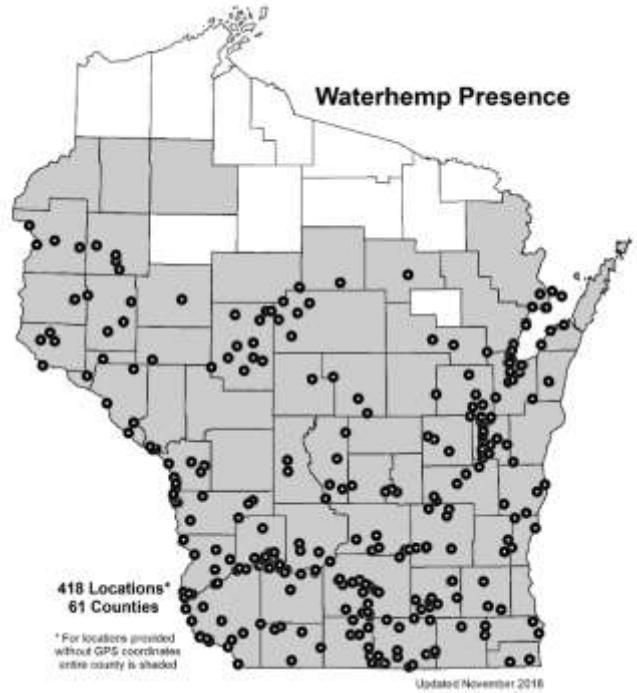
WATERHEMP IDENTIFICATION AND MANAGEMENT IN ESTABLISHED ALFALFA







Extension
UNIVERSITY OF WISCONSIN–MADISON

Mark Renz
Extension Weed Specialist

13 Pigweed species (*Amaranthus*) found in Wisconsin

- **6 of agricultural importance**

1. Red-root pigweed
2. Smooth pigweed
3. Prostrate pigweed
4. Powell's amaranth
5. Common/tall waterhemp*
6. Palmer Amaranth*

2017 Weed Identification Series

Tall/Common Waterhemp

Annual broadleaf that germinates April – August. Commonly found in agronomic and horticultural crops as well as highly disturbed areas.

Leaves: Lance or spearhead shaped, 3-6 in long that alternate on the stem. Petiole is shorter than the length of the leaf blade.

Stem: Typically, 4-5 ft tall, but can grow> 10 ft. Lacks hair on the stem.

Flowers: Many small green flowers form an inflorescence in July-September. While the terminal inflorescence can be > 1 ft long, many wiry lateral branches occur throughout the inflorescence. Male and female flowers found on separate plants, and can on occasion turn pink – red as they mature.

Similar Plants: This plant is often confused with other common pigweeds, especially palmer and spiny amaranth as they also have no hairs on stems. Palmer amaranth can be differentiated by the petiole as it is longer than its leaf blade unlike Waterhemp. Spiny amaranth has distinct spines below leaves. For more information including a video see visit the report-a-pigweed link below.

Herbicide Resistance:
In Wisconsin resistance to glyphosate has been confirmed in 16 counties and resistance to glyphosate and PPO-inhibitors in one county. It is also believed that many populations are also resistant to ALS herbicides but few have been tested. In nearby states much higher levels of resistance to these and other modes of actions of herbicides have been detected. Currently nearby states have Waterhemp populations resistant to five different herbicide modes of action.

UW Extension
University of Wisconsin-Extension

Provided by the Renz Lab
Questions or Comments: reportapigweed@gmail.com
http://fyi.uwex.edu/wifdn/report-a-pigweed/

For more identification info see videos

Vegetative characteristics

Flowering characteristics

Why are we concerned about waterhemp?

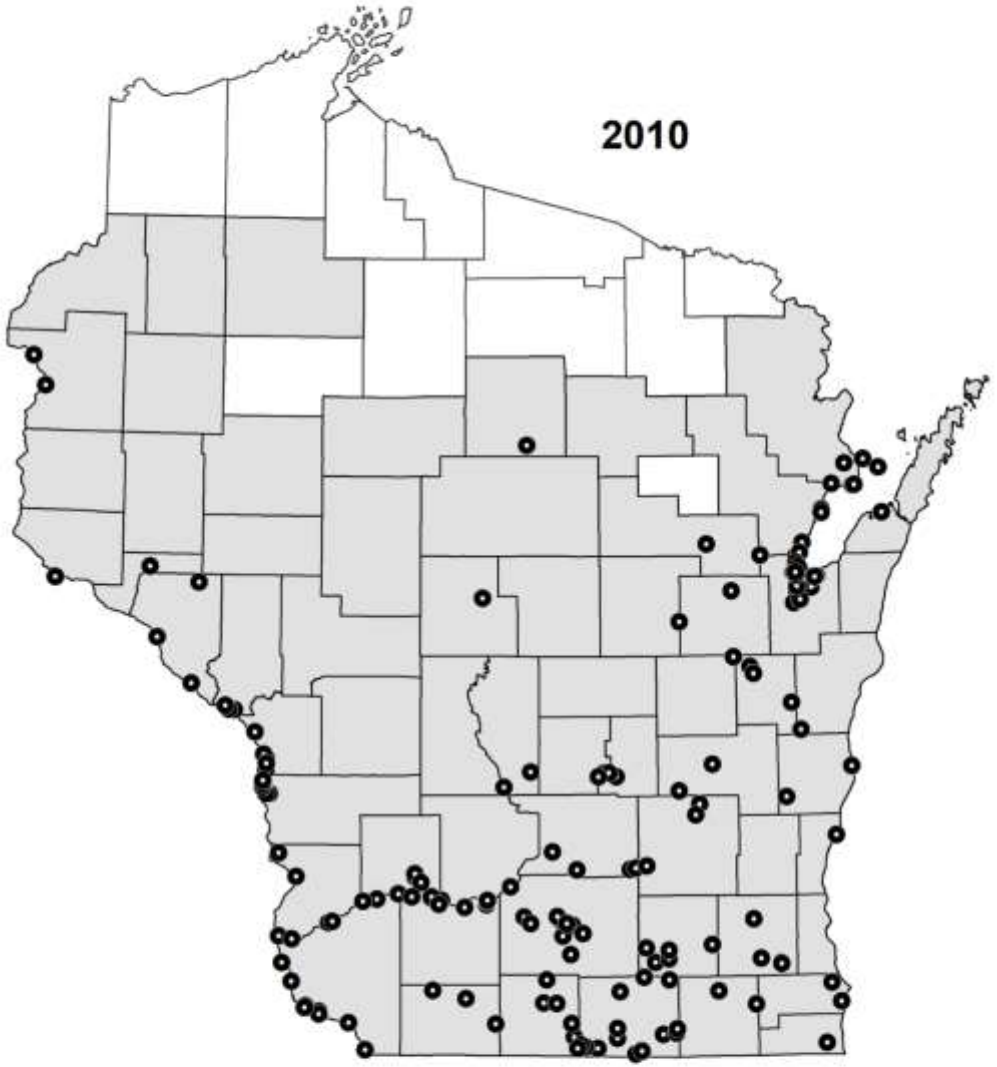
1. Rapidly spreading throughout WI
2. Potential to develop herbicide resistance
3. More competitive than common weeds

Waterhemp

- Native to WI
- Recent rapid expansion
- Surveys corn/soy suggest between 2-6% of fields infested
  - 2012-2013 UW: 5 % of fields
  - 2016 DATCP: 6 % of fields
  - 2017 DATCP: 6 % of fields
  - 2018: DATCP: 2 % of fields

Waterhemp distribution in Wisconsin

- Historically
  - Mississippi & Wisconsin rivers
  - Southern WI
  - Green Bay
- Expanding
  - Western
  - Central
  - Eastern



