Weeds are Bad

Joe Ikley
Extension Weed Specialist

1/16/2024

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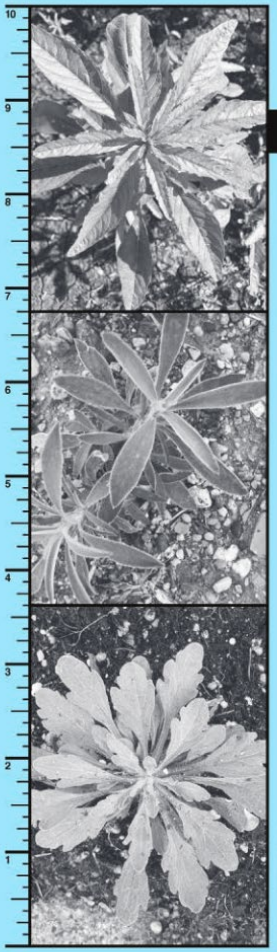

W253-24 This Publication Supercedes All Previous Issues

2024

North Dakota Weed Control Guide

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NDSU North Dakota Agricultural Experiment Station

North Dakota State University
Fargo, North Dakota

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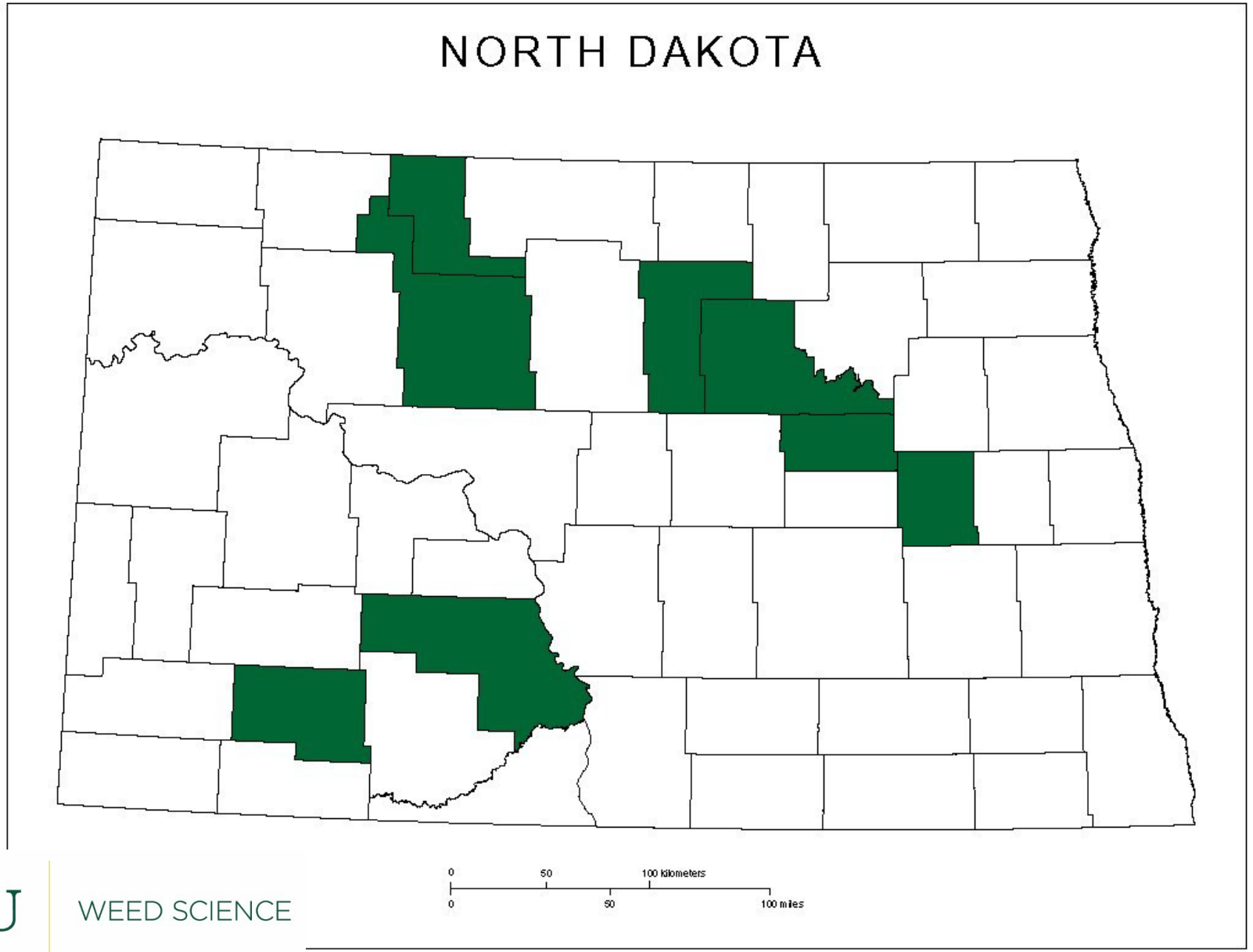
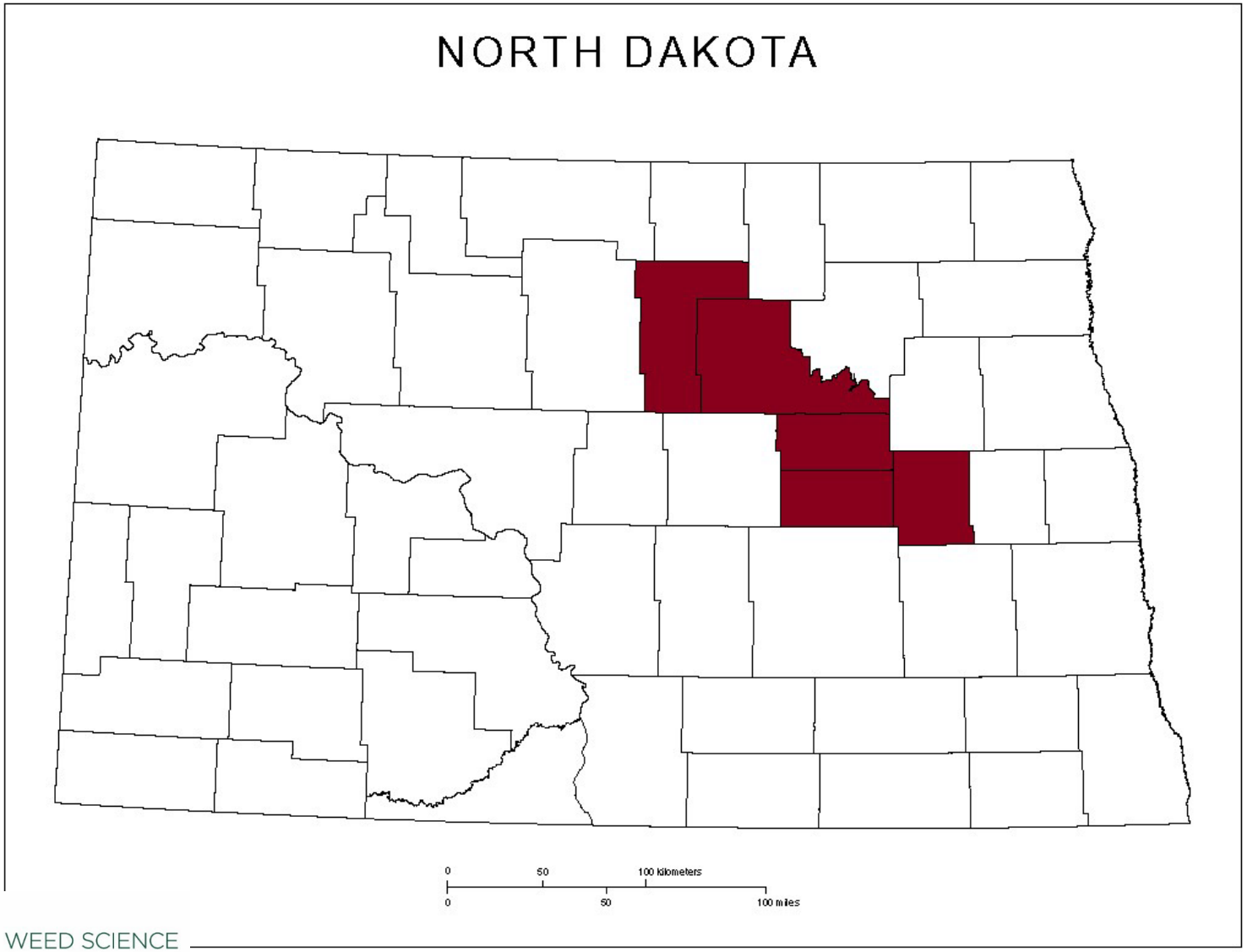
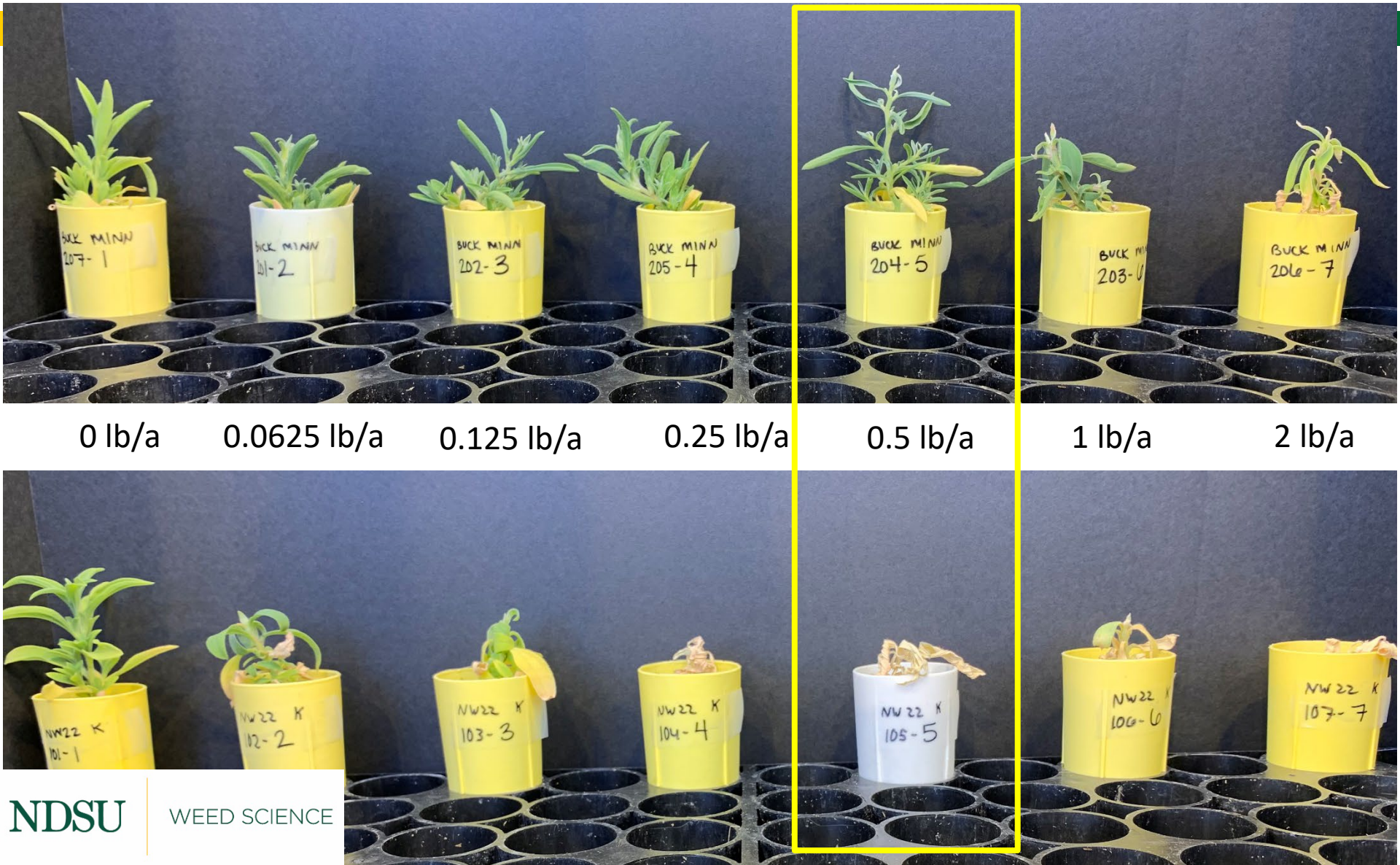
Group 14-R Kochia



