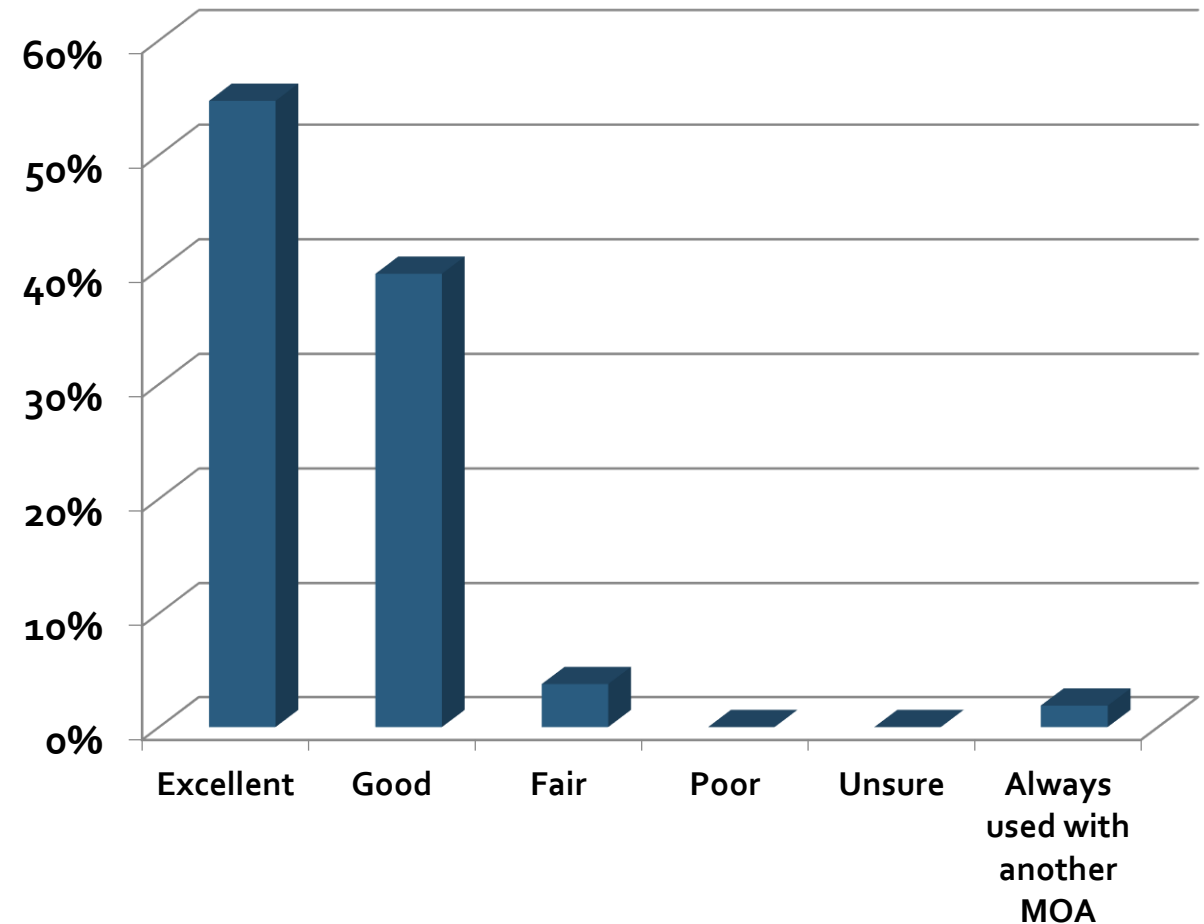
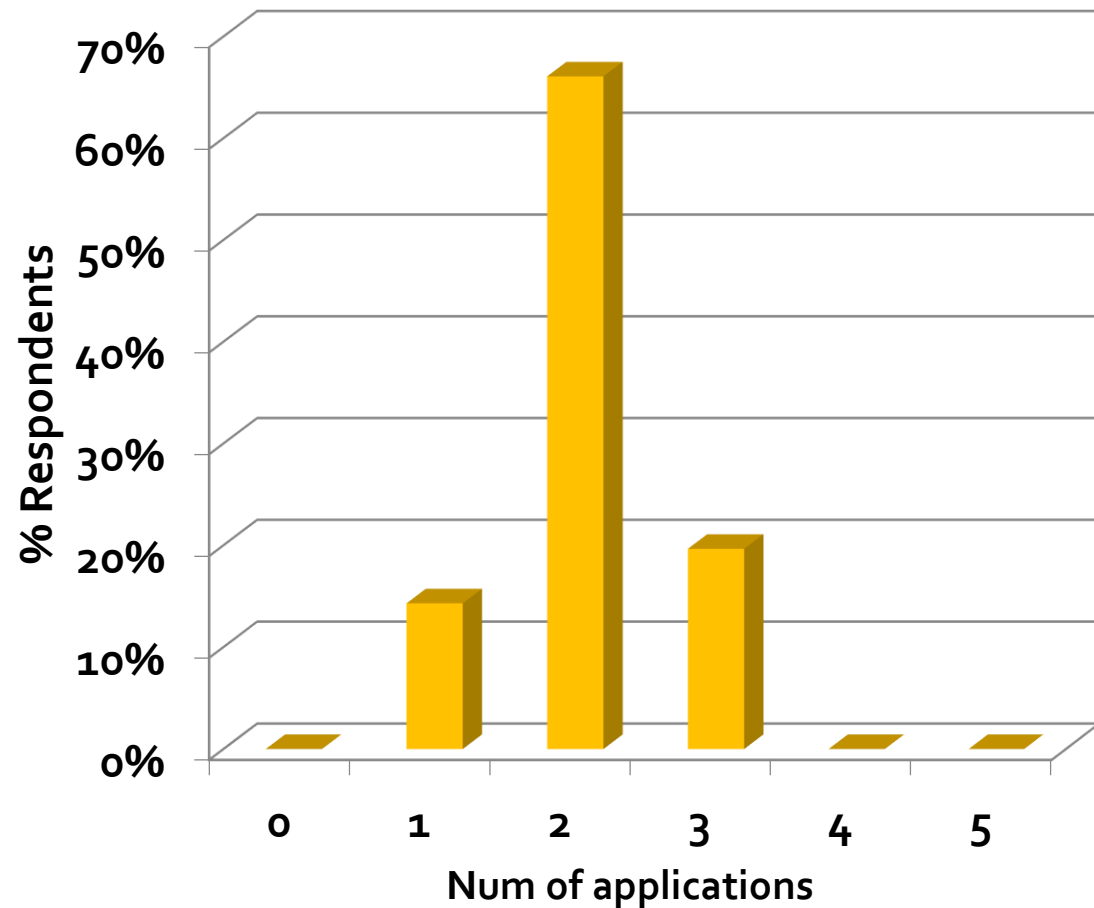