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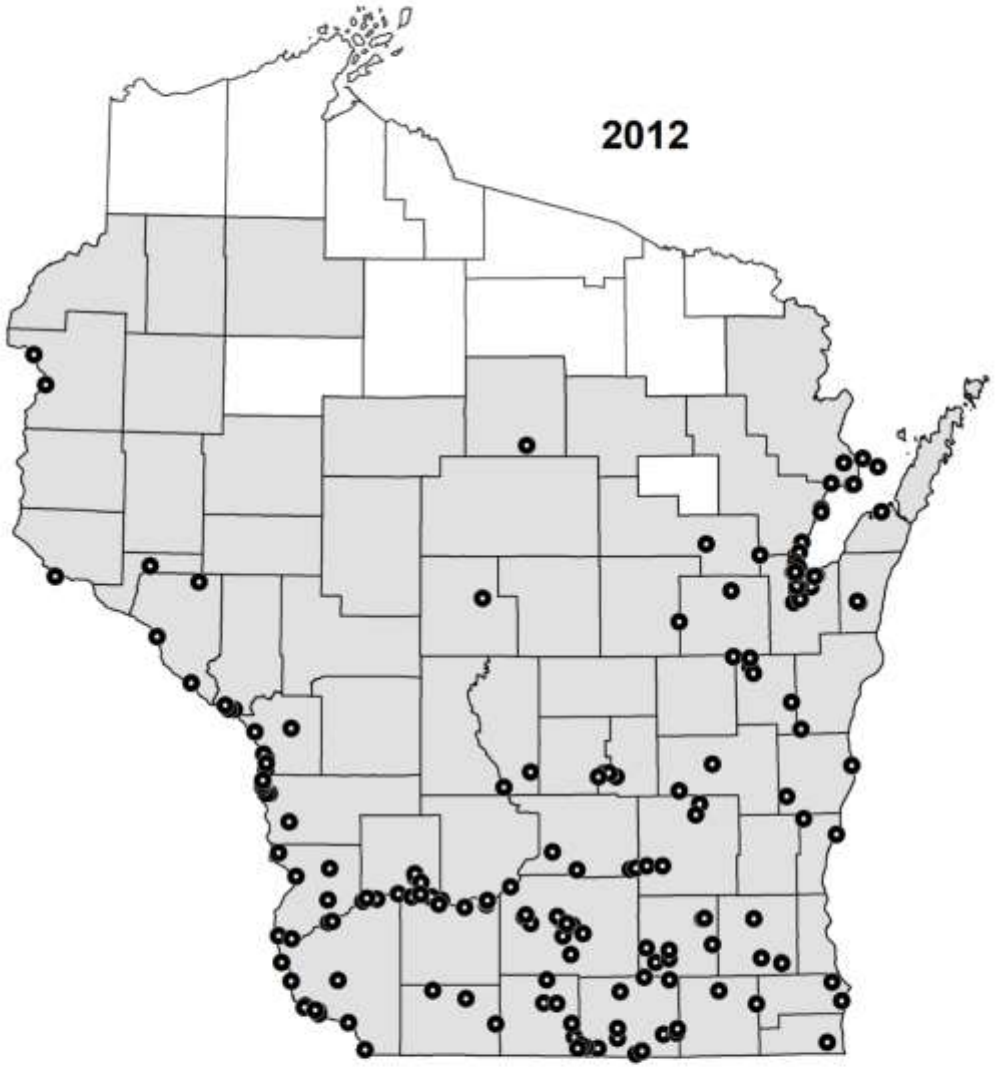

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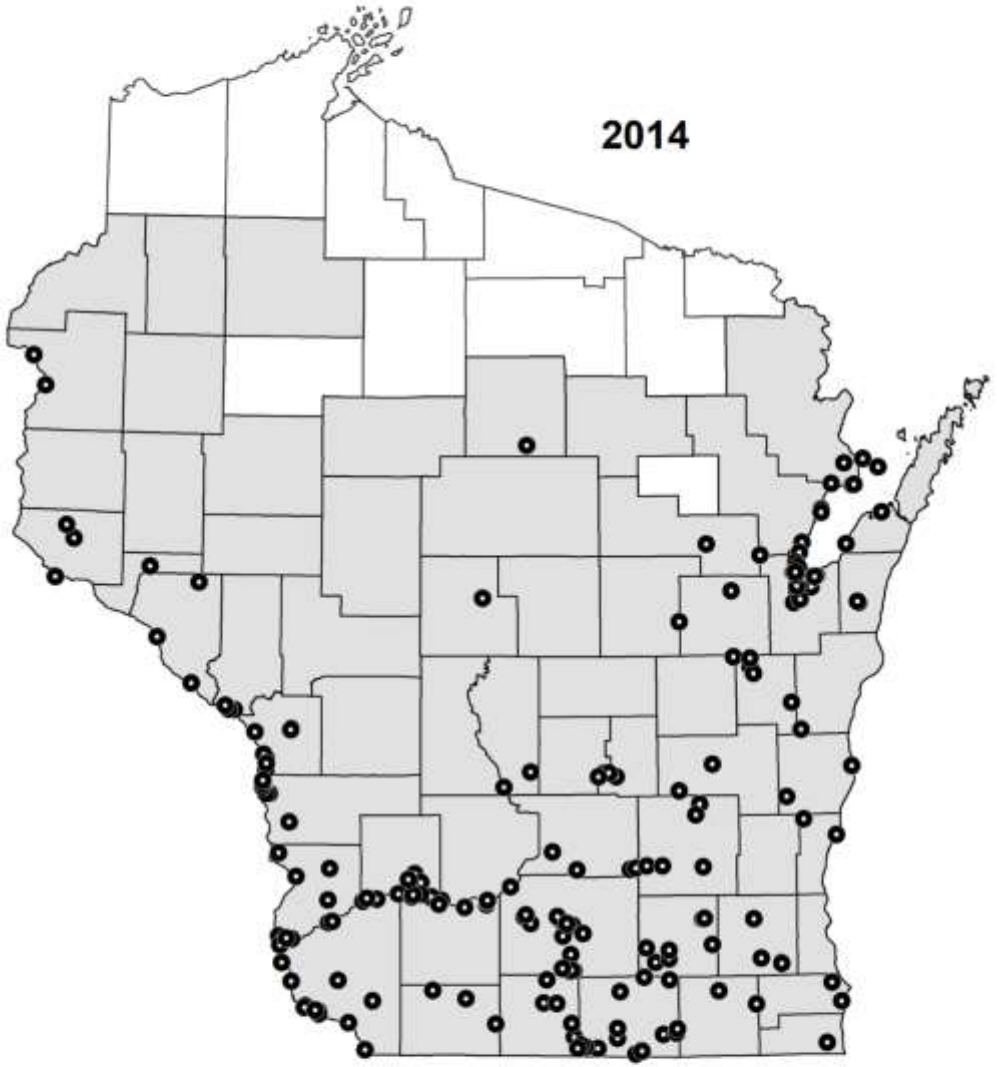

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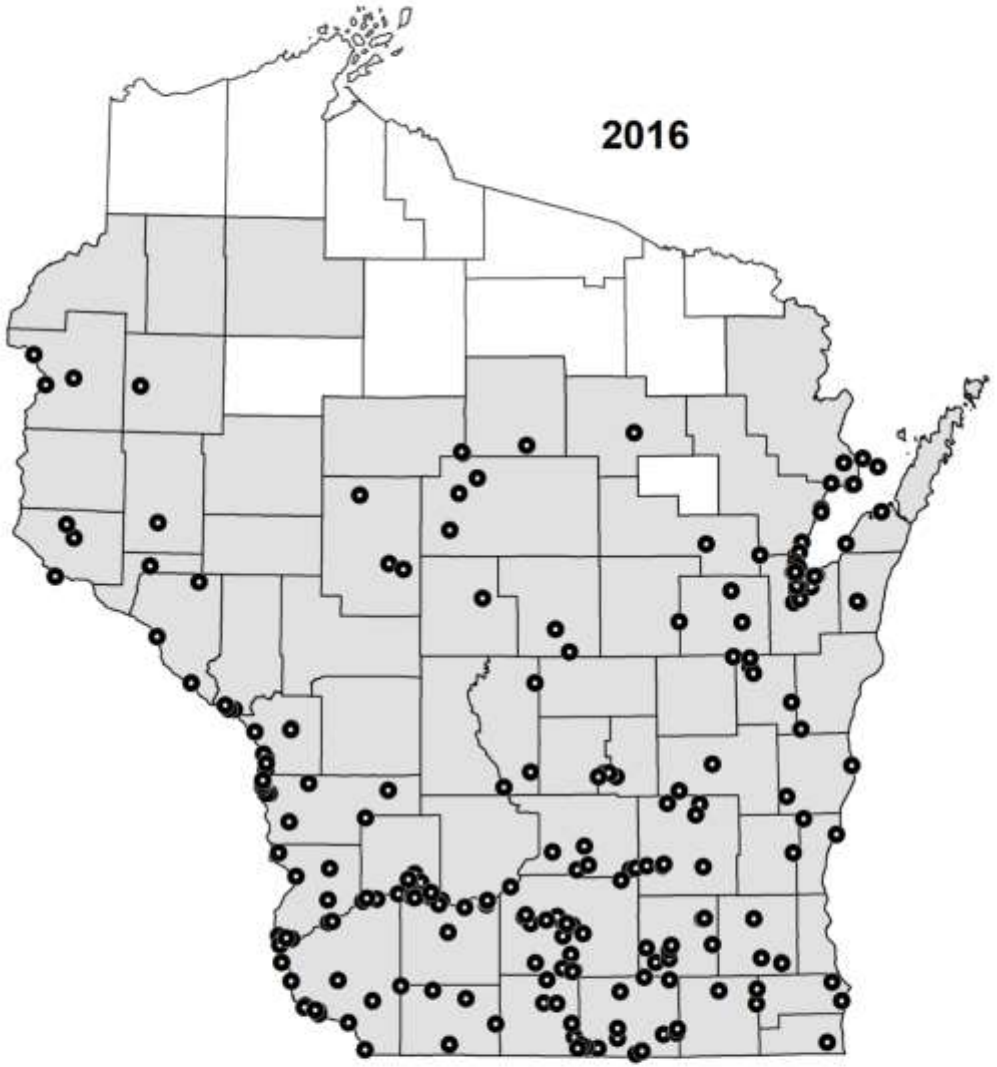

