

# Weed Resistant 2014



# Weed Resistant Statistics

- 1<sup>st</sup> resistance in 1970 in Washington to Triazine chemistry
- 143 different weed species resistant in U.S. (Beyond the Bean Feb. '14)
- 65 million acres are effected by resistant weeds in U.S. (Farm Journal Feb. '14)
- As much as 80% of Soybeans and cotton was weeded in Arkansas in 2012 (Midwest Producer July '12)
  - Some fields disked under!

# Glyphosate

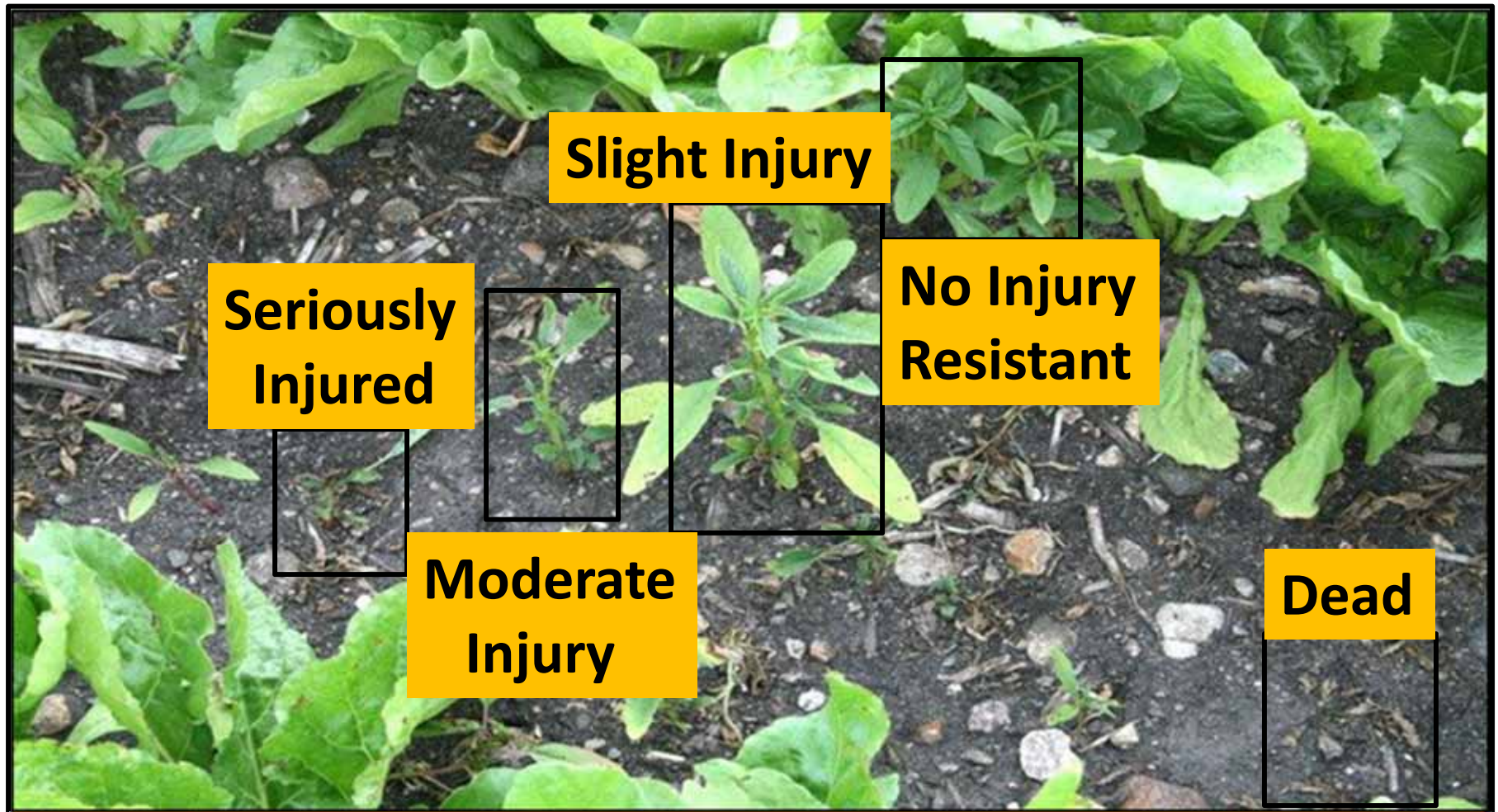
- Introduced in mid 1970's
- Primarily used as a burn down
- Introduction of RR soybeans in 1996
- RR Corn 1998
- RR Sugarbeets 2008
- Controls the widest spectrum of weeds in cropping season
- Most widely used herbicide today