# What was your worst weed problem<sup>1</sup>?



<sup>1</sup>Turning Point Survey of Growers; conducted at the 2018 Sugarbeet Growers Seminar, Grafton

# How many glyphosate applications did you use in 2017? How did it work?





# Glyphosate alone, glyphosate in tank-mixes<sup>1</sup>

	Central Minnesota	RR Valley South	RR Valley Central	RR Valley North
	-----% of survey respondents-----			
Glyphosate	9	23	34	<b>79</b>
Glyphosate + soil residual herbicide applied POST	77	47	11	0
Glyphosate + POST broadleaf herbicide	9	23	53	17
Glyphosate + POST grass herbicide	5	7	2	4
<b>Broadleaf Tank-mix</b>	<b>86</b>	<b>70</b>	<b>64</b>	<b>17</b>

<sup>1</sup>Turning Point Survey of Growers; conducted at the 2018 Sugarbeet Grower Seminars

# Glyphosate products are different formulations and adjuvant loading

Trade Name	Manufacturer	Glyphosate Salt	lb ae/gal	lb ai/gal	Adjuvant Load*	Rate to get 0.98 lb ae /A
PowerMax	Monsanto	K	4.5	5.5	Full	28
Roundup Original	Monsanto	lpa	3	3	Full	42
Buccaneer	Tenkoz	lpa	3	4	Partial	42
Buccaneer Plus	Tenkoz	lpa	3	4	Full	42
Cornerstone 5 Plus	Winfield United	lpa	4	5.5	Full	31
Credit / 41	NuFarm	lpa	3	4	Partial	42
Glyfos	Cheminova	lpa	3	4	Partial	42
Gly Star Gold	Albaugh	lpa	3	4	Full	42
Imitator Plus	Drexel	lpa	3	4	Full	42
Mad Dog	Loveland	lpa	3	4	Partial	42
Showdown	Helena	lpa + NH <sub>4</sub>	2.7+0.3	3.64	Full	42

\*Add NIS to glyphosate unless prohibited by the label; Full, add 1 qt/100 gal water, Partial, add 1-2 qt/100 gal water



# Common lambsquarters control from glyphosate, Bathgate ND





# The Times They Are A-Changin'

Bob Dylan, 1963





# Common Ragweed



- Life cycle: summer annual broadleaf
- Growth habit: fibrous root system, grows 2 to 4 feet high
- Germination: soil temperature triggers germination,
  - between 50 and 80 F
  - returns to dormancy when temperatures get hot in June and July
- Reproductive habit: male and female flowers are in separate flower heads on the same plant (monoecious)
- Seed production: 30,000 to 60,000 seeds per plant
- Longevity: 25 to 35 years??
- Resistant biotypes to multiple classes of herbicides
  - ALS (SOA 2)
  - PPO inhibitor (SOA 14)
  - Glyphosate (9)









# Sugarbeet injury and control of common ragweed, Doran MN, 2018

Three inch common ragweed

		June 21 sgbt inj	June 28 cora cntl	July 11 cora cntl
Herbicide	Rate			
Pov	fl oz/A		(0%)	
Pov	28			
Pov	28+4			
Pov	28+2			
PM	28+4			
Pov	28+2/ 28			
Pov	28+4/ 28			
LSD				



<sup>1</sup>Pov treatments were applied with N-Pak AMS at 2.5% v/v and

Pre  
<sup>2</sup>Application May 31 and June 13

# Sugarbeet injury and control of common ragweed, Doran MN, 2018

Six inch common ragweed

Herbicide Treatment <sup>1</sup>	Rate	June 21 sgbt inj	June 28 cora cntl	July 11 cora cntl
	fl oz/A	------(%)-----		
PowerMax <sup>2</sup>	28	5	78	66
PowerMax+ethofumesate	28+4	18	71	65
PowerMax+Stinger	28+2	13	76	72
PMax+Stinger	28+4	23	75	73
PowerMax+Stinger/ PowerMax+Stinger	28+2/ 28+2	15	81	82
PowerMax+Stinger/ PowerMax+Stinger	28+4/ 28+4	28	76	91
LSD (0.1)		8	13	16

<sup>1</sup>PowerMax alone and PowerMax+Stinger treatments were applied with N-Pak AMS at 2.5% v/v and Prefer 90 NIS at 0.25% v/v.