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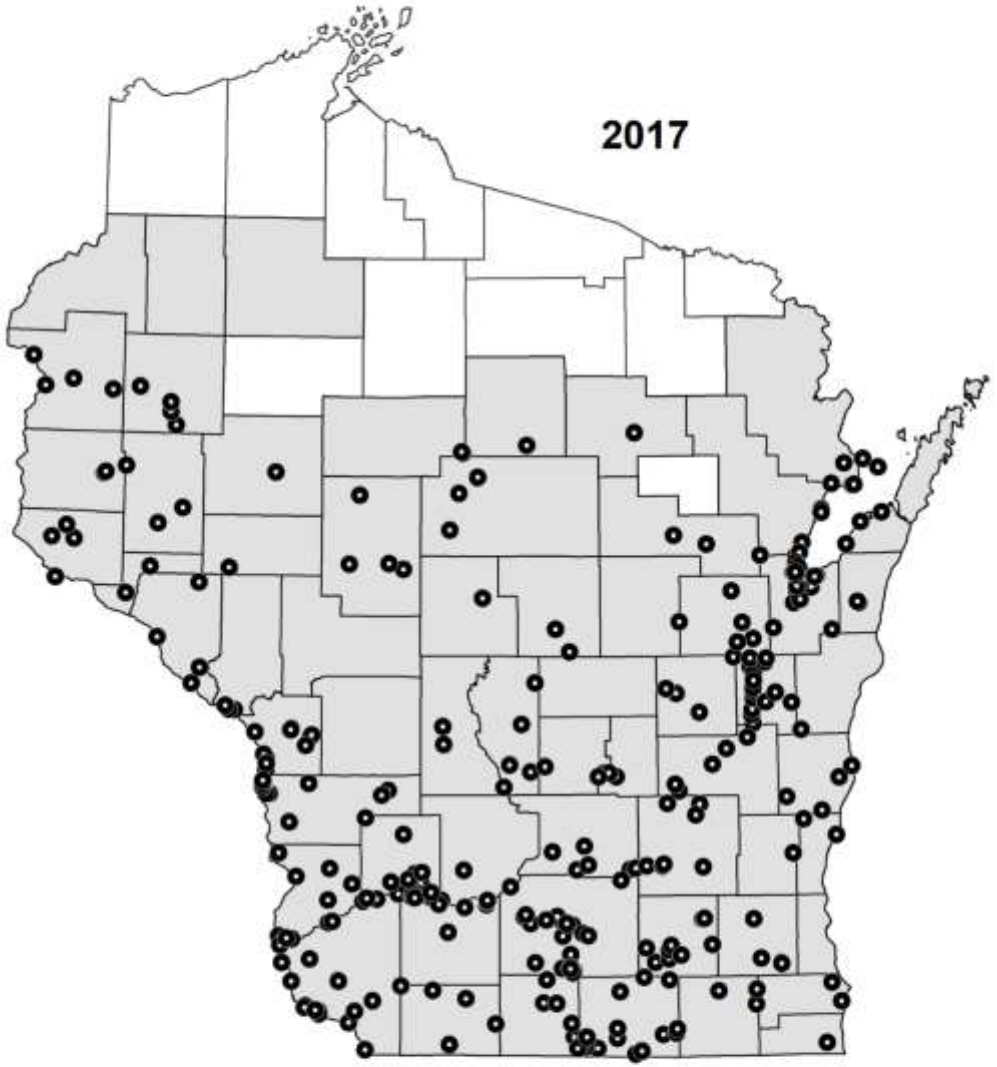

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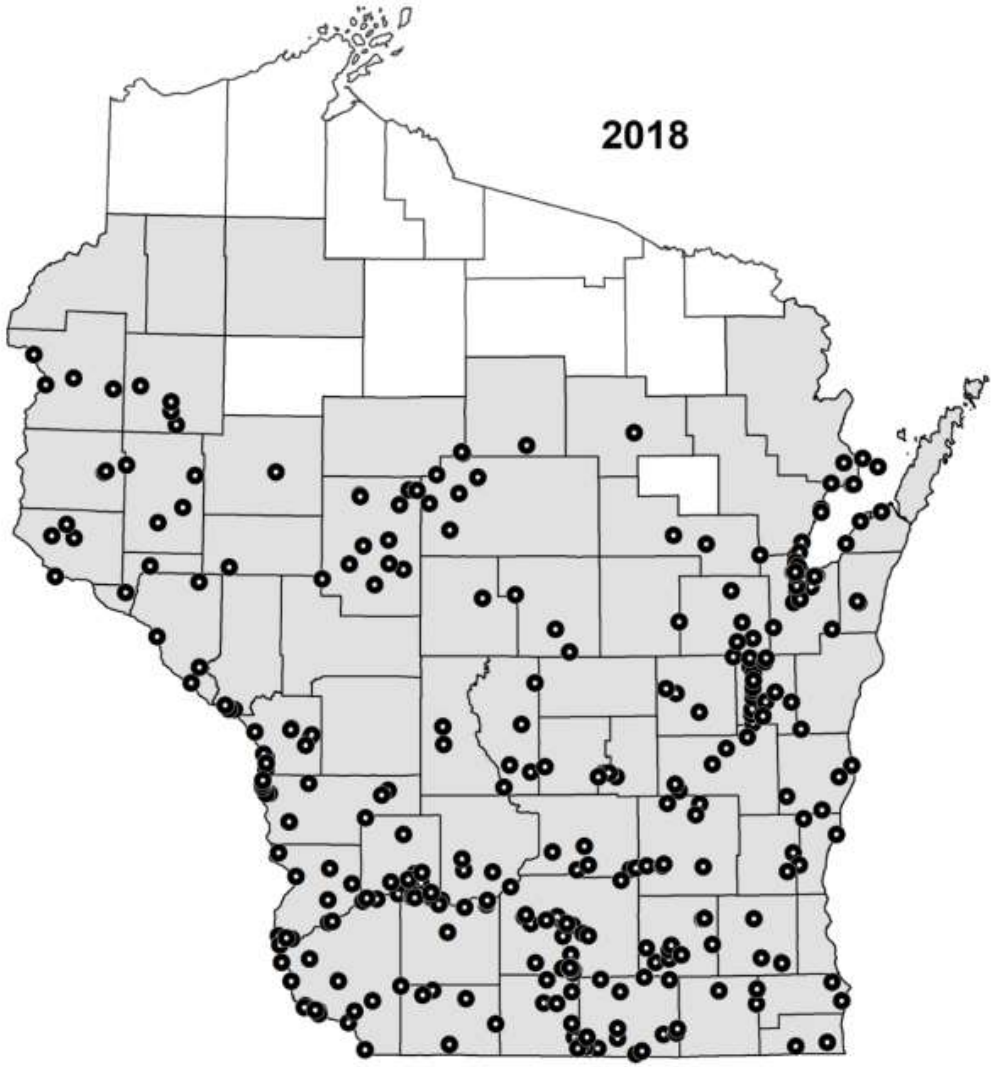