# Understanding Resistance

- Tolerance
  - Yellow nutsedge and wild buckwheat are 2 examples of naturally tolerant to glyphosate
  - Labeled rates of glyphosate are less effective
- Nonperformance
  - Incorrect rate for weed size
  - Rain before completely absorbed
  - Incomplete spray coverage below canopy
  - Reduced glyphosate activity from low temperatures
  - Dust from sprayer
  - Proper adjuvant and AMS rate

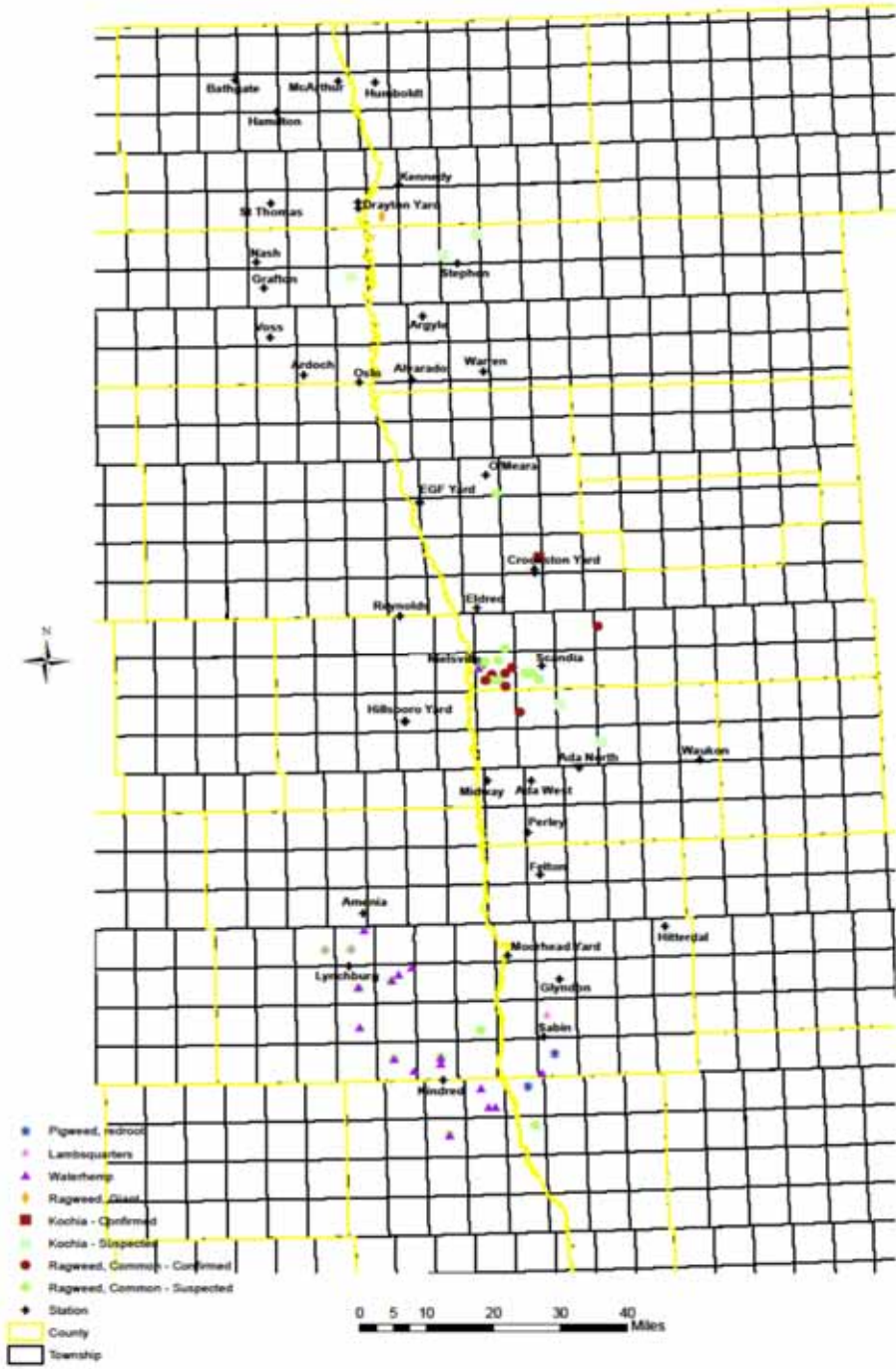


# Understanding Resistance



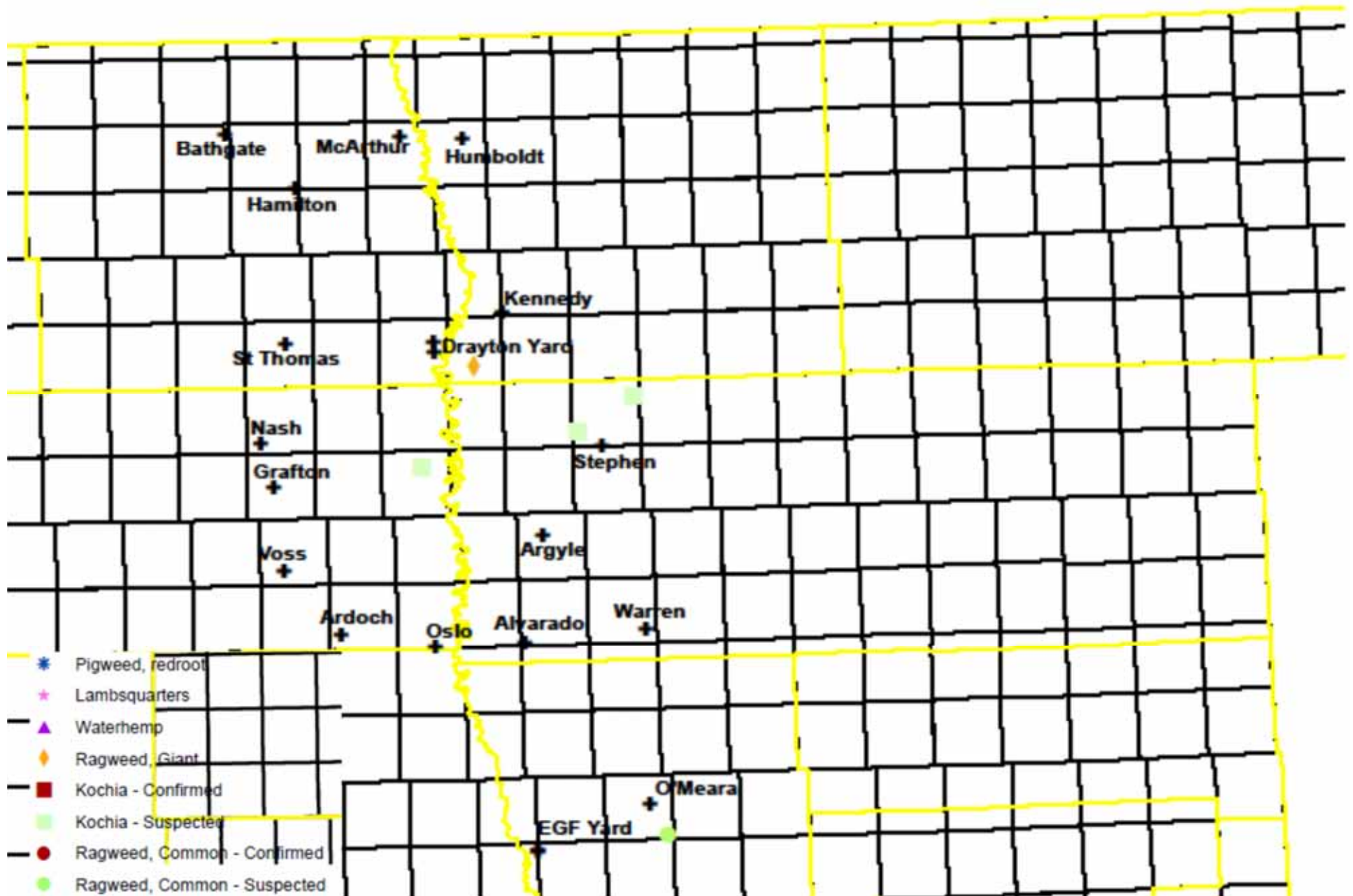
Identifying the stages of glyphosate resistant waterhemp in a field