<sup>2</sup>Application May 31 and June 13



# Kochia

- Life cycle, summer annual
  - One of the first weeds to emerge in spring
- Seed production, 15,000 seeds per plant
- Biology, very deep rooted, tolerate saline soils
- Biology, extremely competitive; a few plants will reduce yield
- Seed viability, 1 to 2 years
- Many document examples of herbicide resistance
  - ALS (SOA 2)
  - 2,4-D and dicamba (SOA 4)
  - Triazines (5)
  - Glyphosate (SOA 9)
  - Multiple resistance in ND, 2+4, 2+9, 2+4+9



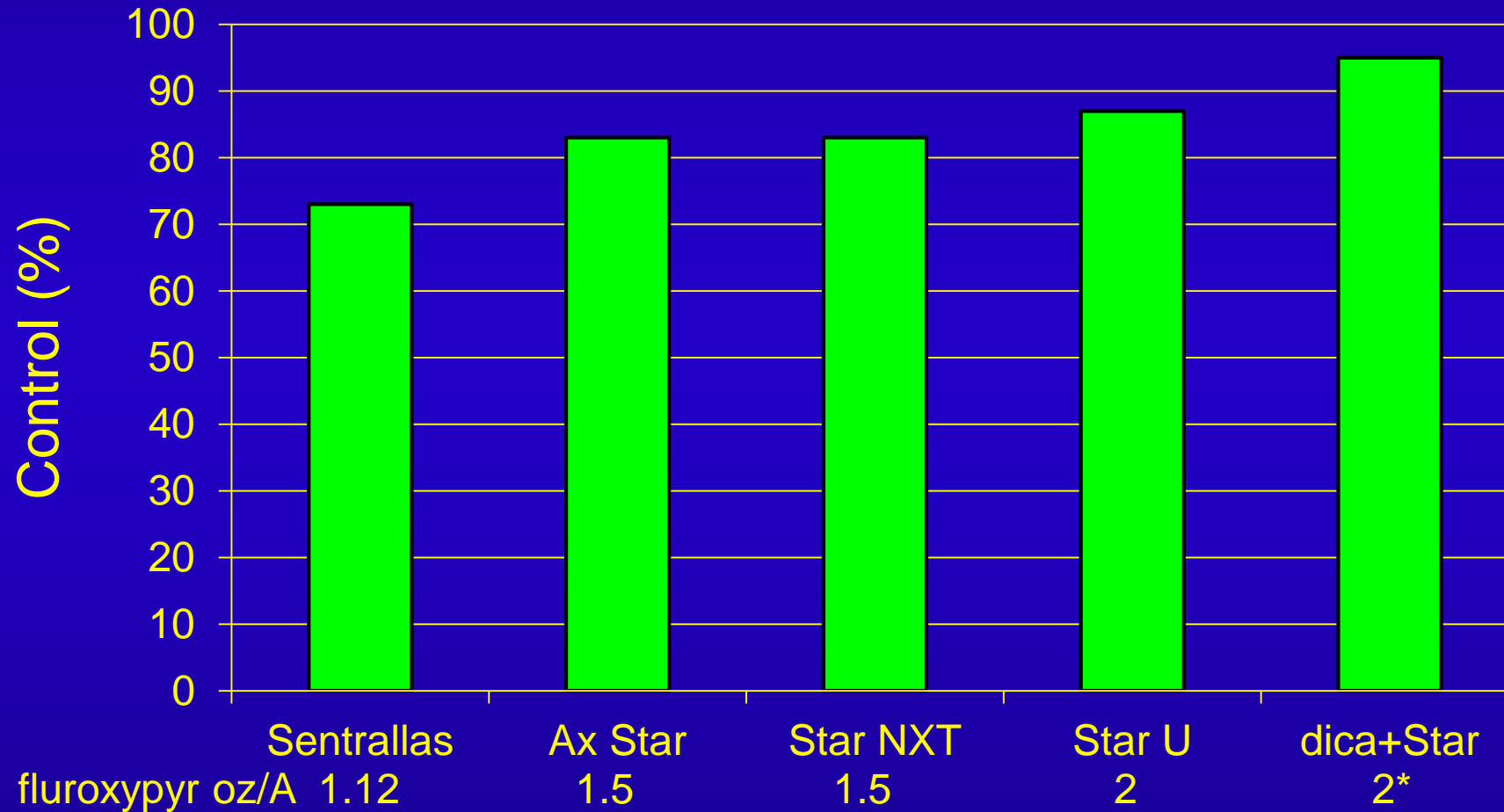


# Small grains are tremendous crop(s) to implement a kochia control protocol

- Narrow rows provide canopy closure
- Herbicides and herbicide families are complimentary
  - Growth Regulators (SOA<sub>4</sub>)
    - Fluroxypyr, Starane, or Starane Ultra
    - Dicamba
    - Widematch (clopyralid+fluroxypyr)
  - PSII Inhibitors (SOA<sub>6</sub>)
    - Bromoxynil
  - PPO Inhibitors (SOA<sub>14</sub>)
    - Aim
  - HPPD Inhibitors (SOA<sub>27</sub>)