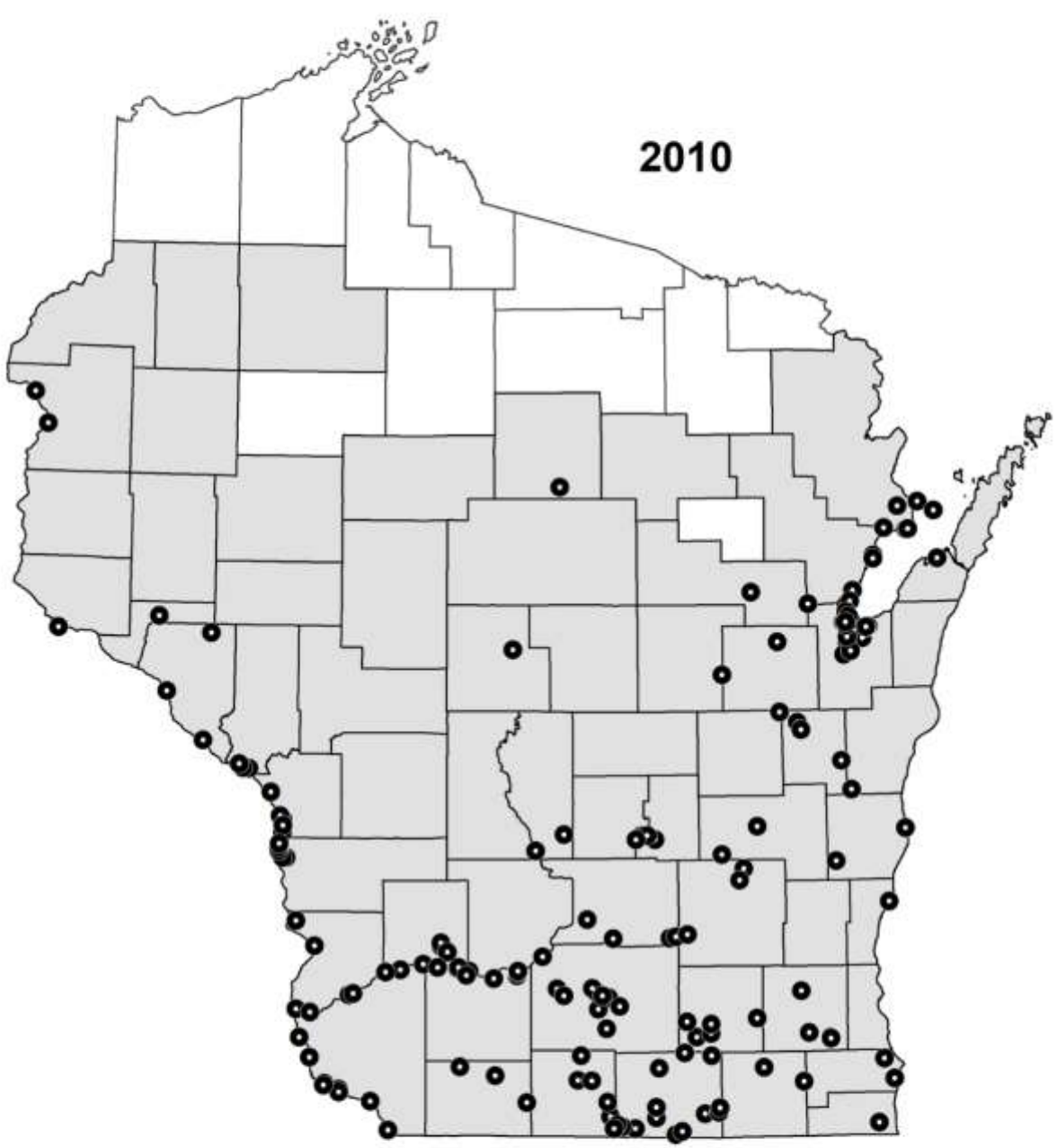
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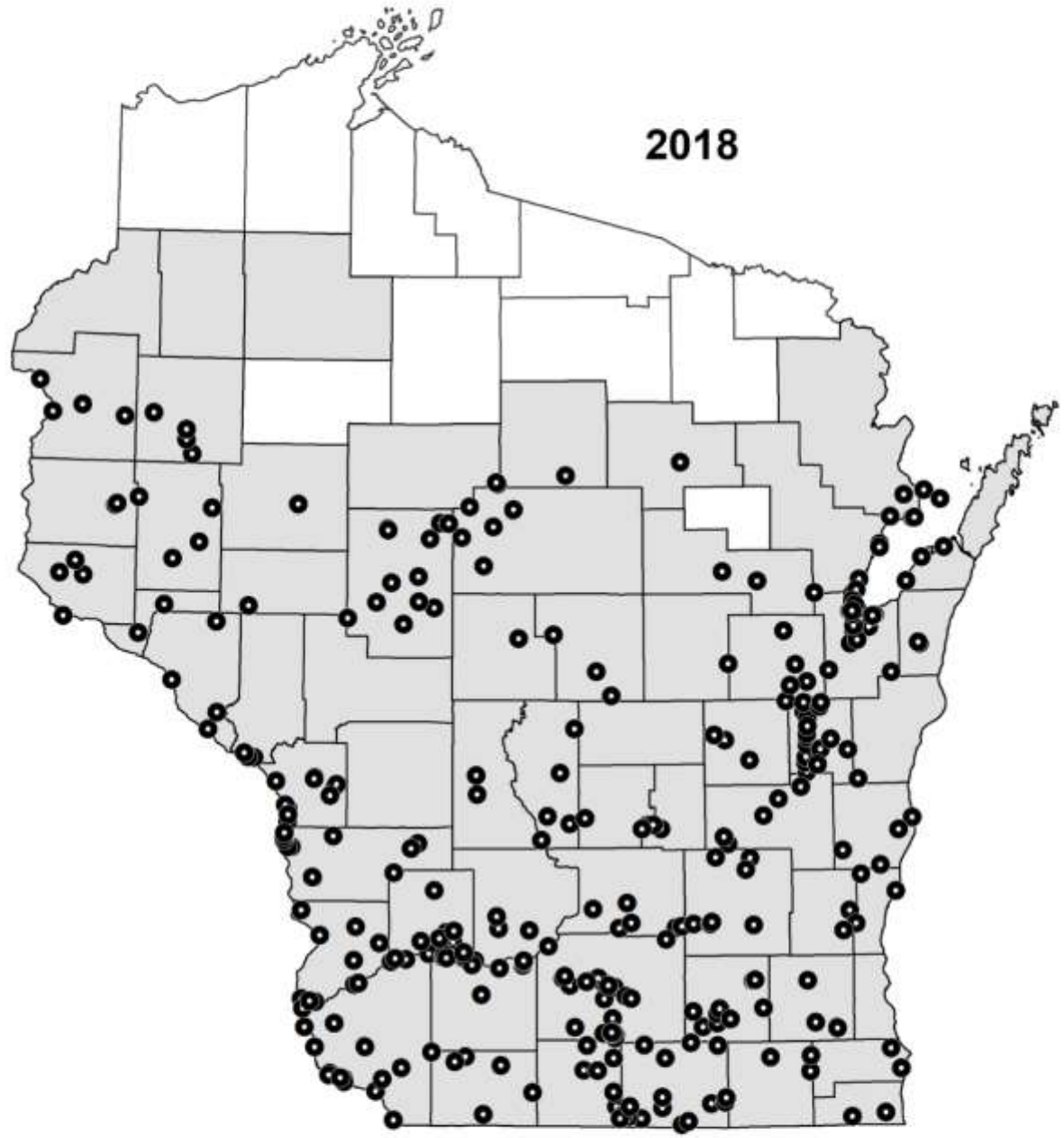

2018

How are populations spreading?

