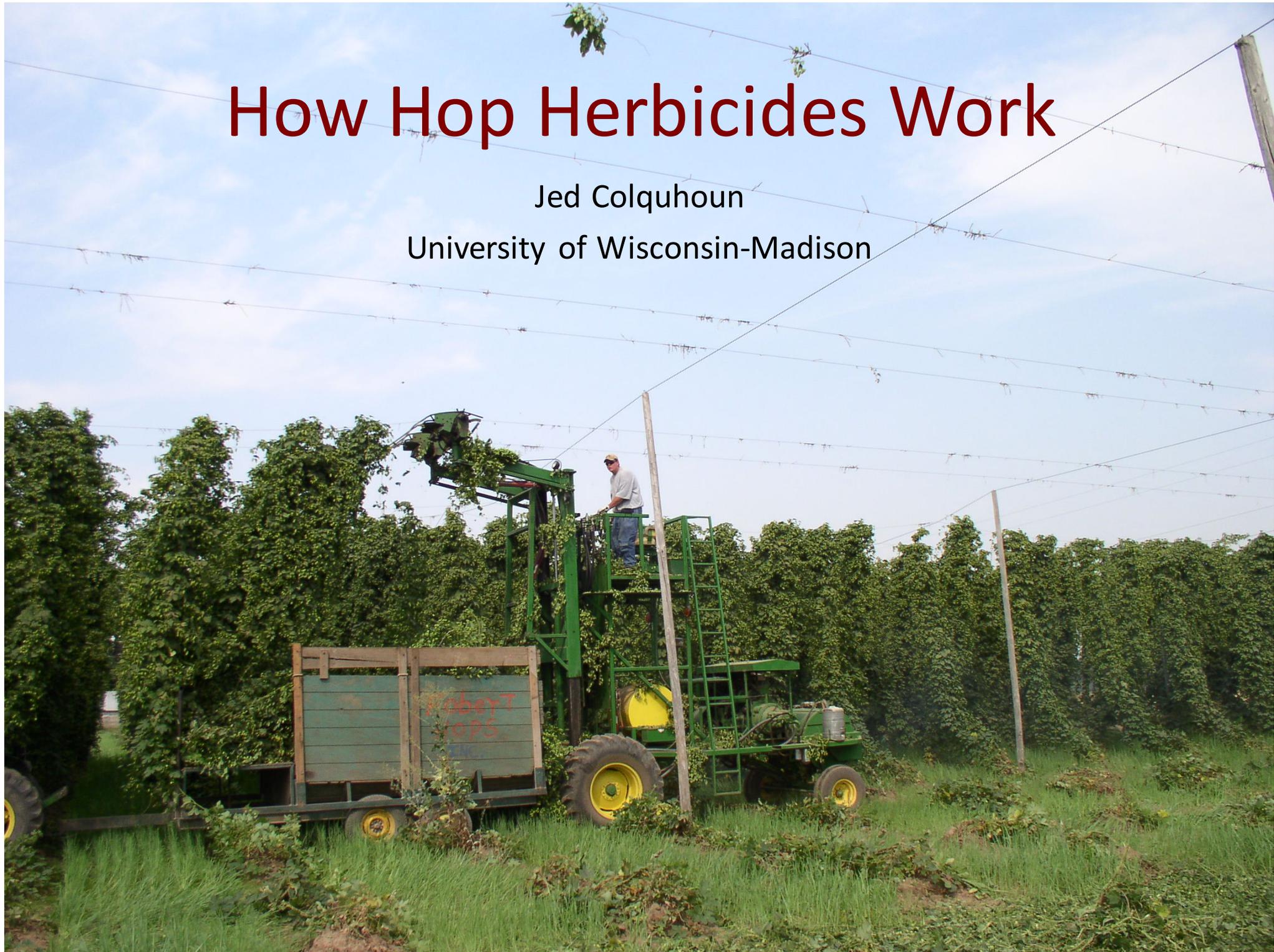


How Hop Herbicides Work

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How Hop Herbicides Work

- Hop herbicides (example trade names):
 - norflurazon (Solicam)
 - trifluralin (Treflan)
 - flumioxazin (Chateau)
 - carfentrazone (Aim)
 - glyphosate (Roundup)
 - 2,4-D
 - clethodim (Select)