# Kochia Control

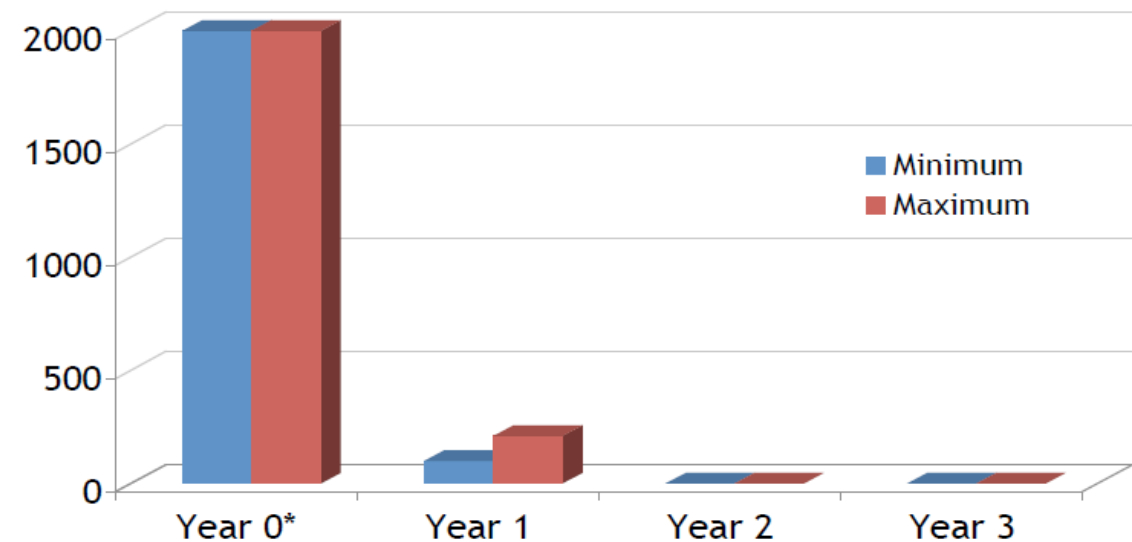


# Control of volunteer RR canola in sugarbeet

- Canola can survive in soil for up to four years
- Number of canola volunteers is dependent on several factors including weather and time of harvest
- Gulden et al. found that the major of volunteer canola germinate and emerge in the first year following crop
- Volunteers can be managed in crop sequence with herbicides
- Small canola is easier to control than large canola



Figure 1. Volunteer canola emergence over time.



\*Year 0 is the starting seedbank with 2000 viable seeds/m<sup>2</sup>

Source: Gulden et al. 2003.



# Volunteer canola control from UpBeet plus PowerMax; early or late planting, cotyledon or 2-leaf at application, Prosper, ND, 2015

		Early, April planting			Late, May planting	
Herbicide <sup>1</sup>	Rate	29 Jun	2 Aug		2 Aug	24 Aug
	(oz/A)	------(%)-----			------(%)-----	
UpBeet / UpB / UpB	0.25	72 c	59 b		-	-
UpBeet / UpB / UpB	0.5	87 b	70 a		79 b	63 b
UpBeet / UpB / UpB	0.75	92 a	70 a		83 b	65 ab
UpBeet / UpB / UpB	1.0				92 a	71 a

		Early, April planting			Late, May planting	
Canola stage		29 Jun	2 Aug		2 Aug	24 Aug
		------(%)-----			------(%)-----	
Cotyledon		80 b	63 b		86	64 b
2-leaf stage		88 a	70 a		83	69 a

<sup>1</sup>UpBeet plus Roundup PowerMax with Destiny HC at 1.5 pt/A plus N-Pak AMS at 2.5% v/v





Roundup PowerMax control



UpBeet, 0.5 oz/A, cotyledon timing



UpBeet, 0.75 oz/A, cotyl timing

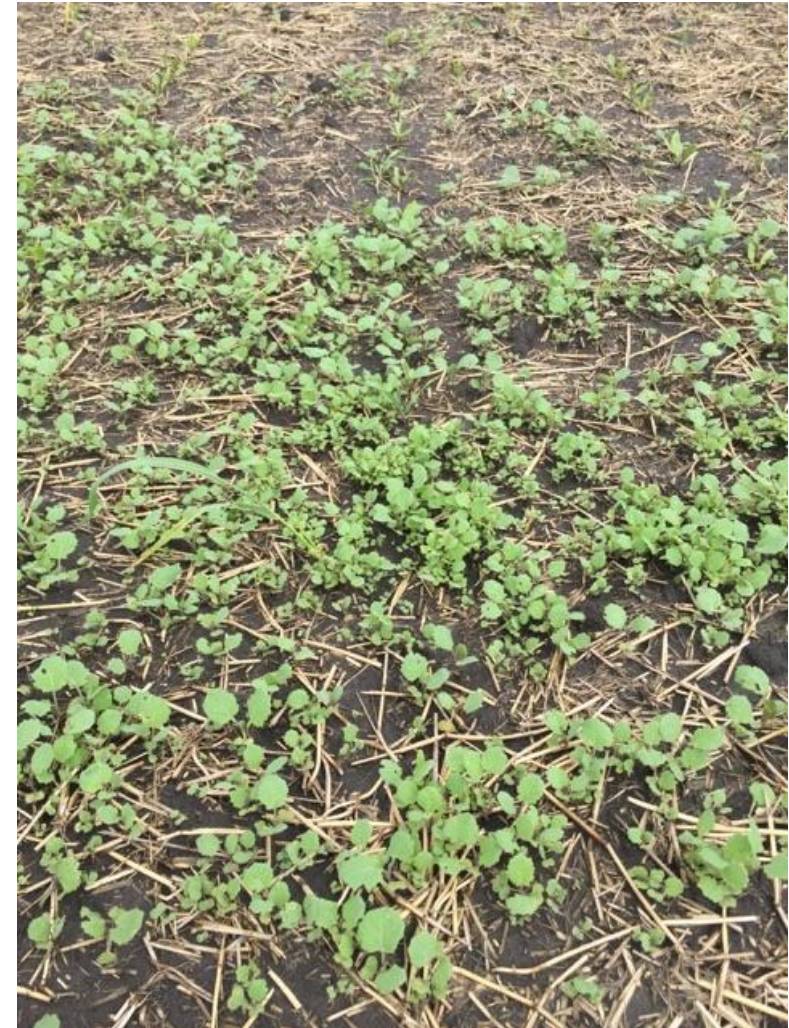


UpBeet, 0.75 oz/A, 2-leaf timing



# Control of volunteer RR canola in sugarbeet

- Sugarbeet injury from UpBeet was inconsistent; tended to be less when initial application at 2-leaf canola
- Canola control from UpBeet tended to be better when applied beginning at the 2-leaf canola compared to cotyledon canola
- Duration of canola germination complicates UpBeet rate decision; 4 x 0.5 oz, 3 x 0.75 oz or 2 x 1 oz/A
- ethofumesate soil applied followed by Roundup PowerMax gave inadequate canola control