# 2013 Weed Resistance Map

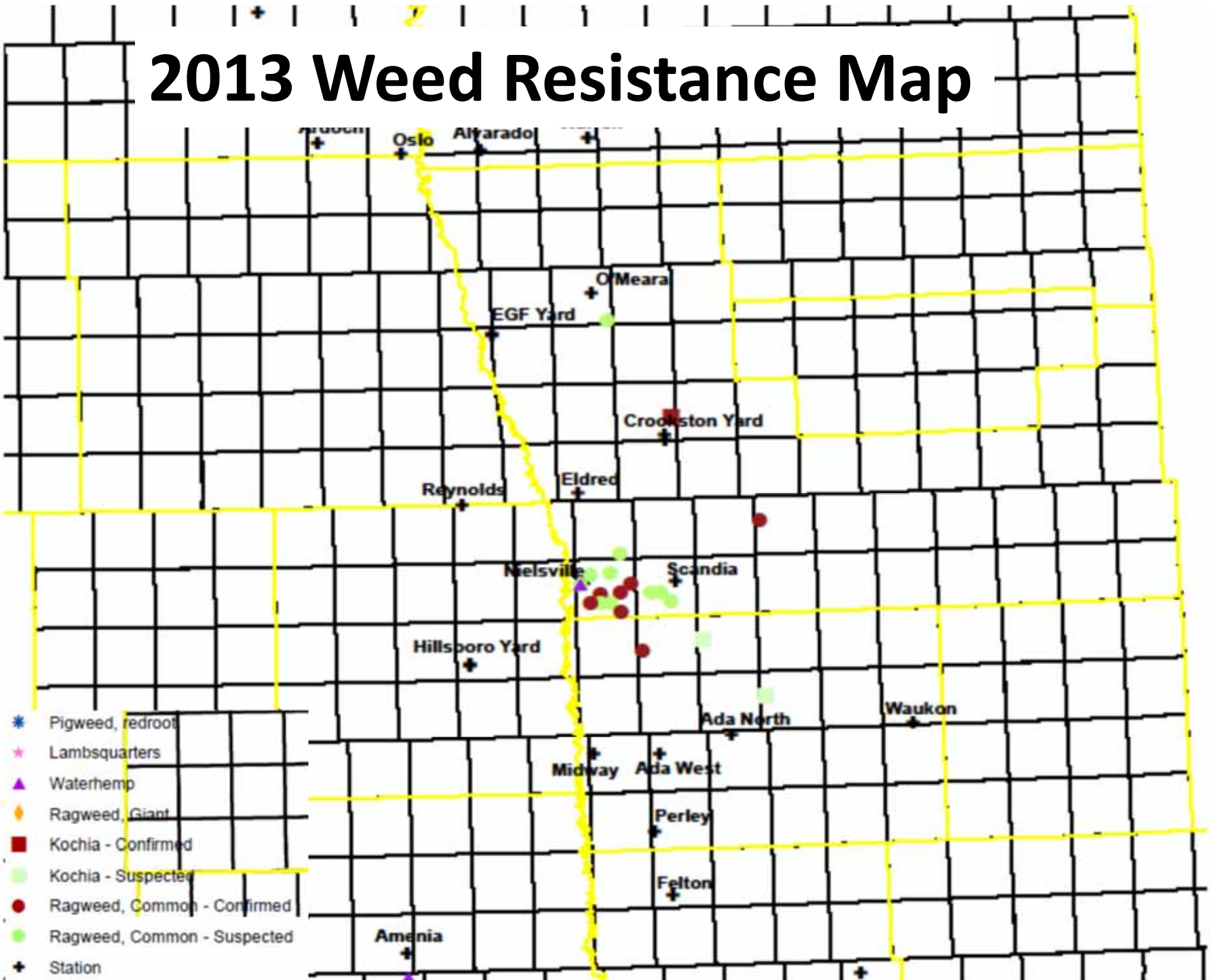




# 2013 Weed Resistance Map

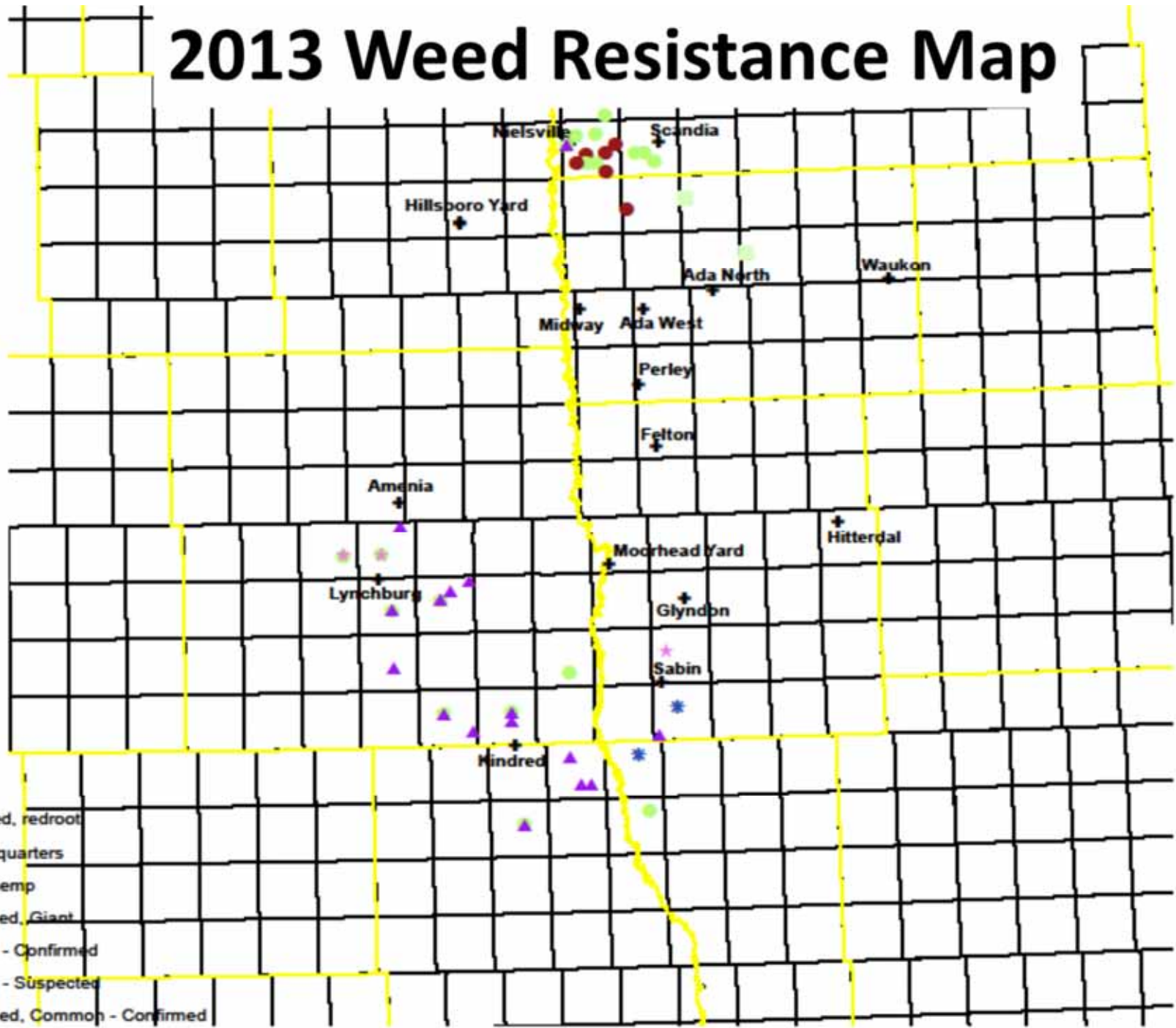


# 2013 Weed Resistance Map





# 2013 Weed Resistance Map



- \* Pigweed, redroot
- \* Lambsquarters
- ▲ Waterhemp
- ◆ Ragweed, Giant
- Kochia - Confirmed
- Kochia - Suspected
- Ragweed, Common - Confirmed
- Ragweed, Common - Suspected

# North Dakota Herbicide Chart

Repeated use of herbicides with the same site of action alone can result in the development of herbicide-resistant weed populations.

## By Mode of Action (effect on plant growth)

This chart groups herbicides by their modes of action to assist you in selecting 1) to maintain greater diversity in herbicide use and 2) to rotate among herbicides with different sites of action to delay the development of herbicide resistance.

The Site of Action Group is a classification system developed by the Weed Science Society of America.

Site of Action Group	Site of Action	Number of resistant weed species in U.S.	Chemical Family	Active Ingredient	Product Examples Trade Name ®	