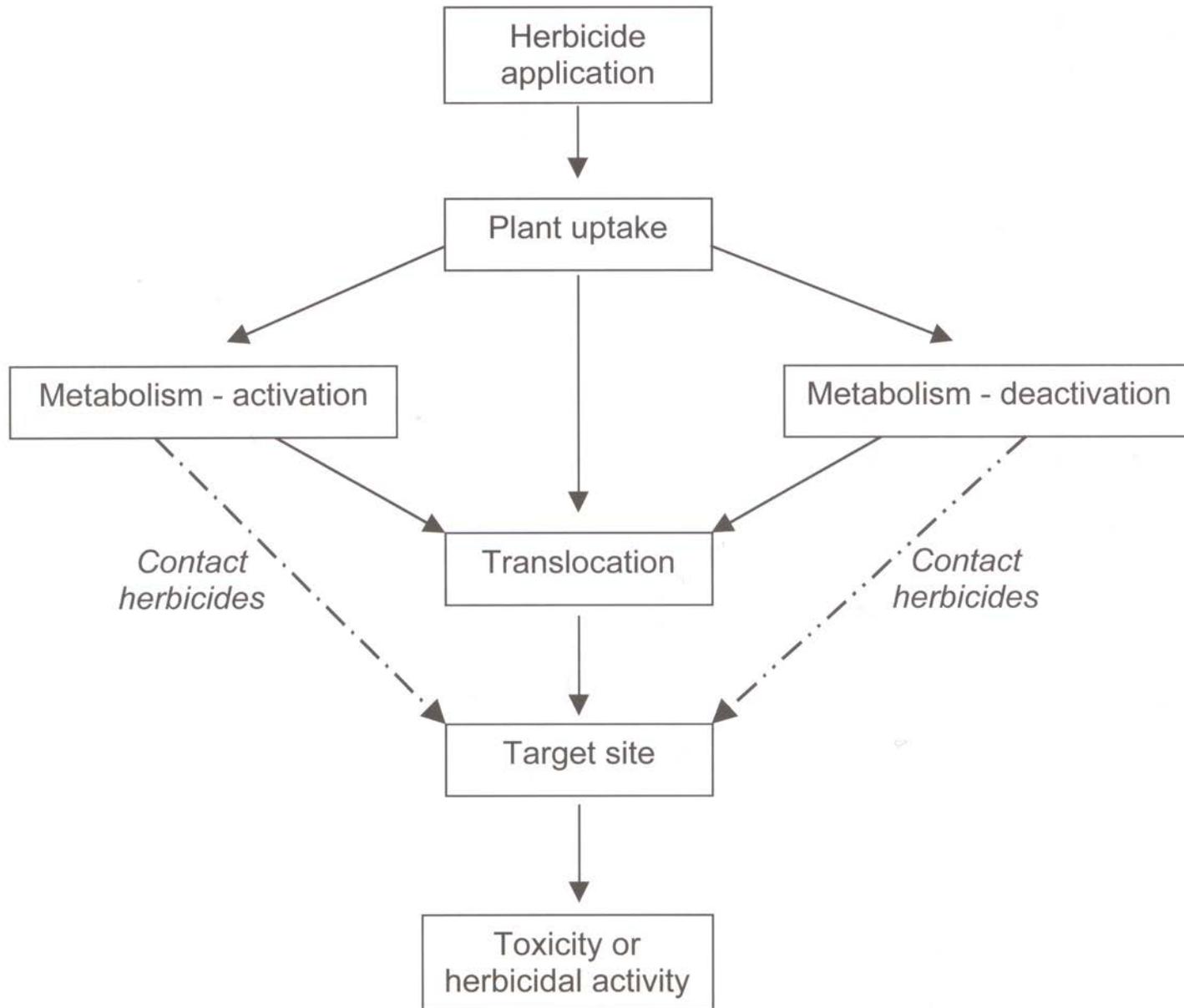
Pesticide labels change often and vary regionally. As always, read and follow the pesticide label prior to use. The information in this presentation is not a substitute for the label – the label is the law!