Dicamba-R Kochia



Dicamba-Resistant Kochia



0 lb/a | 0.0625 lb/a | 0.125 lb/a | 0.25 lb/a | 0.5 lb/a | 1 lb/a | 2 lb/a

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Soil-applied dicamba

The Notorious P.I.G.

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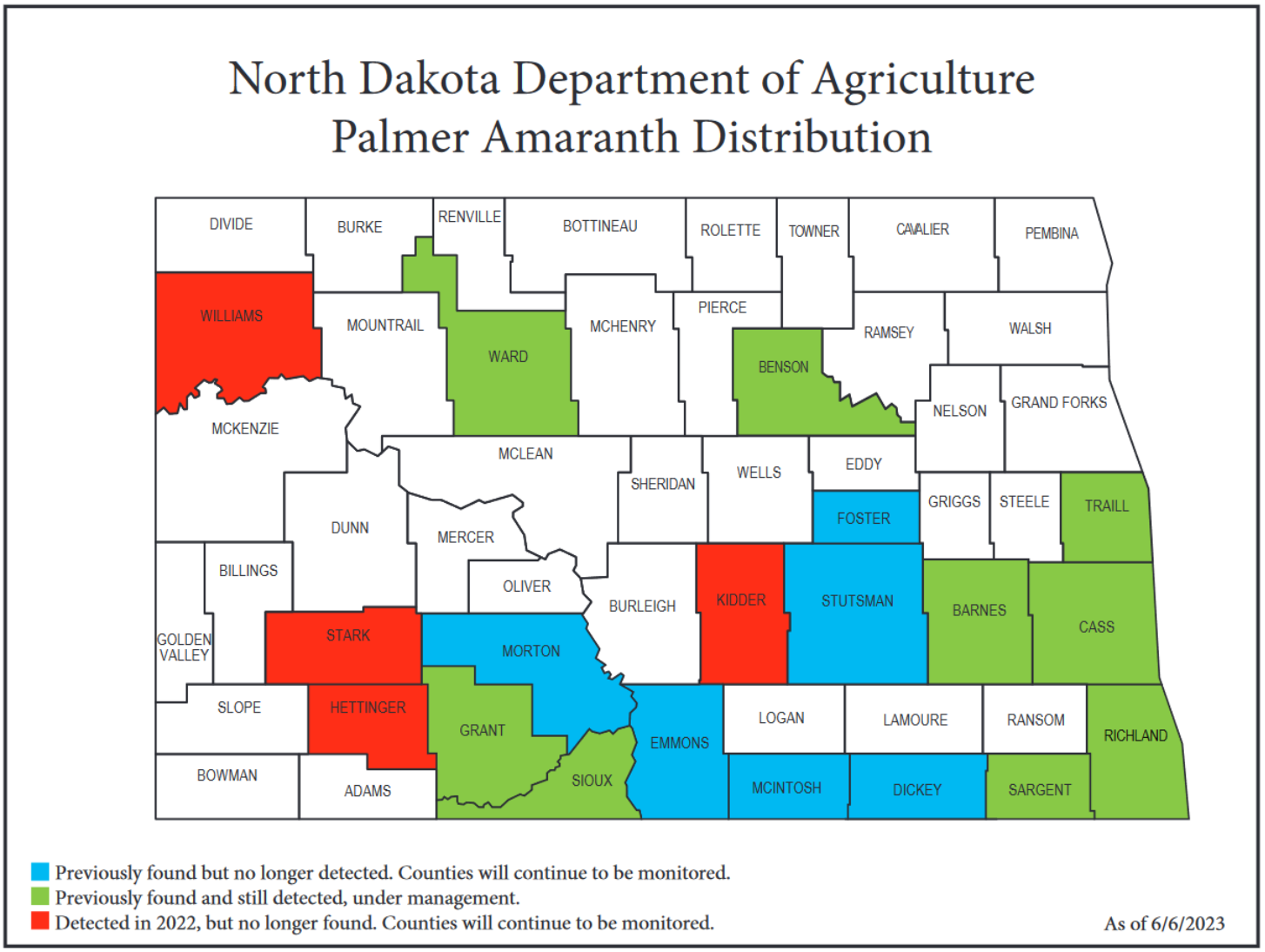
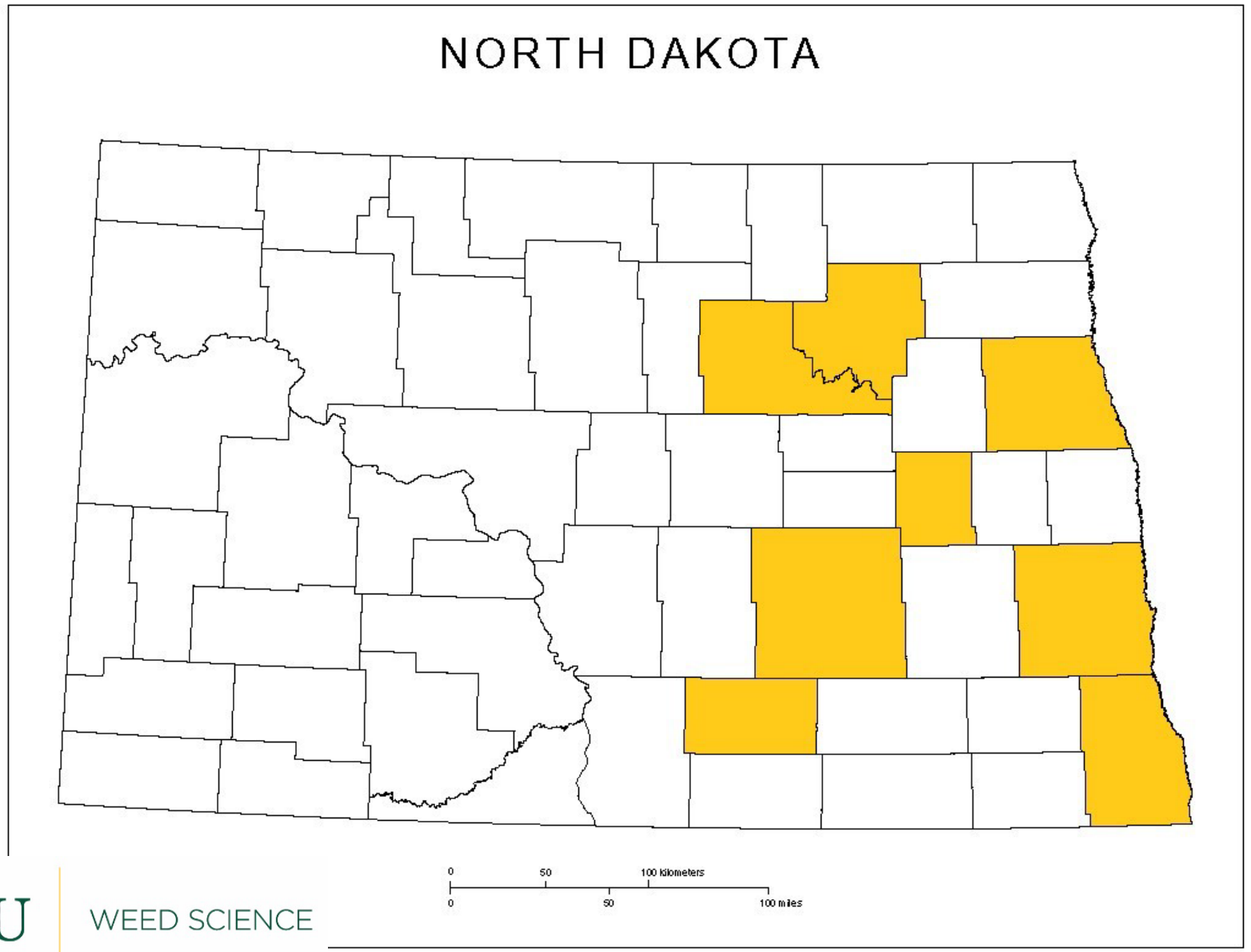
Palmer amaranth – No New Cases in 2023