1	ACCase Inhibitors (acetate CoA carboxylase)	15	Aryloxyphenoxy propionate "Pop"	clodinafop	Discover NO	
				fenoxaprop	Tacoma, Parity, others	
				flazasulfop quizalofop	Fusilade DX Assure II, Targa	
8	Lipid Synthesis Inhibitors		Cyclohexanedione "Dim"	diethodim sethoxydim	Select Max, others Poast, others	
				Phenylpyrazolin "Den"	pinoxaden	Axial XL
2	ALS Inhibitors (acetolactate synthase)	44	Imidazolinone "Imi"	imazamox imazapic imazethapyr	Raptor, Beyond Plateau Pursult	
				Sulfonyleurea "SU"	halosulfuron	Permit, others
					mesosulfuron	Osprey
					rimosulfuron	Resolve, Matrix, others
					sulfosulfuron triflorsulfuron tribenuron triflurofuron	Maverick Harmony, others Express, others UpBeet
Triazolopyrimidine "TPS"	clorasulam forasulam flumetsulam	FirstRate component of several Python				

This chart lists premix herbicides alphabetically by their trade names so you can identify the premix's component herbicides and their respective site of action groups. Refer to the Mode of Action chart on the left for more information.

Premix Trade Name ®	Trade Name ®	Active Ingredient	Site of Action Group