How Hop Herbicides Work

- Hop herbicides:
 - What they're used for in hops
 - How they work, not in a textbook way but so that they work best
 - Any issues to keep an eye out for



How Hop Herbicides Work



norflurazon (Solicam)

- PRE herbicide: apply to clean soil after tillage in fall or early spring
- Controls several broadleaves and grasses
- Apply as a directed spray to the soil on each side of the row
- Apply 6 months or more after crop planting
- 60 day pre-harvest interval

norflurazon (Solicam)

- Uptake: primarily roots
- Translocation: to the growing points
- Plant system affected:
 - Blocks pigment formation
 - Toxic byproducts build up in plant
 - Cell membranes are destroyed
- Selectivity: tolerant plants have less uptake and more metabolism

norflurazon (Solicam)



trifluralin (ex: Treflan)

- Controls several annual grasses and a few broadleaf weeds
- PRE control only – emerged weeds not touched
- Needs to be incorporated 1 to 2 inches deep, but don't damage the hop crowns
- Don't spray or drag treated soil over hop crowns – emergence will be delayed

trifluralin (ex: Treflan)

- Uptake: roots of nearby germinating weeds
- Translocation: to root growing points
- Plant system affected:
 - Cell division in root tips is disrupted
- Selectivity: tolerant plants have less uptake, less translocation and more metabolism

trifluralin (ex: Treflan)



trifluralin (ex: Treflan)



carfentrazone (Aim EC)

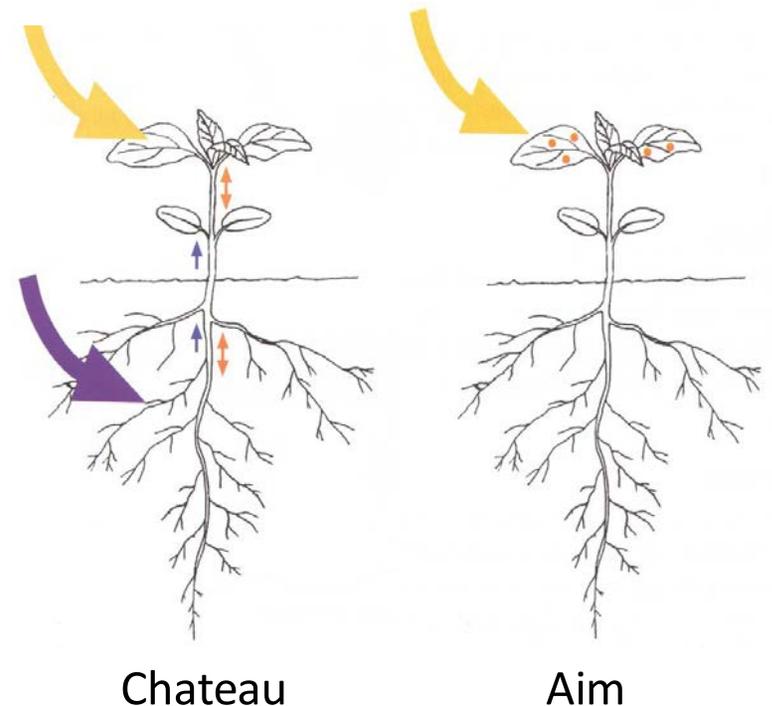
- Available in WI on a Special Local Needs label
- For sucker control and for young broadleaf emerged weeds
 - Suckers: apply to the bottom 1.5 ft and to sucker mat. See label for adjuvant requirements
 - Newly-emerged broadleaf weeds: Apply using a shielded or hooded sprayer
 - Avoid newly trained hop vines until sufficient barking and until they are tall enough to avoid the apical bud

flumioxazin (Chateau SW)

- For sucker control and for PRE weed control
 - Suckers: Apply as a directed spray after the hop bines are at least 6 ft tall
 - Spray the lower 2 ft of hops
 - PRE weed control: Apply to dormant hops as a band 1 to 1.5 ft from the row
 - Controls several broadleaves and some grasses
 - Don't use with an adjuvant
 - Avoid contact with hops

flumioxazin (Chateau SW) and carfentrazone (Aim EC)

- Uptake: roots and shoots for Chateau; shoots for Aim
- Translocation: some with Chateau; almost none with Aim
- Plant system affected:
 - Cell membranes are destroyed and cells collapse
- Selectivity: tolerant plants metabolize the herbicides



carfentrazone (Aim EC)