Group 14-Resistant Waterhemp



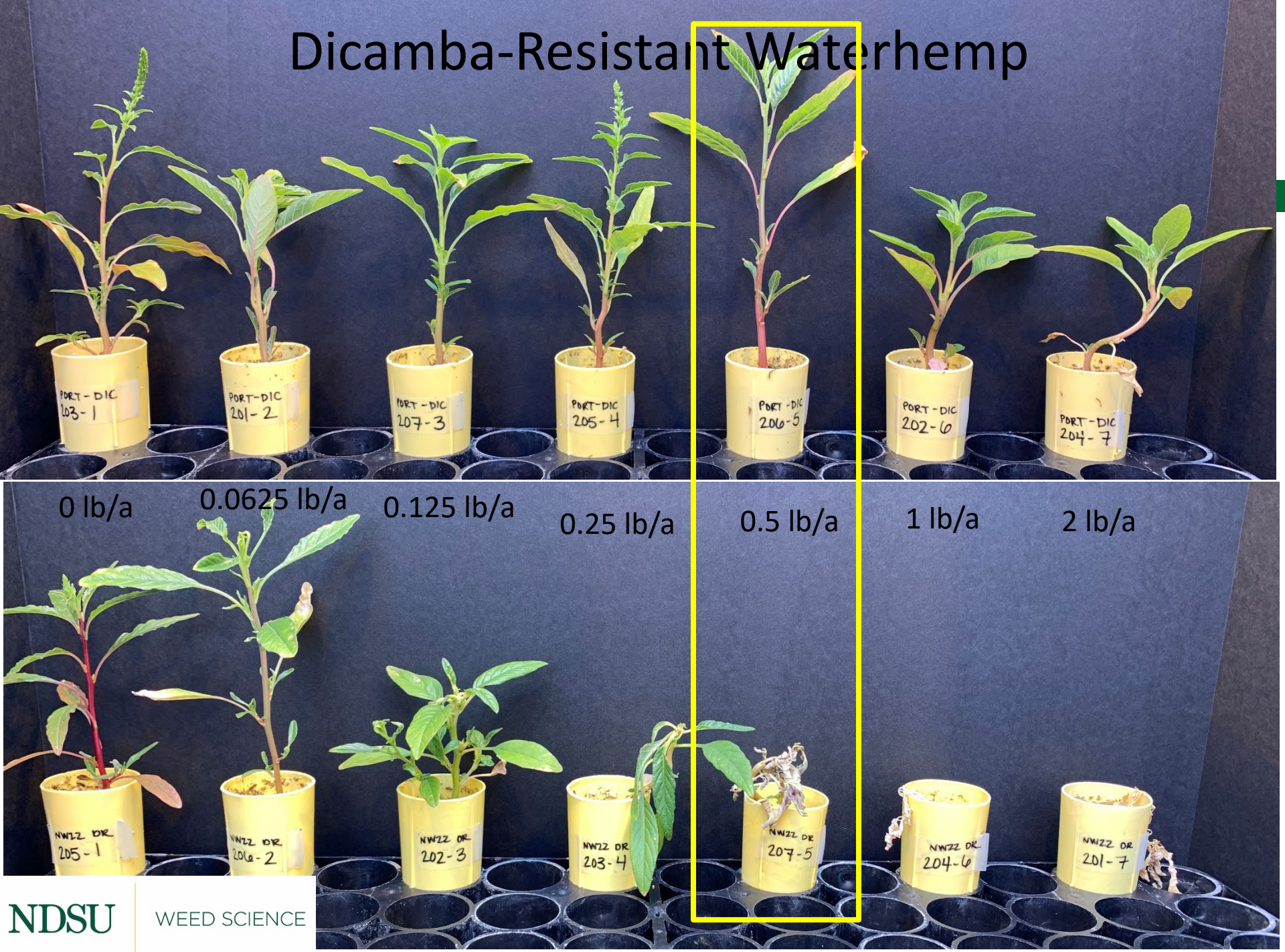
PPO-Inhibitor Resistance – Waterhemp

Mechanisms of Resistance

Target Site Resistance: *PPX2* gene (PPO2 isozyme)

- Deletion of glycine residue at 210th position
  - ΔGly210
  - 50% increase in PPO2 active site "pocket"
  - 100- to 500-fold reduction in sensitivity to diphenylether herbicides
  - Reduced sensitivity to sulfentrazone and flumioxazin
- Substitution at Arg98 position
  - Arg98Gly, Arg98Met, or Arg98Leu

Dicamba-Resistant Waterhemp



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Pigweed Control with PRE Herbicides