Affinity BroadSpec	Harmony :1	triflorsulfuron	2
	Express :1	tribenuron	2
Affinity TankMix	Harmony :4	triflorsulfuron	2
	Express :1	tribenuron	2
Anthem *	Zidua*	pyoxasulfone	15
	Cadet	sulfacet-ethyl	14
Audit	Harmony :3	triflorsulfuron	2
	Express :1	tribenuron	2
Authority Assist	Spartan	sulfentrazone	14
	Pursult	imazethapyr	2
Authority First - or Sonle	Spartan	sulfentrazone	14
	FirstRate	clorasulam	2
Authority MTZ	Spartan	sulfentrazone	14
	Melribuzin	metribuzin	5
Axial Star	Starane	fluroxypyr	4
	Axial XL	pinoxaden	1
Betamix	---	desmedipham	5
	---	phenmedipham	5
Boundary	Dual Magnum	s-metolachlor	15
	Melribuzin	metribuzin	5
BroadAxe	Dual Magnum	s-metolachlor	15
	Spartan	sulfentrazone	14
Bronate (generic)	Buobit	bromoxynil	6
	MCPA	MCPA	4
Callisto Xtra	Callisto	mesotrione	27
	Atrazine	atrazine	5
Capreno	---	thiencarbazone	2
	Laudis	terbuthione	27
Corvus	---	thiencarbazone	2
	Balanoe Flexx	isoxaflutole	27
Curtall	Stinger	clopyralid	4
	2,4-D	2,4-D	4
Curtall M	Stinger	clopyralid	4
	MCPA	MCPA	4
Extreme	Pursult	imazethapyr	2
	Glyphosate	glyphosate	9