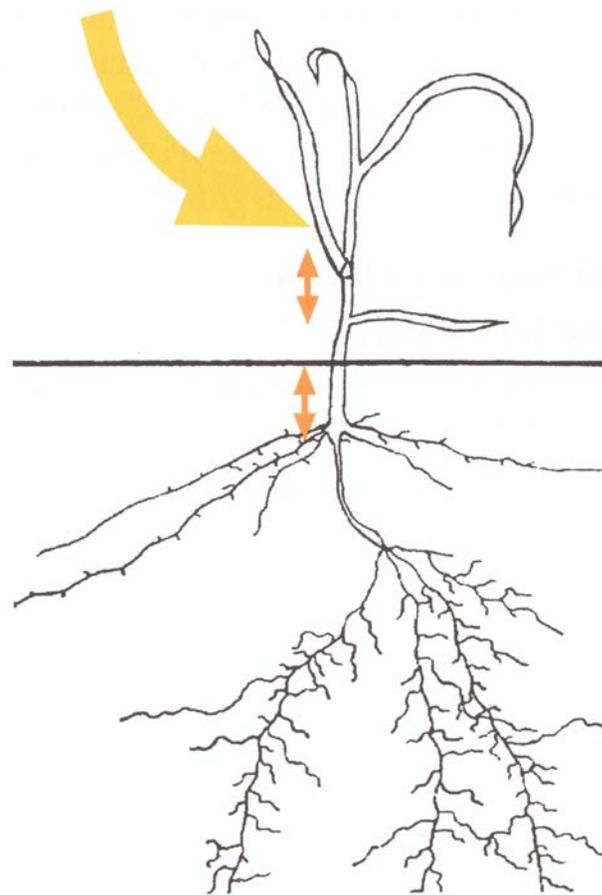


glyphosate (ex: Roundup)

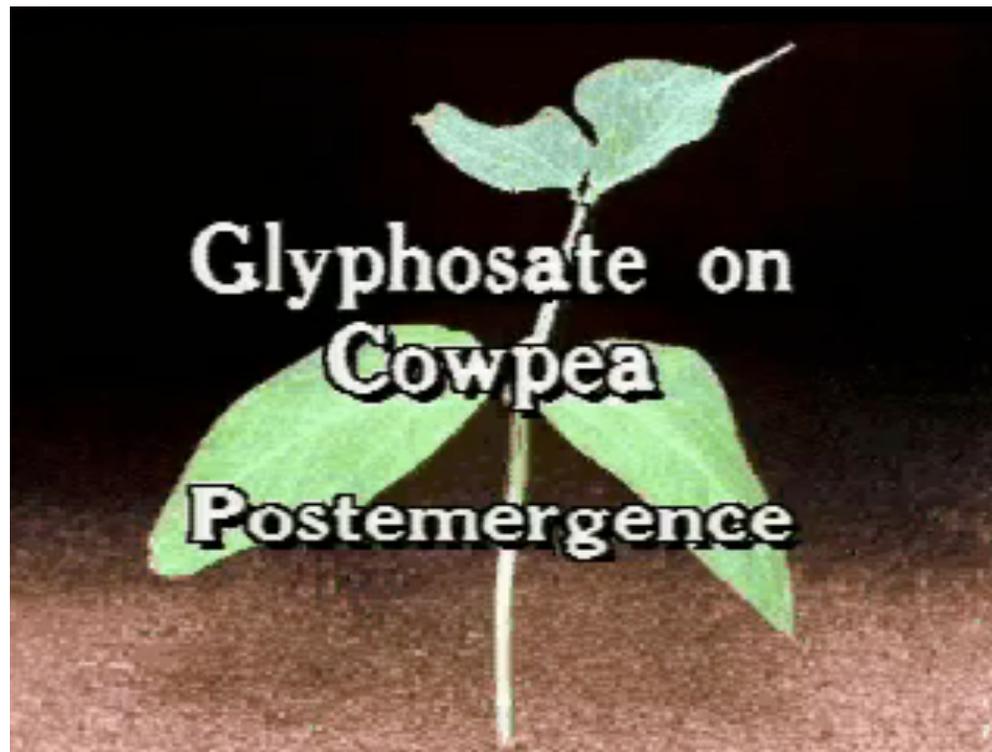
- Non-selective: what you spray will be injured or killed, including the hops!
- Post-emergent – no soil residual
- Can be applied as a row middle, shielded, wiper, directed or spot treatment
 - Don't let it contact the hops – remove suckers in the area prior to application if needed
 - 14 day pre-harvest interval

glyphosate (ex: Roundup)

- Uptake: only by shoots, not by roots
- Translocation: to the active sink in the plant
- Plant system affected:
 - Amino acid production
- Selectivity: Non-selective!
Roundup injures or kills most plants that it touches!