# These steps are general for all sprayers, but...

- Know your sprayer
  - Where can residues hide? Where are my valves? Screens? Hoses?
  - Consult your operators manual
- Develop a checklist
- Know the physical properties of the chemical you're applying
  - Dry vs. EC vs. solution
  - Jar mix to test incompatibility



# Seven steps of sprayer cleanout

1. Spray out booms every night (or when herbicides demand it)
2. First rinse is in the field
3. Remove and clean all screens
4. Remove and clean boom end caps
5. Second rinse with water
6. Add tank cleaner
7. Final rinse and flush

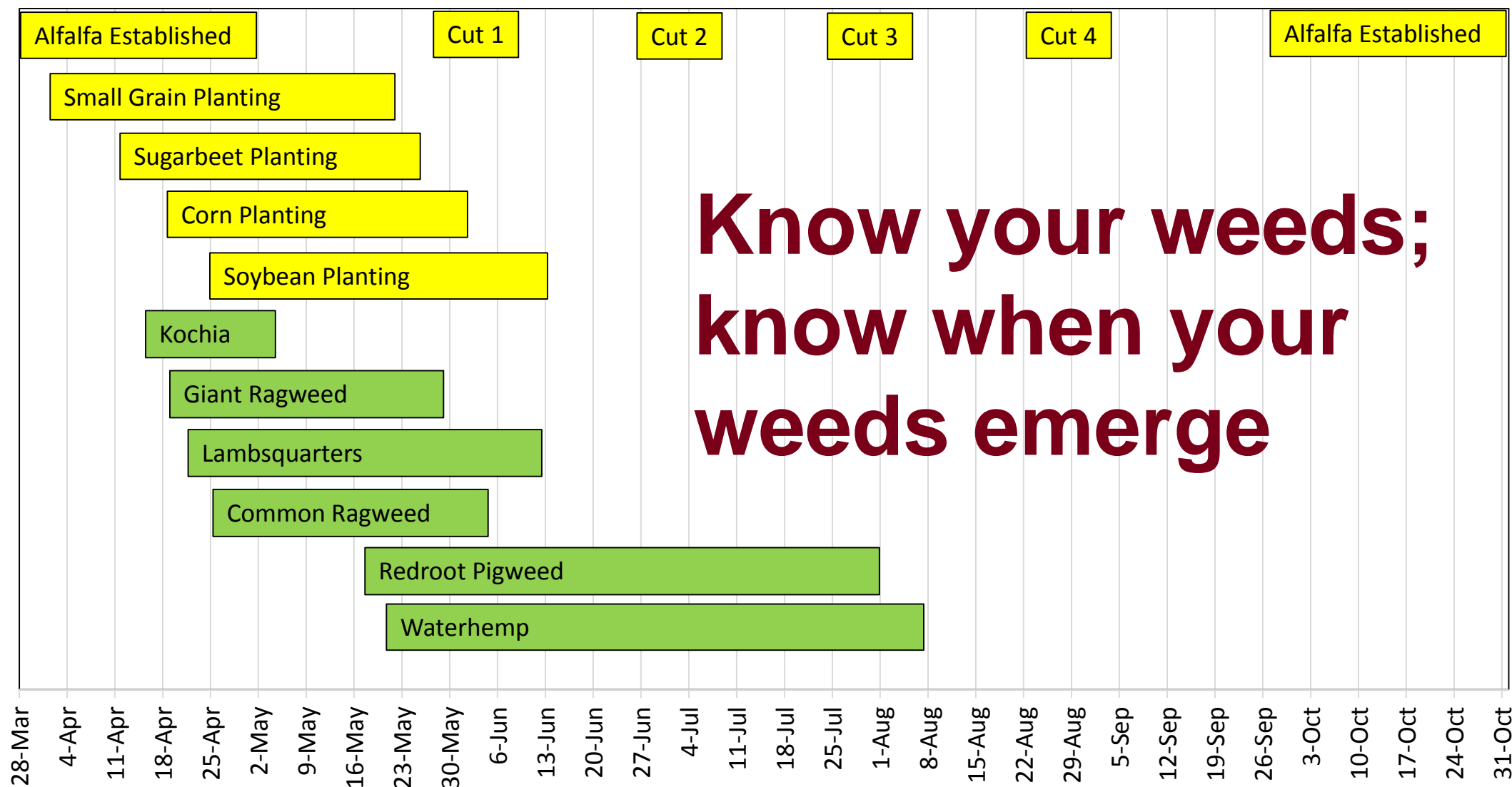


Key:

Emergence Period

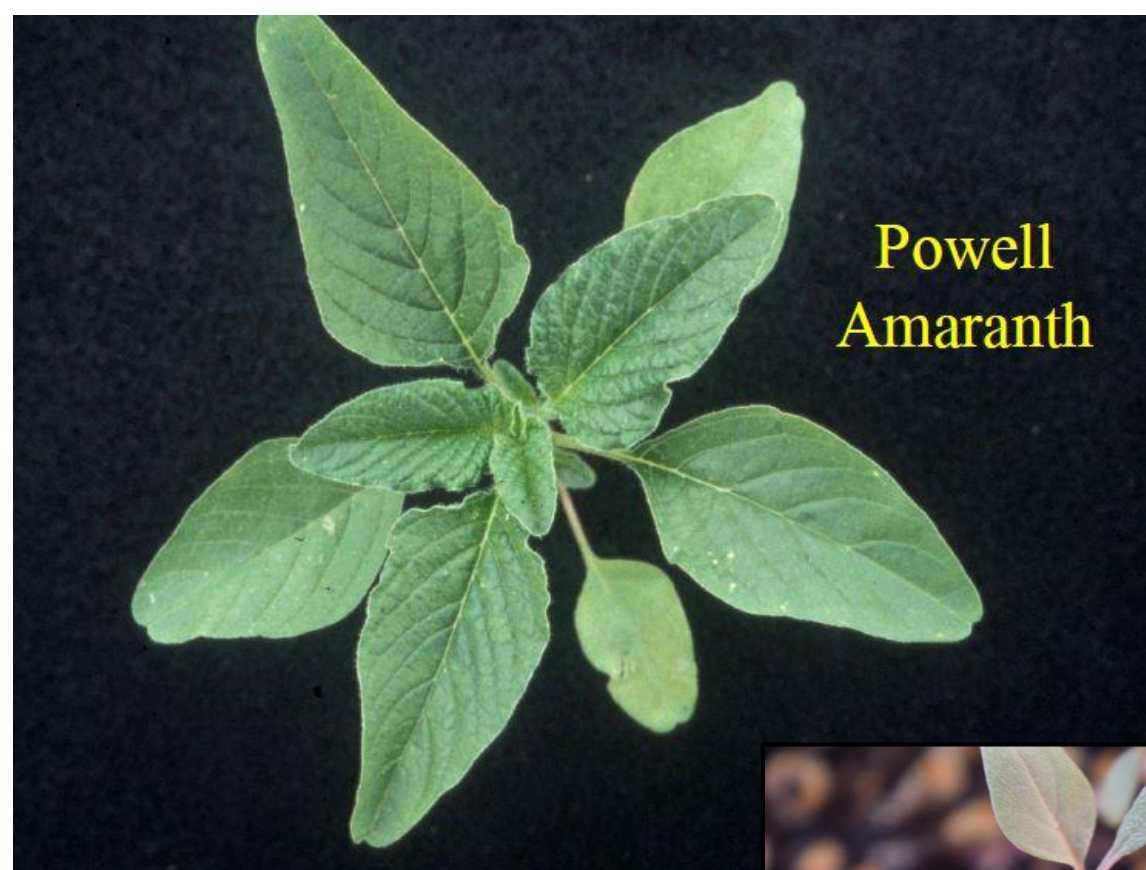
Flowering Period

Crop Planting and Harvesting

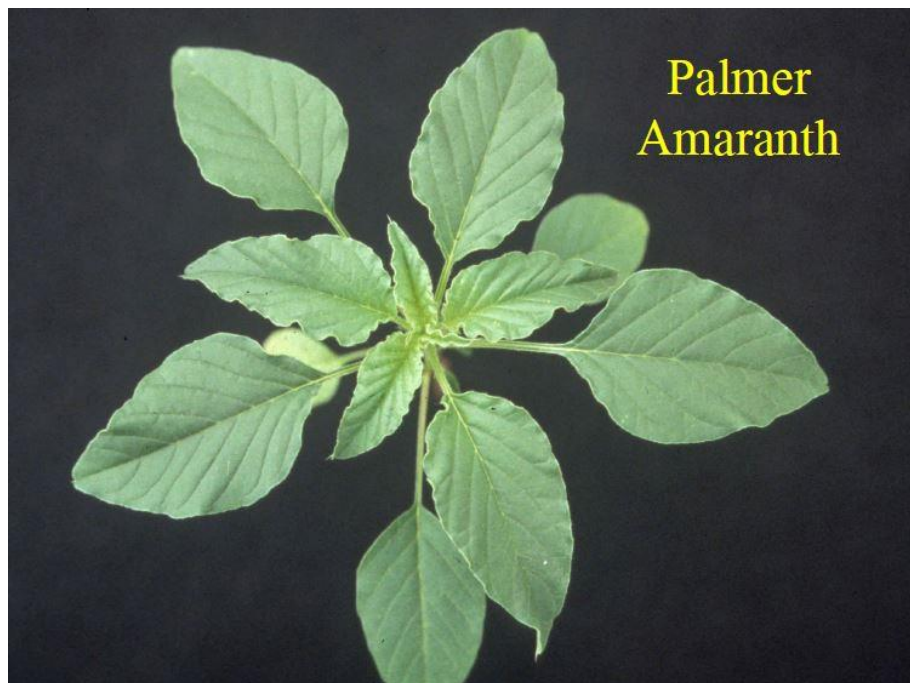
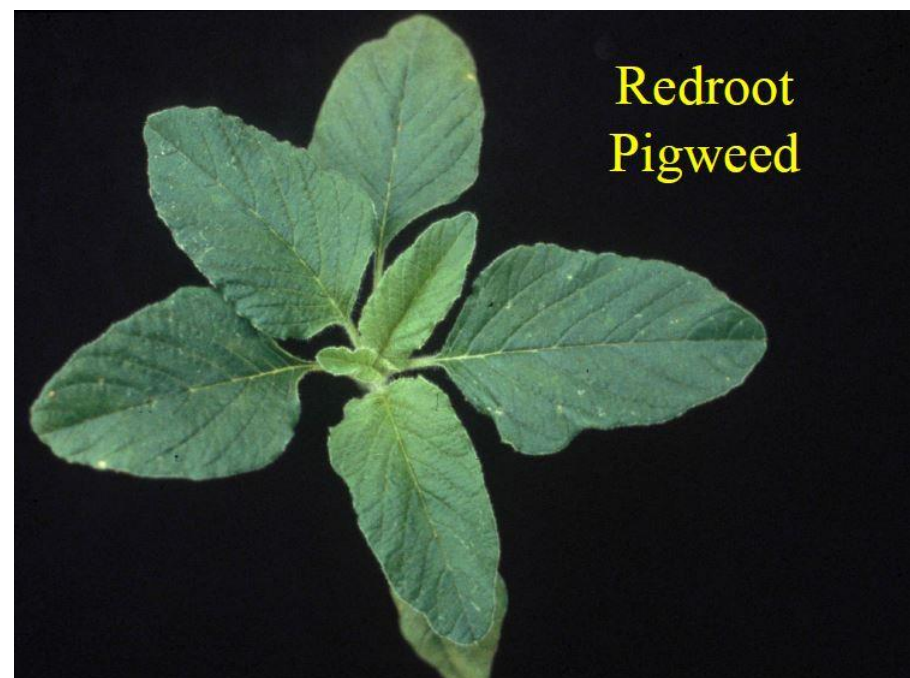