# RR Corn Options



Pre-Emerge Herbicides for RR Corn	Site of	Formulation	Sugarbeet Rotation Restrictions	Common Ragweed	Giant Ragweed	Lambsquarters	Kochia	Waterhemp
	Action							
Verdict @ > 10 fl oz/A	14,15	EC	NCS	G/E	G	G/E	G/E	G/E
Harness / Surpass	15	EC	NCS	F	P	F/G	F	G/E
Callisto	27	SC	18 mth	G/E	G	G/E	P	G/E
Zidua	15	WDG	15 mth	P/F	P	F	F/G	G/E
<b>Post Tank Mixes with Glyphosate for RR Corn</b>								
Status	4,19	WDG	4 mth	G/E	G/E	G/E	E	G
Banvel /Clarity	4	SL	NCS	G/E	G	G	G/E	G
Halex GT	9,15,27	SC	18 mth	G	G	G/E	G/E	G/E
Impact	27	SC	18 mth	G	G	G/E	E	G/E
Laudis	27	SC	18 mth see label	G	G	G/E	E	G/E
Callisto	27	SC	18mth	F	G	G/E	P/F	E



# RR Soybean Options



Pre-Emerge Herbicides for RR Soybeans	Site of Action	Formulation	Sugarbeet Rotation Restrictions	Common Ragweed	Giant Ragweed	Lambsquarters	Kochia	Waterhemp
Valor	14	WDG	4-10 mth	N/F	N/P	G/E	G/E	G/E
Verdict @ 5 fl oz/A	14,15	EC	NCS	P/F	P	P/G	P/F	F/G
Outlook	15	EC	NCS	P	P	P/F	N/P	F/G
Boundary (Sencor+Dual)	5,15	EC	18 mth	G	P/F	G	P	G/E
Zidua	15	WDG	15 mth	P/F	P	F	F/G	G/E
Fierce	14,15	WDG	18 mth	P/F	P/F	F/G	F/G	G/E
<b>Post Tank Mixes with Glyphosate for RR Soybeans</b>								
Flexstar	14	EC	18 mth	G/E	G	P/F	G	G/E
Cobra	14	EC	NCS	G/E	G	P	P/F	G/E
NCS = Next Cropping Season 2CS = Two Cropping Seasons								
N = None P = Poor F = Fair G = Good E = Excellent								
EC= Emulsifiable Concentrate; SC = Suspension Concentrate; SL = Soluble Liquid; WDG = Water Dispersible Granule								

# Waterhemp Resistance

- Resistant to multiple Site of Action
  - Site 2 ALS Inhibitors (Harmony, Raptor)
  - Site 4 Growth Regulators (Clarity)
  - Site 5 Photosystem II Inhibitors (Atrazine)
  - Site 9 EPSP Synthase Inhibitors (Glyphosate)
  - Site 14 PPO Inhibitors (Flexstar)
  - Site 27 HPPD Inhibitors (Huskie)

# Resistant Waterhemp Management in Sugarbeet

- PPI/PRE Nortron (8) (2 to 5 pt/a) + Dual (15) (.5 to 1 pt/a) or Nortron (8) (6 to 7.5 pt/a)
  - Need to sign an Indemnified Label for PPI/PRE Dual
- 1<sup>st</sup> Post-cotyledon sugarbeets
  - Roundup (9) (28 to 32 oz/a) + Betamix (5) (12 oz/a) + Nortron (8) (4 oz/a) + HSMOC (1 pt/a) + AMS (1 #/a)
- 2<sup>nd</sup> Post-10 to 14 DAT
  - Roundup (9) (24 to 28 oz/a) + Betamix (5) (16 oz/a if 4 lf sgbt) + Nortron (8) (4 oz/a) + Outlook (15) (14 to 21 oz/a) or Dual (15) (1 pt/a) + HSMOC (1 pt/a) + AMS (1 #/a)