glyphosate (ex: Roundup)



Susceptible: 1 pint/Acre (21 DAT)



Oregon: 1 pint/Acre



Oregon: 4 pints/Acre



Oregon: 8 pints/Acre



Glyphosate resistance update

- Common waterhemp:
 - Eau Claire County: 10x resistance
 - Pierce County: 13x resistance
- Palmer amaranth:
 - Dane County
- Previously identified:
 - Giant ragweed
 - Horseweed

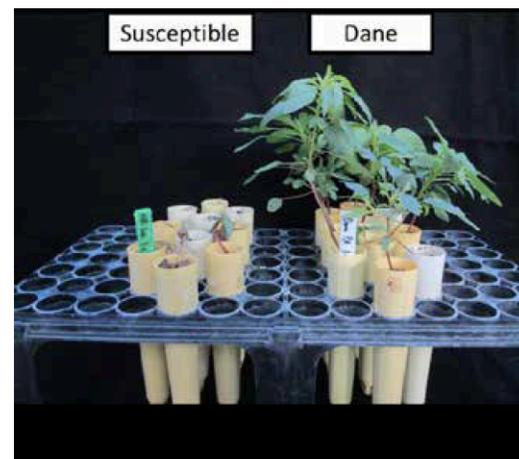


Figure 1. Comparison of ten susceptible plants versus ten Dane County Palmer amaranth plants. Pictures taken at 21 days after application.

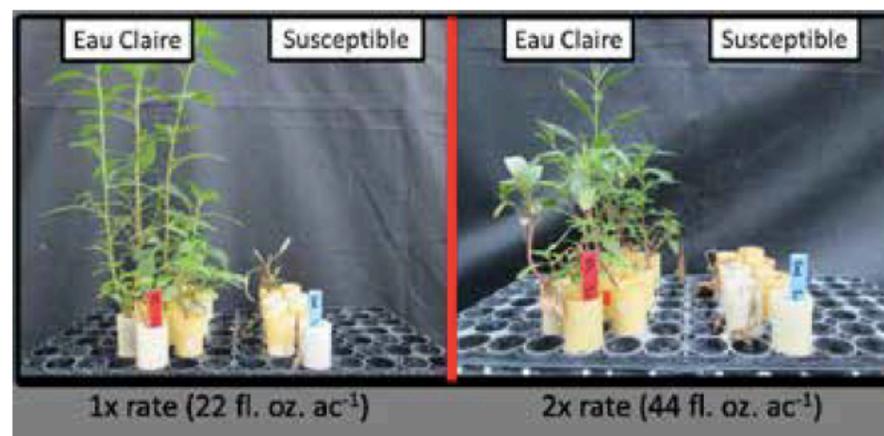
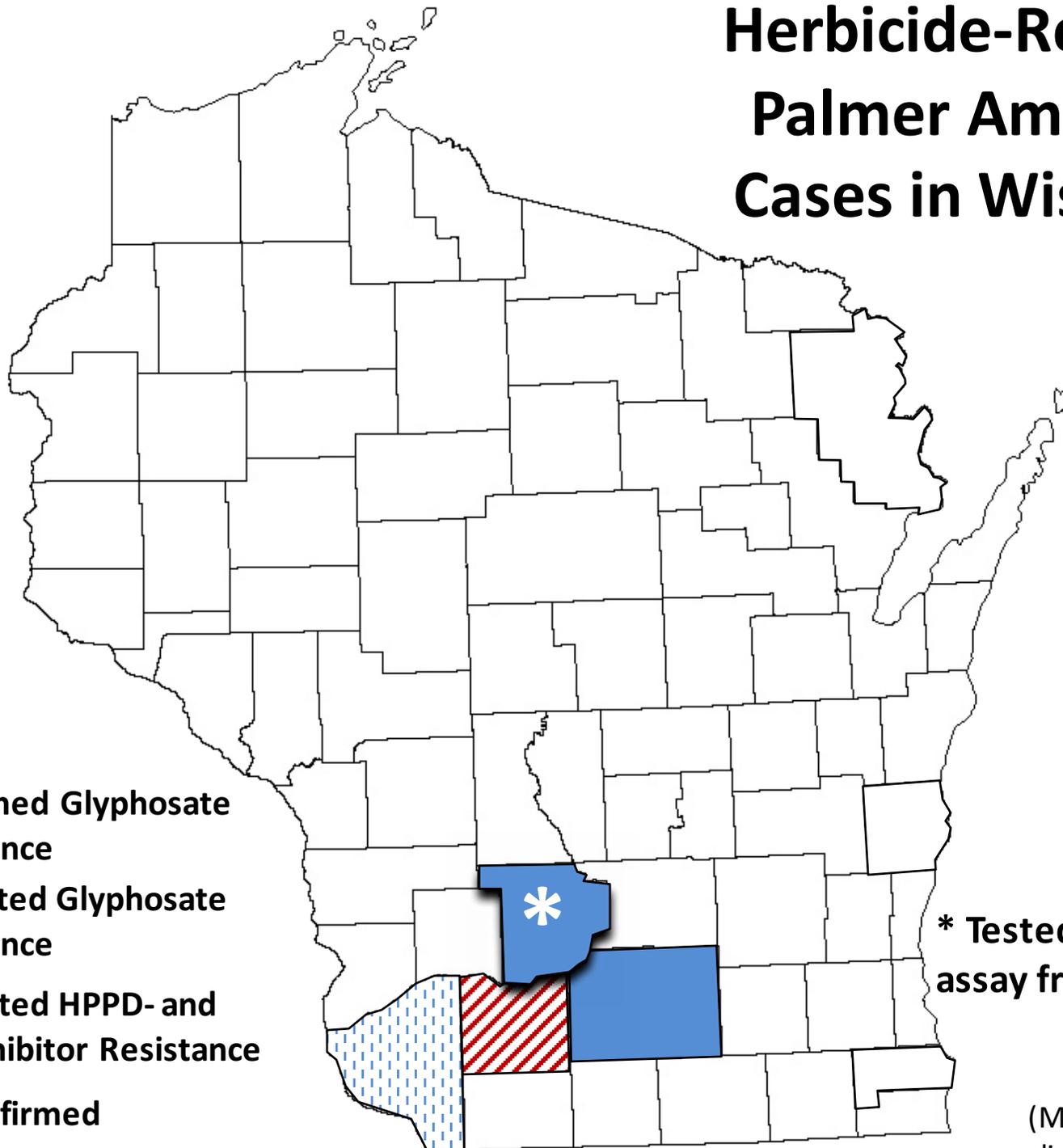