1. Custom harvesting

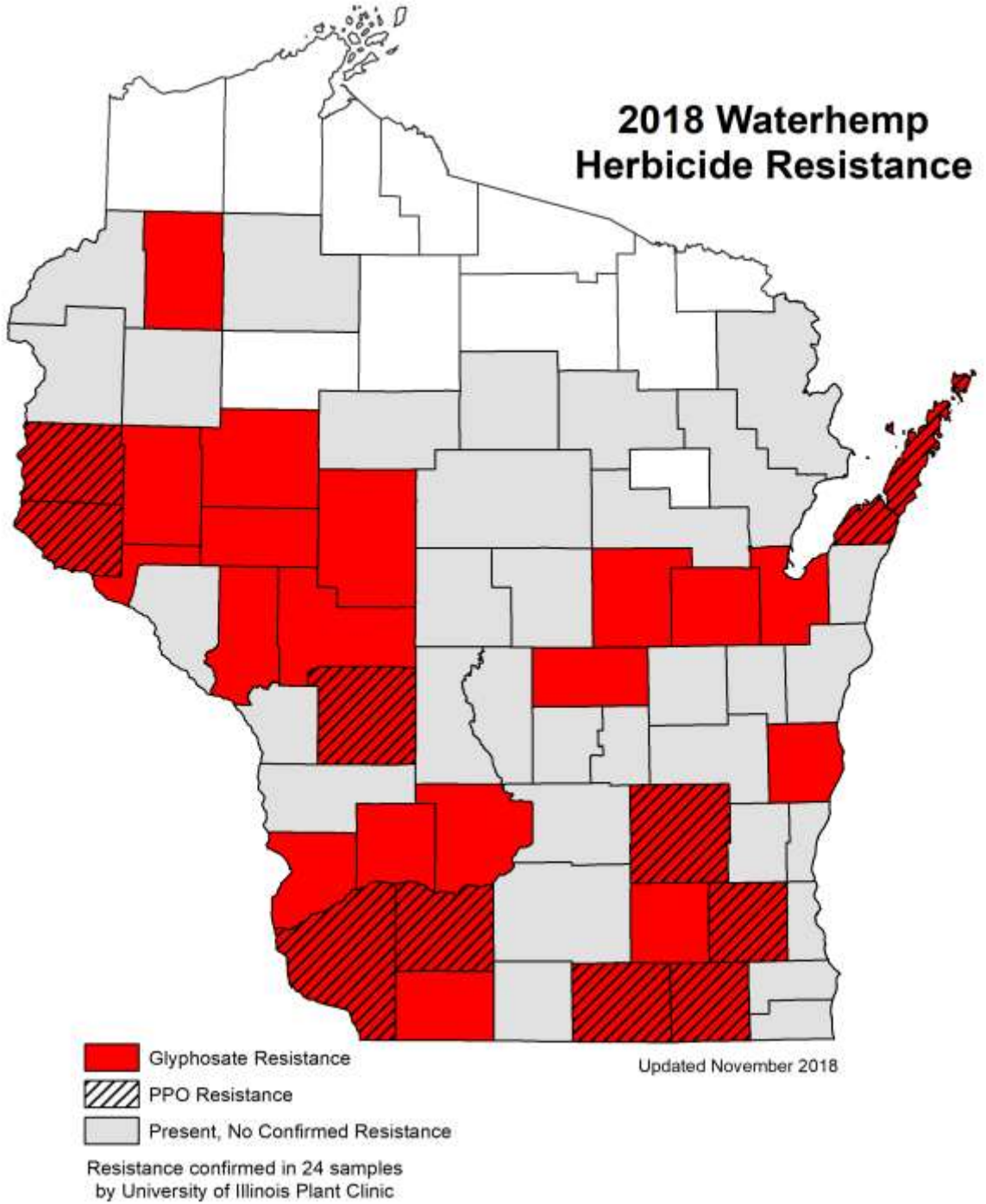
2. Inputs from other states
   - Feed
   - Manure
   - Birdseed
   - equipment

3. Non-human spread
   - Waterfowl
   - Water
   - Erosion

Waterhemp resistance to herbicides in Wisconsin

28 counties with glyphosate resistant populations

10 counties with glypohosate + PPO resistant populations



Resistances documented in US (1/7/18)

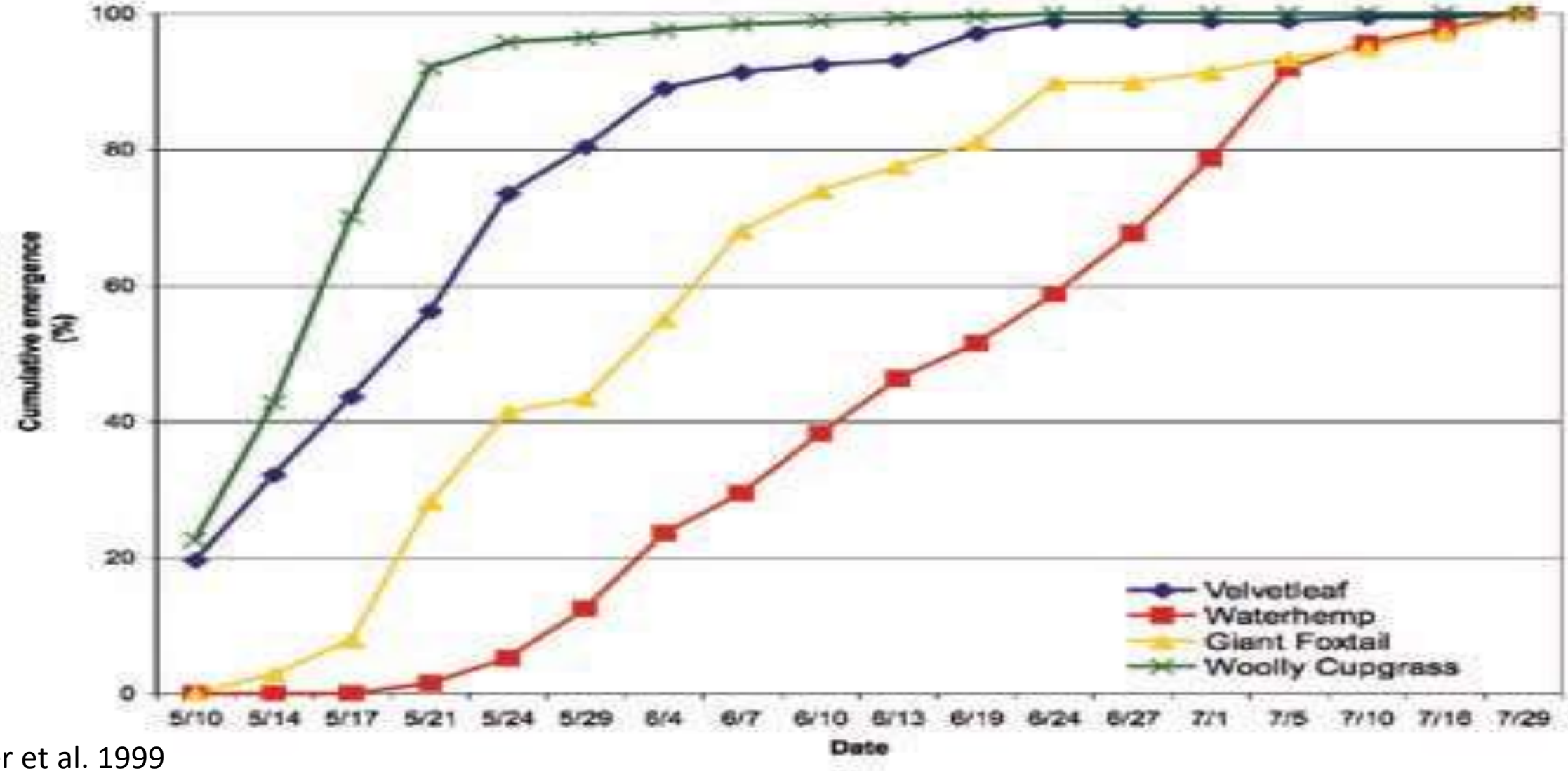
Mode of action	Waterhemp	States reported in midwest
5 (Atrazine)	Y	MO, KS, IL, IA, NE
2 (ALS inhibitors)	Y	MN, IA, IL, MO, OH, WI, KS, OK, IN, MN, NE, MI
9 (glyphosate)	Y	MO, IL, KS, MN, OH, IN, IA, SD, ND, WI, NE
27 (HPPD)	Y	IL, IA, NE
14 (PPO)	Y	KS, IL, MO, IA, MN, IN, NE, WI
4 (Auxins)	Y	NE, IL