- Less than 0.5” within 14 days of PRE
  - 2021-2023
  - First inch after 4 weeks and 10 events - 2023

- Rate titration of metribuzin
- Different PRE programs with metribuzin on waterhemp
- Benefit of dicamba added PRE

PRE Pigweed Control with Metribuzin

- Concept: We need more metribuzin
  - Many premixes are full rate of another herbicide, cut rate MTZ
- Rate titration from 4 to 16 ounces 75 DF
  - *No soybean injury observed
- Dicamba, sulfentrazone, *S*-metolachlor used as comparisons

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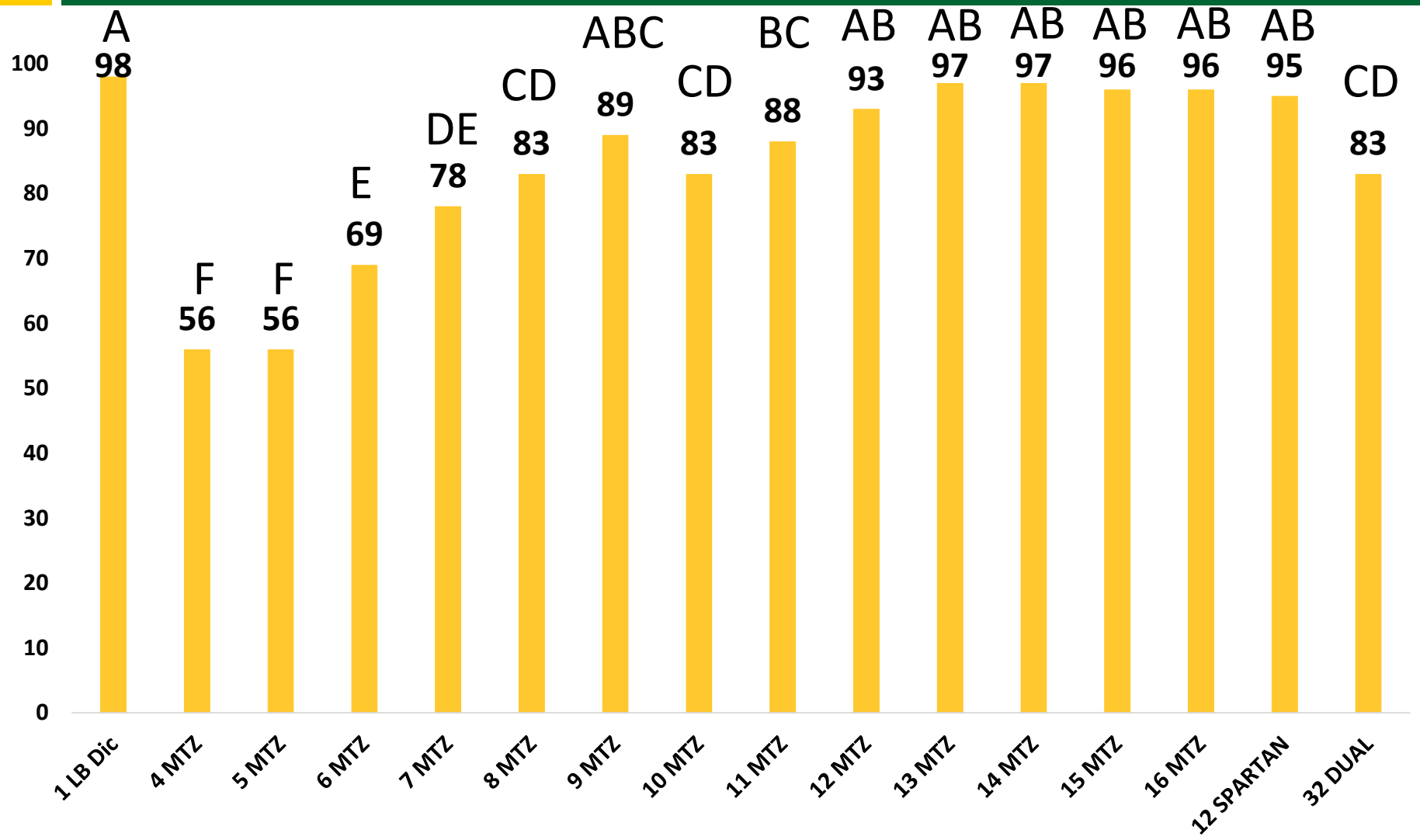
Waterhemp Control
4 Weeks After Planting