Figure 1. Comparison of ten Eau Claire County common waterhemp versus seven susceptible plants. Pictures taken at 14 days after application.

Herbicide-Resistant Palmer Amaranth Cases in Wisconsin

-  Confirmed Glyphosate Resistance
-  Suspected Glyphosate Resistance
-  Suspected HPPD- and ALS-Inhibitor Resistance
-  No Confirmed Resistance

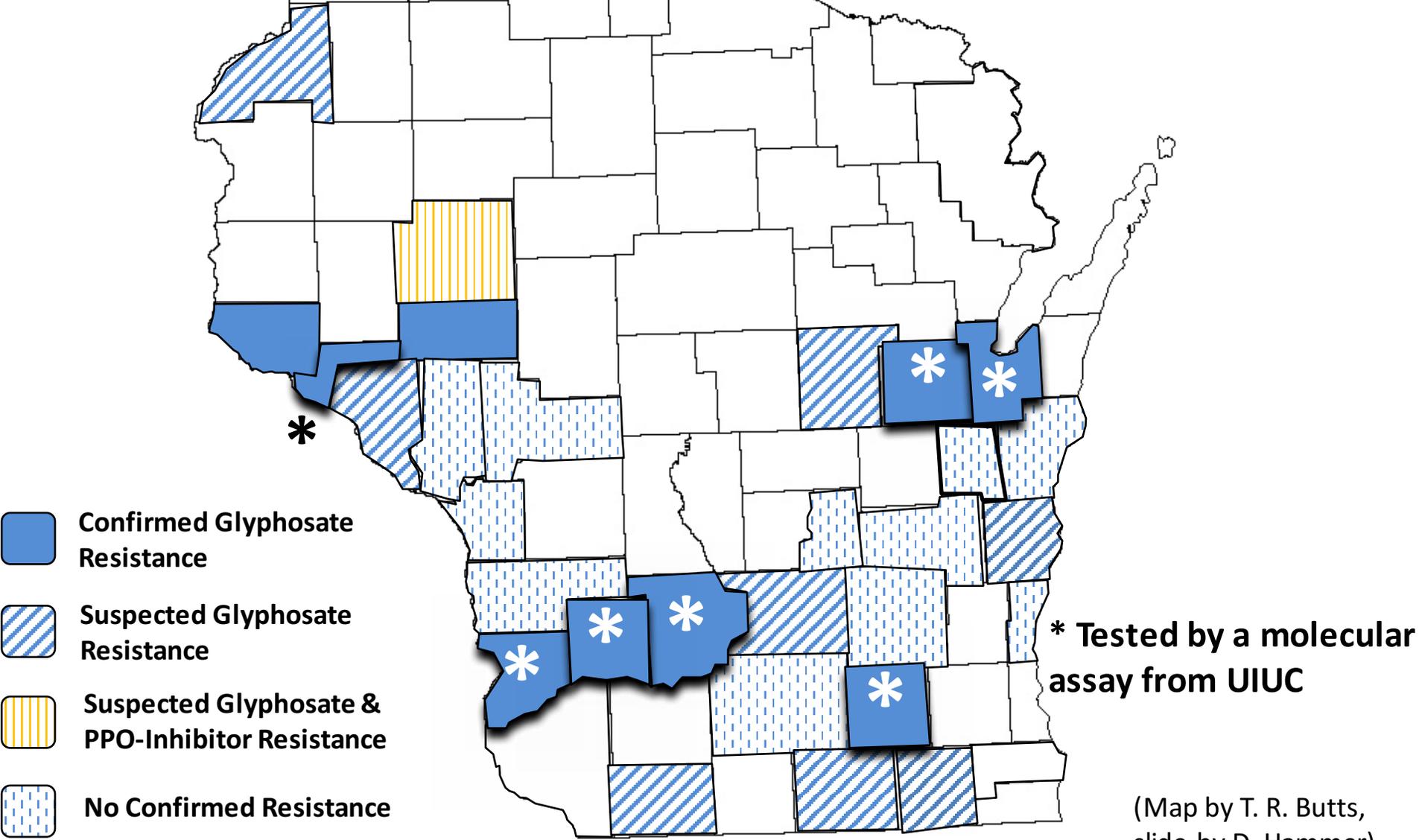


* Tested by a molecular assay from UIUC

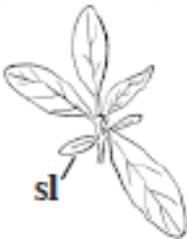
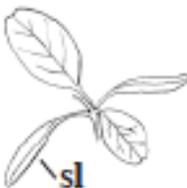
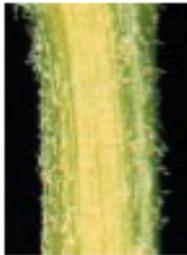
(Map by T. R. Butts,
slide by D. Hammer)



Herbicide-Resistant Common Waterhemp Cases in Wisconsin



(Map by T. R. Butts, slide by D. Hammer)

	Common Waterhemp	Redroot Pigweed	Smooth Pigweed	Powell Amaranth	Palmer Amaranth
Seedling shape					
Stem hairs					
Leaf shapes					
Separate male and female plants	Yes	No	No	No	Yes
Seedhead shape	smooth, long, slender	prickly, short, stout	slightly prickly, long, slender	prickly, very long, thick	very prickly, very long, thick

Source:
Pratt et al.,
Iowa State
University,
1999

2,4-D (several trade names)

- Post-emergent broadleaf weed control
- Make directed applications to row middles
- Can make up to 3 applications, but with at least 30 days between applications
- 28 day pre-harvest interval
- Don't contact green hop stems or foliage

2,4-D (several trade names)

- Uptake: shoots and foliage
- Translocation: to the growing points
- Plant system affected:
 - Plant hormones: unbalanced and overloaded
- Selectivity: grasses uptake and transport 2,4-D less effectively and metabolize it quickly; differences in broadleaf control based on metabolism rate

2,4-D (several trade names)



2,4-D



Did you catch my drift?



clethodim (ex: Select)

- Post-emergent grass control
 - Controls most annuals and some perennials
 - No broadleaf weed control
- Apply to actively growing grasses
- Include an adjuvant as directed by the label
- 21 day pre-harvest interval

clethodim (ex: Select)

- Uptake: shoots and foliage
- Translocation: to the growing points
- Plant system affected:
 - ACCase enzyme is blocked
- Selectivity: grasses have an active ACCase enzyme; broadleaf plants don't

clethodim (ex: Select)



clethodim (ex: Select)