# Resistant Waterhemp Management in Sugarbeet

- 3<sup>rd</sup> Post-8 leaf sugarbeet
  - Roundup (22 oz/a) + Betamix (24 oz/a) + Nortron (4 oz/a) + Outlook (0 to 10 oz/a) or Dual (0 to 1 pt/a) + HSMOC (1 pt/a) + AMS (1 #/a)
    - 90 day PHI for Nortron & max annual use 1 gal/a
- 4<sup>th</sup> Post-10 to 21 DAT (If needed)
  - Roundup (22 oz/a) + Betamix (32 to 48 oz/a) + AMS (1 #/a)
    - 75 day PHI for Betamix

# Kochia Resistance

- Resistant to multiple Site of Action
  - Site 2 ALS Inhibitors (Harmony, Raptor)
  - Site 4 Growth Regulators (Clarity)
  - Site 5 Photosystem II Inhibitors (Atrazine)
  - Site 9 EPSP Synthase Inhibitors (Glyphosate)

# Resistant Kochia Management in Sugarbeet

- PPI/PRE Nortron (6 to 7.5 pt/a)
- 1<sup>st</sup> Post-1 leaf kochia
  - Roundup (28 to 32 oz/a) + Betamix (12 oz/a) + Nortron (4 oz/a) + HSMOC (1 pt/a) + AMS (1 #/a)
- 2<sup>nd</sup> Post-10 to 14 DAT, 1 leaf kochia
  - Roundup (24 to 28 oz/a) + Betamix (16 oz/a if 4 lf sgbt) + Nortron (4 oz/a) + HSMOC (1 pt/a) + AMS (1 #/a)



# Resistant Kochia Management in Sugarbeet

- 3<sup>rd</sup> Post-8 leaf sugarbeets
  - Roundup (22 oz/a) + Betamix (24 oz/a) + Nortron (4 oz/a) + HSMOC (1 pt/a) + AMS (1 #/a)
    - 90 day PHI for Nortron & max annual use 1 gal/a
- 4th Post-10 to 21 DAT (If needed)
  - Roundup (22 oz/a) + Betamix (32 to 48 oz/a) + AMS (1 #/a)
    - 75 day PHI for Betamix

# Common Ragweed Resistance

- Resistant to multiple Site of Action
  - Site 2 ALS Inhibitors (Harmony, Raptor)
  - Site 5 Photosystem II Inhibitors (Atrazine)
  - Site 9 EPSP Synthase Inhibitors (Glyphosate)
  - Site 14 PPO Inhibitors (Flexstar)

# Resistant Ragweed Management in Sugarbeet

- 1<sup>st</sup> Post-cotyledon sugarbeets
  - Roundup (28 to 32 oz/a) + Stinger (3 to 4 oz/a) + AMS (1 #/a)
- 2nd Post-10 to 14 DAT
  - Roundup (24 to 28 oz/a) + Stinger (3 to 4 oz/a) + AMS (1 #/a)
- 3rd Post-8 leaf sugarbeet
  - Roundup (22 oz/a) + Stinger (3 to 4 oz/a) + AMS (1 #/a)
- 4th Post-10 to 21 DAT (If needed same as 3<sup>rd</sup>)
  - 45 day PHI for Stinger
  - Do not exceed 10.7 oz/a per season

# Keys to Resistant Weed Control

- Use a PPI/PRE
- Spray small weeds (1")
- Use maximum glyphosate rates allowed
- Tank mix
- Manage sprays around weather/environment
- Scout fields 7-10 days after application
- Hand weed when necessary

# Keys to Resistant Weed Control

- More chemistry class choices in rotational crops, use them
- Perimeter weed management
- Row crop cultivation only when needed
- Moldboard plow to bury weed seeds
- Do not allow weed seed production!



# ACSC Chemical

- All retailer/distributors have availability to ACSC chemical
  - Sugarbeet Mix (Generic Betamix)
  - Phen-Des 8+8 (Generic Betamix)
  - B & B Plus (Generic Progress)
- Stored at AgDepot in Grand Forks
- No Deliveries
- Full Pallet Only (180 gals)
- No Returns

**Any Questions?**