Taken from www.weedscience.org

Waterhemp is more competitive than common weeds in WI

- High growth rates (>1 inch per day)
  - More than most weeds and crops
- Produces more seed
  - 1.5 X more seeds than other pigweeds
- Emerges later into the season
  - Allows some plants to escape PRE applications
  - Flourish after POST applications of non-residual herbicides

Emergence pattern of 4 annual weeds



Hartzler et al. 1999

Tips on managing waterhemp in alfalfa

- Management in alfalfa will be different than corn/soybeans
- Optimize alfalfa plant health to minimize impact
  - Proper fertilization, cutting schedule, rotation, etc……
- Use herbicides efficiently to get desired results
  - Residual herbicides used will be similar to soybeans
  - Do not rely on POST herbicides to control waterhemp

Alfalfa is a competitive crop

- If well managed established alfalfa will provide effective early season competition = reduced emergence
- Harvesting waterhemp plants will limit impact
  - Pigweed forage quality is decent if harvested when vegetative
- Regrowing alfalfa **that is not stressed** should compete with waterhemp
  - Moisture, insect damage, disease damage

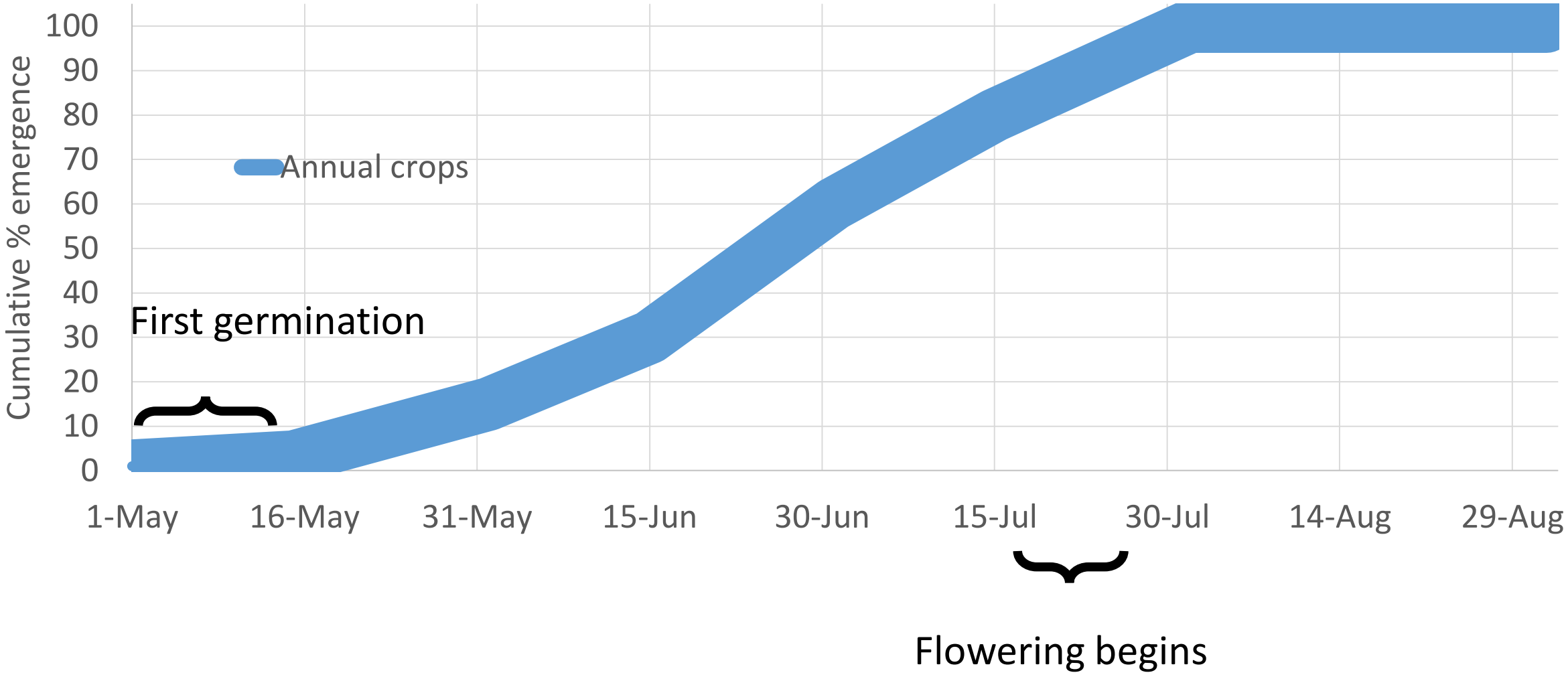
Why is Waterhemp in our established alfalfa fields?

- Emergence of waterhemp is likely after the first two harvests
- Delays in harvesting will benefit waterhemp
- Waterhemp plants that are mowed will likely resprout
- Stands that are injured (disease, insect) or below threshold may not be able to compete with plants

Photo: Richard Halopka

Estimated waterhemp emergence pattern in WI

from data from annual row crops in 1990s



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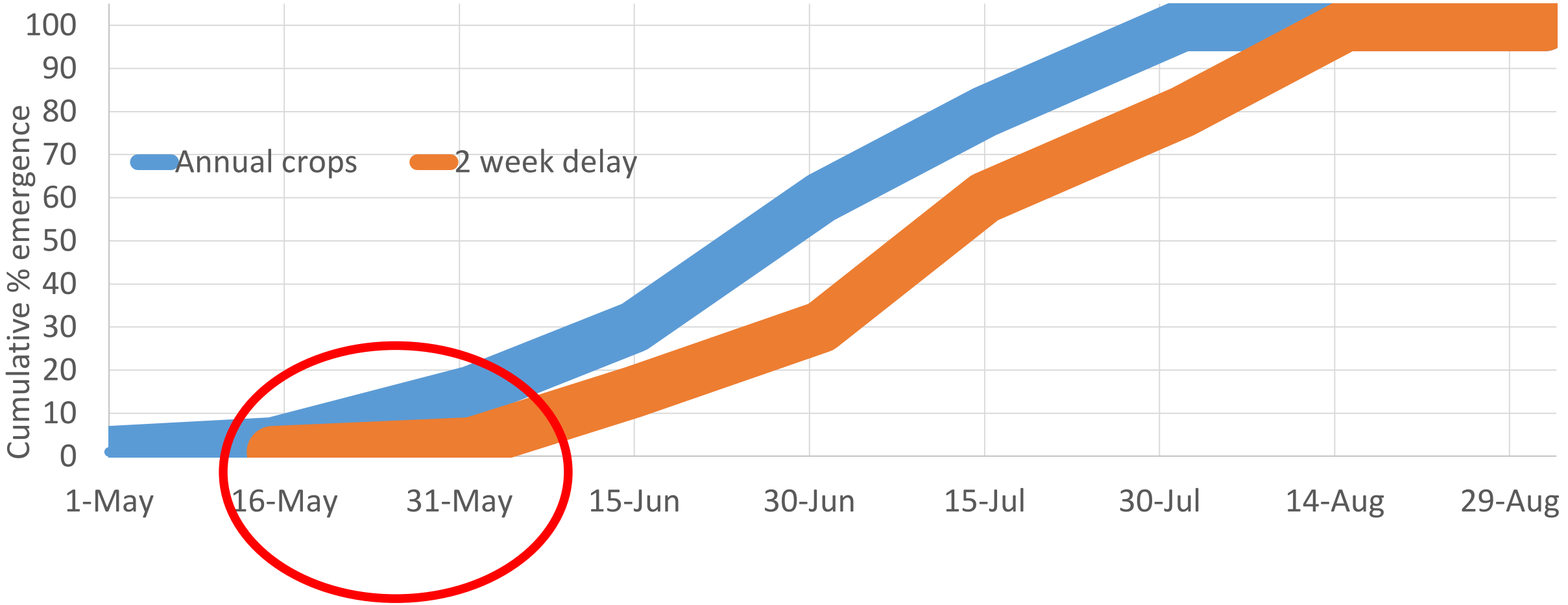

First waterhemp emergence likely delayed 2-4 weeks under alfalfa

POST Herbicides we use in established alfalfa

Herbicide	Active ingredient	Rate used	Effectiveness
Butyrac	2,4-DB	1-3 qt/A	Fair-good
Extreme	glyphosate + imazethapyr	2.2-4.4 pt/A	Excellent*
Pursuit	imazethapyr	3-6 fl oz/A	Excellent*
Raptor	imazamox	4-6 fl oz/A	Excellent*
Roundup	Glyphosate	22-44 fl oz/A	Excellent*

* Denotes resistance to these products **is common in some areas of Wisconsin**

In Michigan, promoting Paraquat between 3-4 cuttings…..