PRE Herbicides and Metribuzin Rates

- Evaluate 0.25 and 0.5 lb ai/A metribuzin with soybean herbicides

Product	Rate (per A)
Valor EZ + Zidua SC	2.5 fl oz + 3.5 fl oz
Surveil (Valor + Firstrate)	3.5 oz
Surveil + Zidua SC	3.5 oz + 3.5 fl oz
Fierce MTZ*	1.25 pt
Spartan	4 fl oz
Dicamba	0.5 lb ae

*Additional MTZ spiked in to total 0.25 and 0.5 lb

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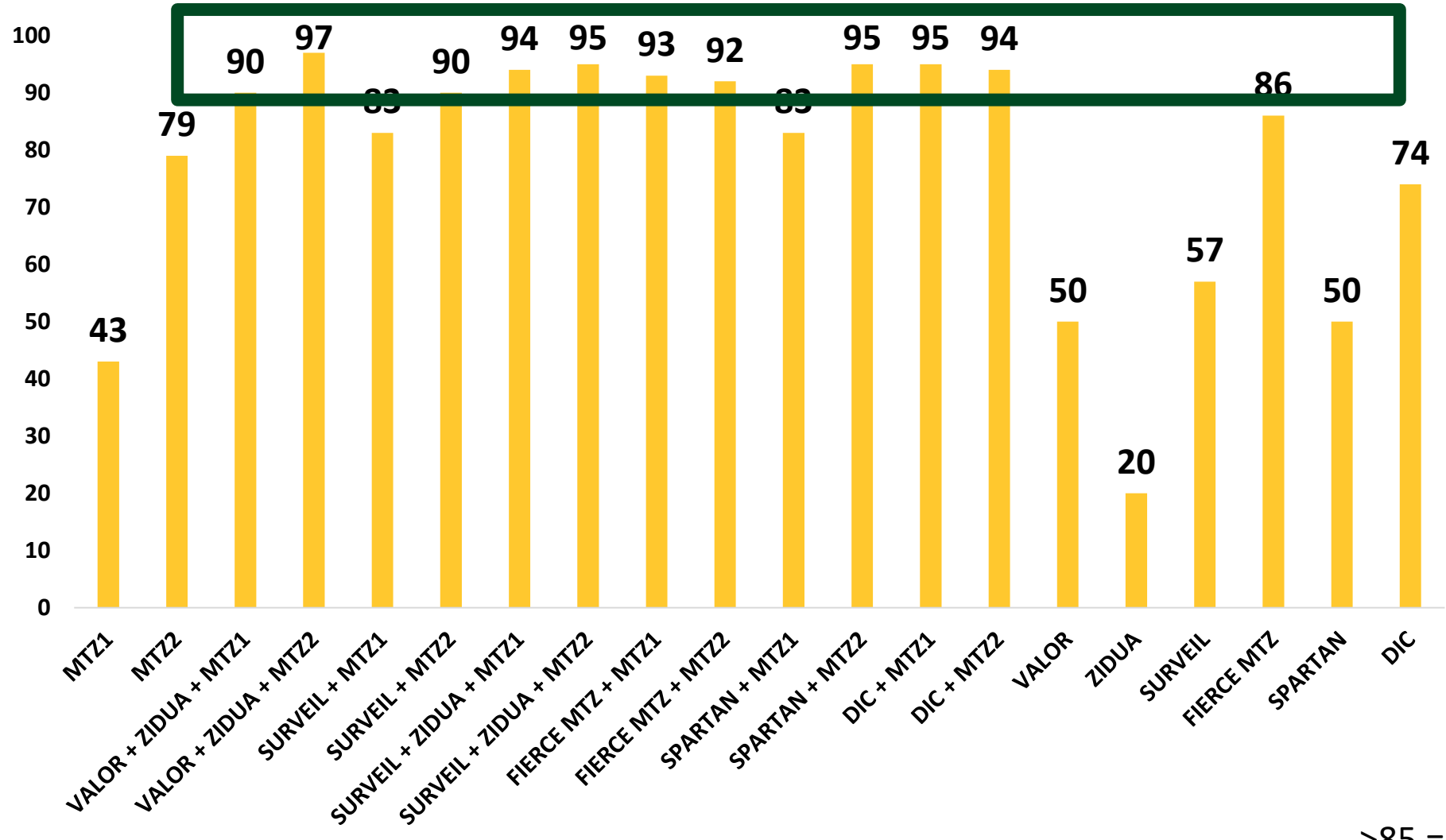
Waterhemp Control 4 Weeks After Planting