Adapted from Werle et al. 2014, Goplen et al. 2017, Weedometer 2008













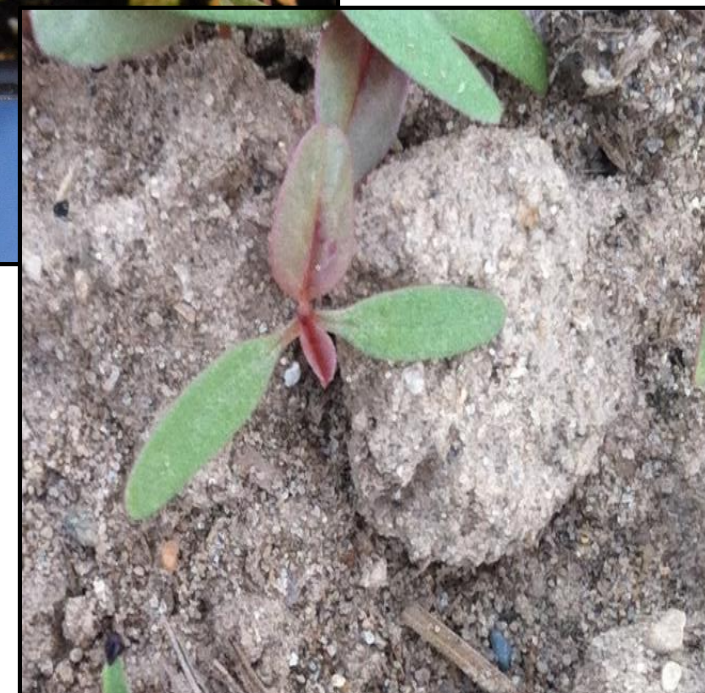
Redroot pigweed



Palmer amaranth



Waterhemp







Powell amaranth



Waterhemp



Redroot pigweed





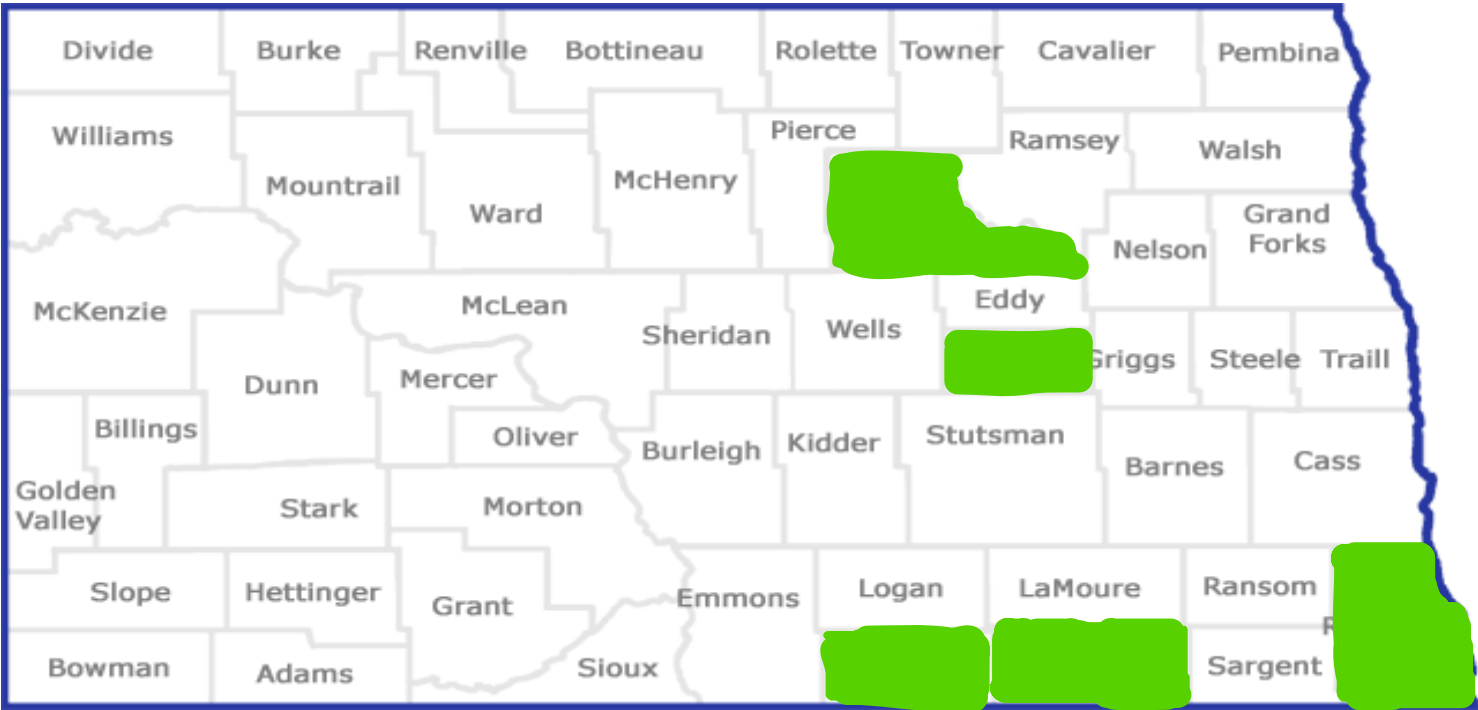


# Palmer amaranth (left) and waterhemp (right) 35 days after planting





# Palmer amaranth was confirmed in five North Dakota Counties in August and September

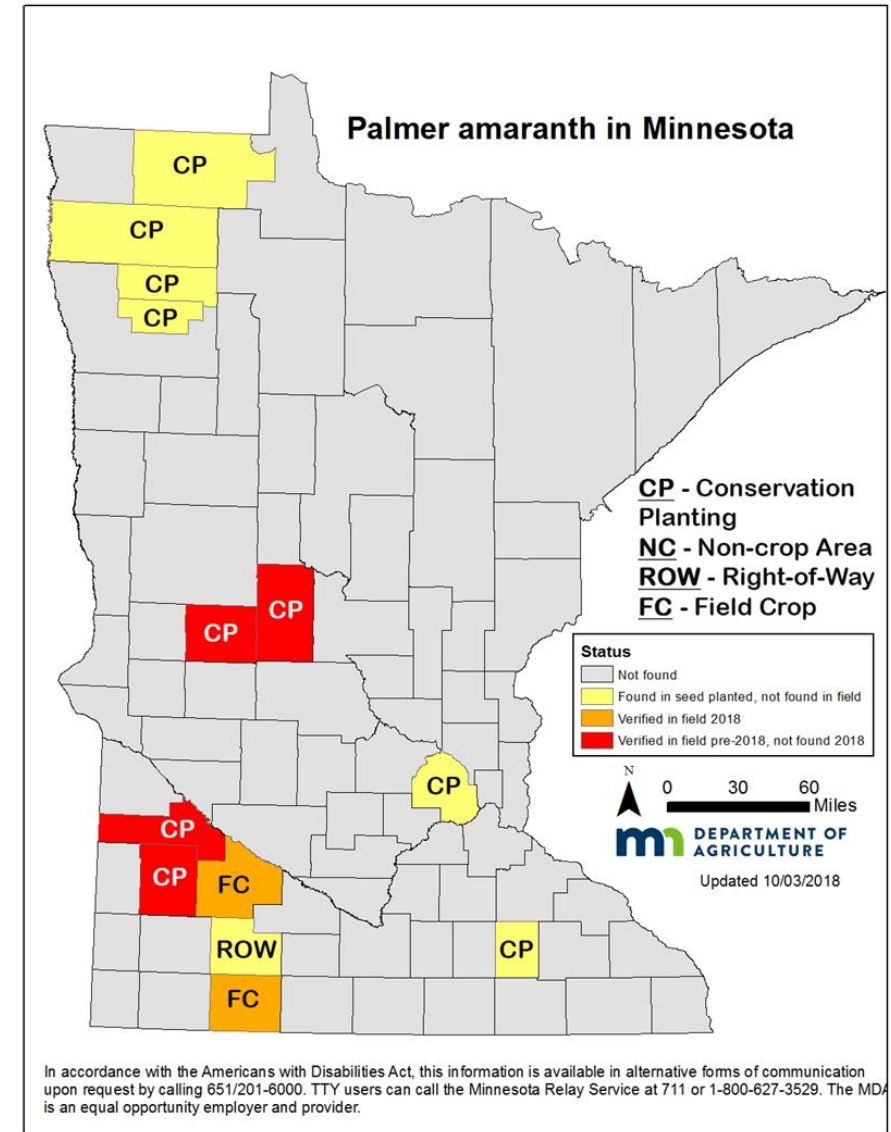


County	Possible source
McIntosh	Migratory birds
Dickey	Purchase of used combine out-of-state
Foster	Custom combining
Benson	Railroad car cleanout
Richland	Alternative sources for cattle feed

# Current Status in Minnesota

## • STATEWIDE SUMMARY

- 18 landowners in Six Counties With Confirmed Palmer plants since 2016
  - 42 CRP plantings in 4 Counties ( 2016 – 2017)
    - **NO PALMER** discovered in Lyon, Yellow Medicine, Todd or Douglas counties in Fall 2018 on these plantings
  - 2 Soybean fields - 1 Jackson & 1 Redwood County – Fall 2018
    - Plants hand-pulled and destroyed; no seed produced
    - **No other Palmer plants found within a 5-mile radius MDA field survey**
- \* 2017 – Summer – seed lot tested positive for Palmer
  - Sold to MNDOT for seeding a ROW in SW MN
  - **MDA Found No Palmer On This Site In 2017 or 2018**
- \*\* 2018 – Spring - seed lot tested positive for Palmer
  - Sold to 8 Landowners, planted at 14 locations in 4 counties potentially impacting 1,400 acres
  - **MDA Found No Palmer On These Acres In 2018**





# Acknowledgements

- Sugarbeet Research and Education Board for funding these research
- Our cooperators: **James Bergman (Oslo), Pinta Brothers (Minto),**  
American Crystal Sugar (Moorhead)
- North Dakota State University Experiment Station and Crookston  
Research and Outreach Center

# Thank you for your Support

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