PRE Herbicides we use in established alfalfa

applied either pre-greenup or in between cuttings

Herbicide	Active ingredient	Rate	Plantback restriction corn	Plantback restriction soy	Plantback restriction small grain
Chateau	flumioxazin	4 oz/A	4 months	4 months	12 months
Metribuzin	metribuzin	0.33-1.33 lbs/A	4 months	0 months	4-12 months
Prowl H20	pendimethalin	1.1-4.2 qt/A	Following year	0 months	4 mo – following year
Velpar	hexazinone	1-6 pt/A	12 months	2 years	2 years
Warrant	acetochlor	1.25-2 qt/A	0 months	0 months	0- 4 months

PRE Herbicides we use in established alfalfa

Herbicide	Active ingredient	Rate	% Control 25 DAT	% Control 50 DAT	Data source
Chateau	flumioxazin	4 oz/A			
Metribuzin	metribuzin	0.33-1.33 lbs/A			
Prowl H20	pendimethalin	1.1-4.2 qt/A			
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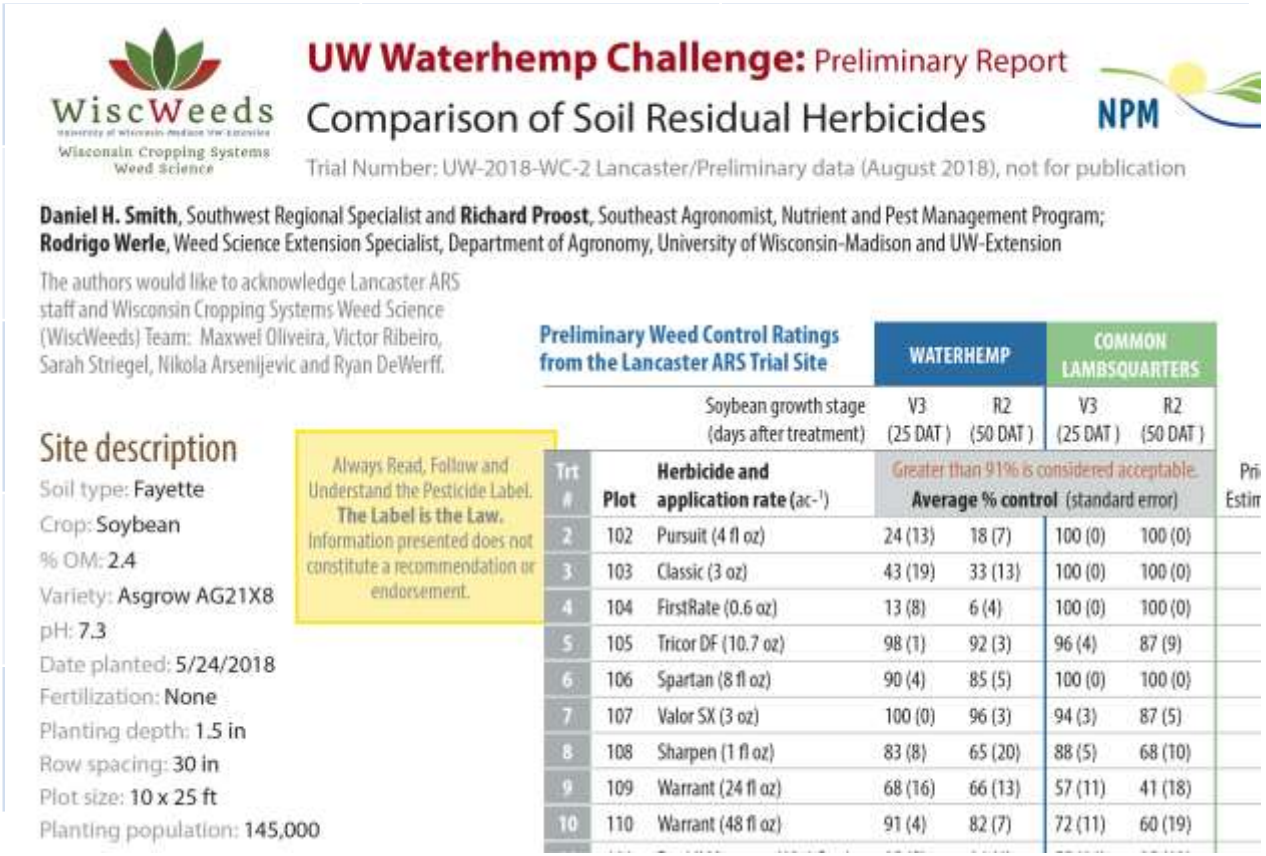

WiscWeeds
Wisconsin Cropping Systems Weed Science

UW Waterhemp Challenge: Preliminary Report

Comparison of Soil Residual Herbicides

NPM

Trial Number: UW-2018-WC-2 Lancaster/Preliminary data (August 2018), not for publication

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Rodrigo Werle, Weed Science Extension Specialist, Department of Agronomy, University of Wisconsin-Madison and UW-Extension

The authors would like to acknowledge Lancaster ARS staff and Wisconsin Cropping Systems Weed Science (WiscWeeds) Team: Maxwel Oliveira, Victor Ribeiro, Sarah Striegel, Nikola Arsenijevic and Ryan DeWerff.

Site description

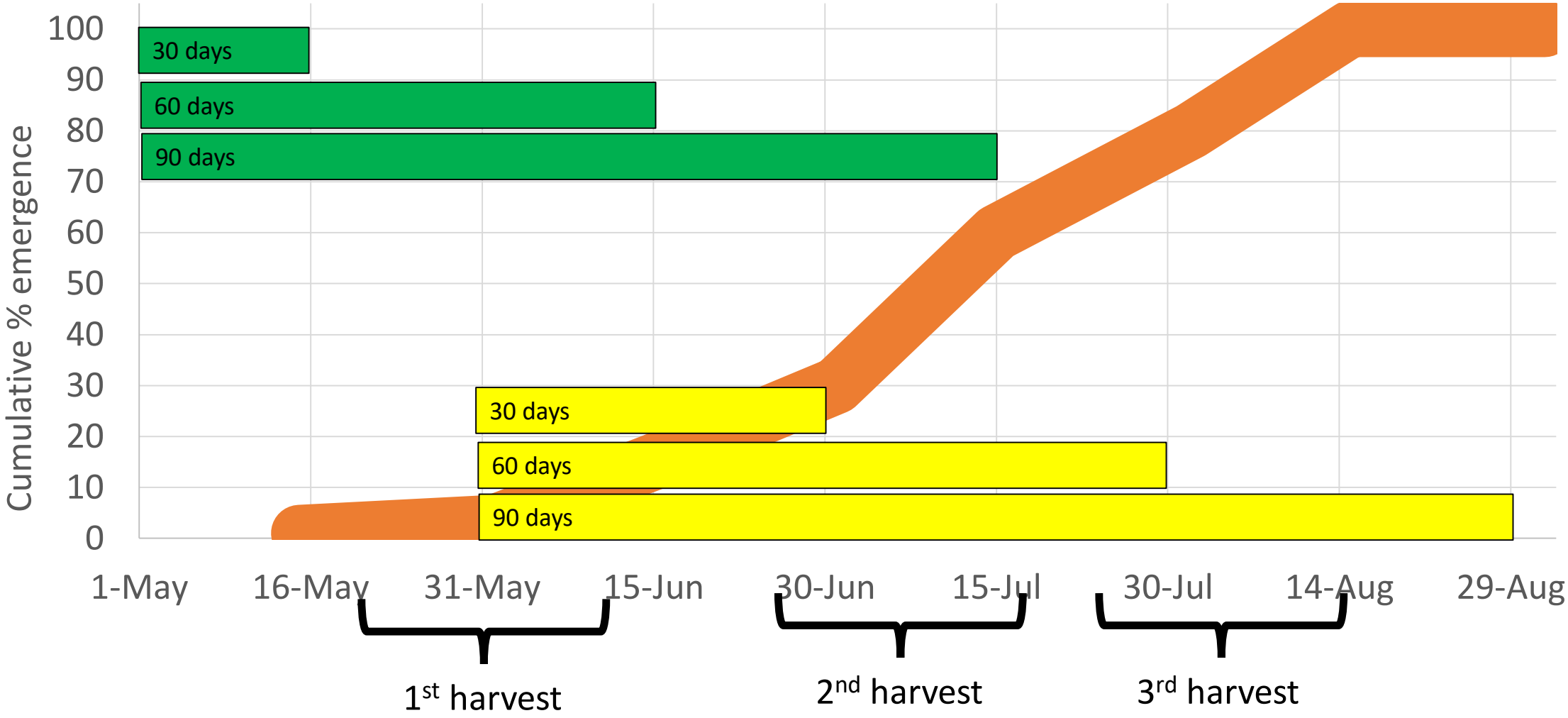
Soil type: Fayette
Crop: Soybean
% OM: 2.4
Variety: Asgrow AG21X8
pH: 7.3
Date planted: 5/24/2018
Fertilization: None
Planting depth: 1.5 in
Row spacing: 30 in
Plot size: 10 x 25 ft
Planting population: 145,000

Always Read, Follow and Understand the Pesticide Label. **The Label is the Law.** Information presented does not constitute a recommendation or endorsement.

Preliminary Weed Control Ratings from the Lancaster ARS Trial Site

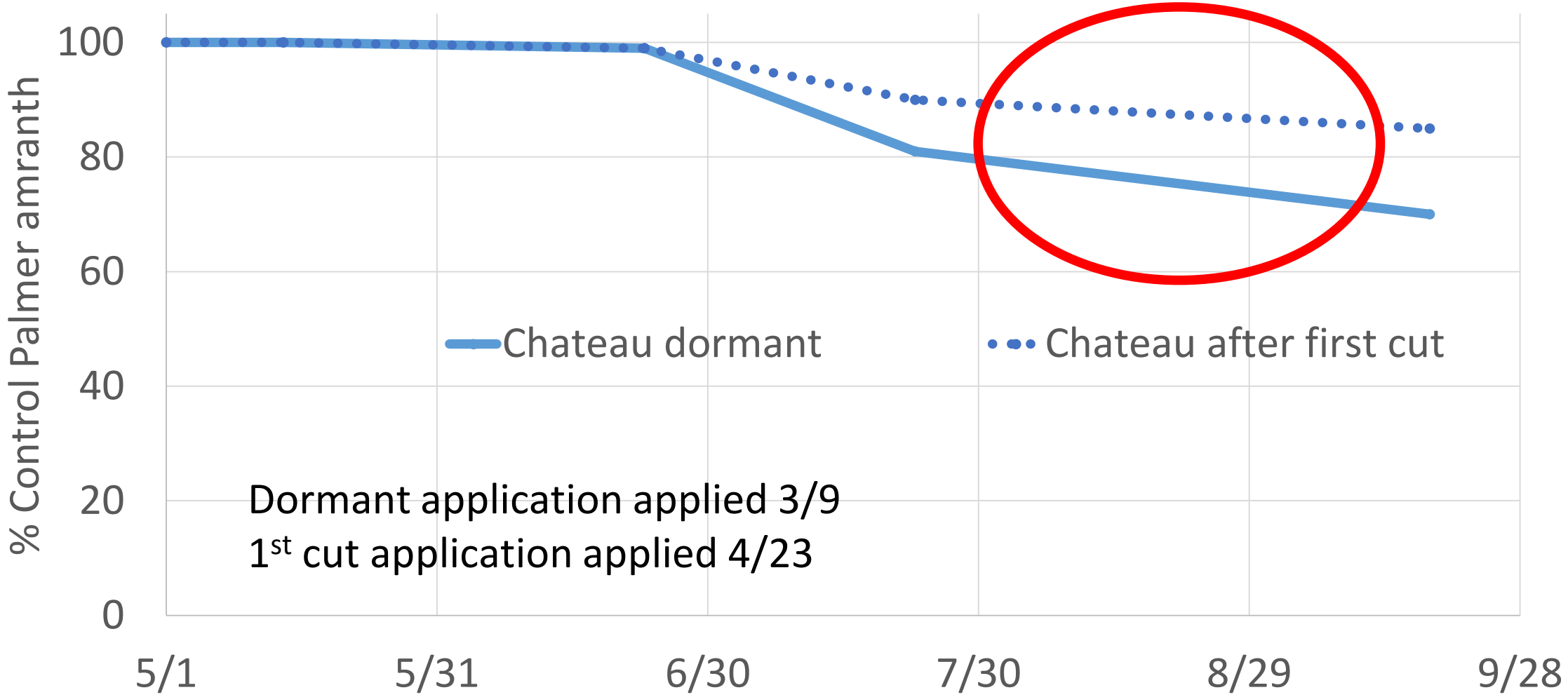
Trt #	Plot	Herbicide and application rate (ac⁻¹)	WATERHEMP Soybean growth stage (days after treatment) V3 (25 DAT)	WATERHEMP R2 (50 DAT)	COMMON LAMBSQUARTERS V3 (25 DAT)	COMMON LAMBSQUARTERS R2 (50 DAT)
			Greater than 91% is considered acceptable. Average % control (standard error)			
2	102	Pursuit (4 fl oz)	24 (13)	18 (7)	100 (0)	100 (0)
3	103	Classic (3 oz)	43 (19)	33 (13)	100 (0)	100 (0)
4	104	FirstRate (0.6 oz)	13 (8)	6 (4)	100 (0)	100 (0)
5	105	Tricor DF (10.7 oz)	98 (1)	92 (3)	96 (4)	87 (9)
6	106	Spartan (8 fl oz)	90 (4)	85 (5)	100 (0)	100 (0)
7	107	Valor SX (3 oz)	100 (0)	96 (3)	94 (3)	87 (5)
8	108	Sharpen (1 fl oz)	83 (8)	65 (20)	88 (5)	68 (10)
9	109	Warrant (24 fl oz)	68 (16)	66 (13)	57 (11)	41 (18)
10	110	Warrant (48 fl oz)	91 (4)	82 (7)	72 (11)	60 (19)

If use residual herbicides, do we treat at green-up or wait until the first cutting?



Applications after first cut may improve season long control

Data from Kansas on palmer amaranth



Data from other states on palmer may demonstrate how waterhemp in WI will behave

- Weed competition with alfalfa **was minimal** for the first two alfalfa cuttings
  - Impact likely in 3rd and 4th cutting
- Residual herbicides provide control, but not year-long
  - Sequential applications best
- **No differences in forage quality** among treatments
  - In 1st and 2nd cutting

When you start developing a plan for waterhemp, think about your goals….

Maximize high quality forage

- Manage alfalfa to optimize competition
  - Proper fertility, cutting schedule, rotation
- Use herbicides to keep Waterhemp < 25% of forage biomass
  - Likely only in 3rd and 4th cut
    - POST after 3rd cut (Paraquat)
    - Residual after 1st or 2nd cut
- Mow/harvest when waterhemp is vegetative

Eliminate waterhemp seed

- Manage alfalfa to optimize competition
  - Proper fertility, cutting schedule, **rotation**
- Use herbicides to prevent emergence of waterhemp
  - Residual herbicides (sequential apps)
  - Incorporate POST applications
    - Make sure populations are not resistant to herbicides you use

Management options

- Timely mowing
  - Will impact waterhemp but it will resprout
- POST herbicides
  - Pursuit*, Raptor* and Roundup* are effective but resistance is common
  - Paraquat and 2,4-Db are options with no known resistance in WI
- PRE herbicides
  - Chateau* & Metribuzin* will give good to excellent control through summer
  - Warrant will give good to excellent control for 1-2 months
  - Others can control Waterhemp, but long plant-back or short residual make less valuable

* Resistance to this mode of action has been documented in WI

Summary

- We have a lot to learn about Waterhemp management in established alfalfa
  - Emergence timings and how harvest schedule alters it
  - Length of residual herbicides on Waterhemp in WI
  - Impact of Waterhemp on forage production, quality and stand in WI

- Develop a plan based on
  - Goals in waterhemp management
  - Evaluate costs
  - how widespread waterhemp is in your area and farm

Data from Kansas on palmer suggests….