>85 = A

Valor

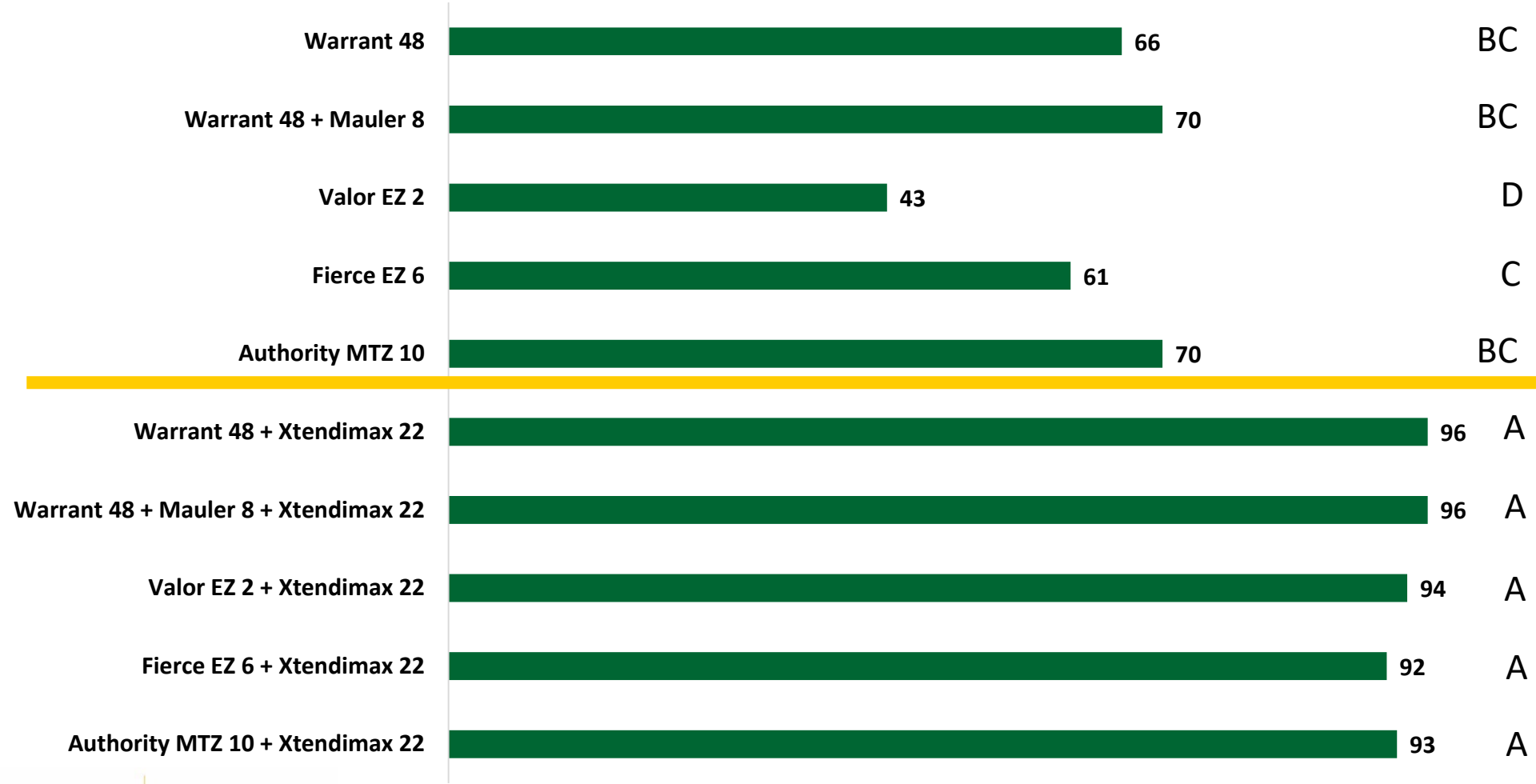
Zidua

Fierce MTZ

PRE Waterhemp Control with Dicamba

- Conducted at NW22 (Fargo) in 2021, 2022, and 2023
- PRE Herbicides applied with and without 0.5 lb dicamba
- All years had <0.5” rainfall within 14 days after application

Waterhemp Control – 2021-2023
35-42 DAP



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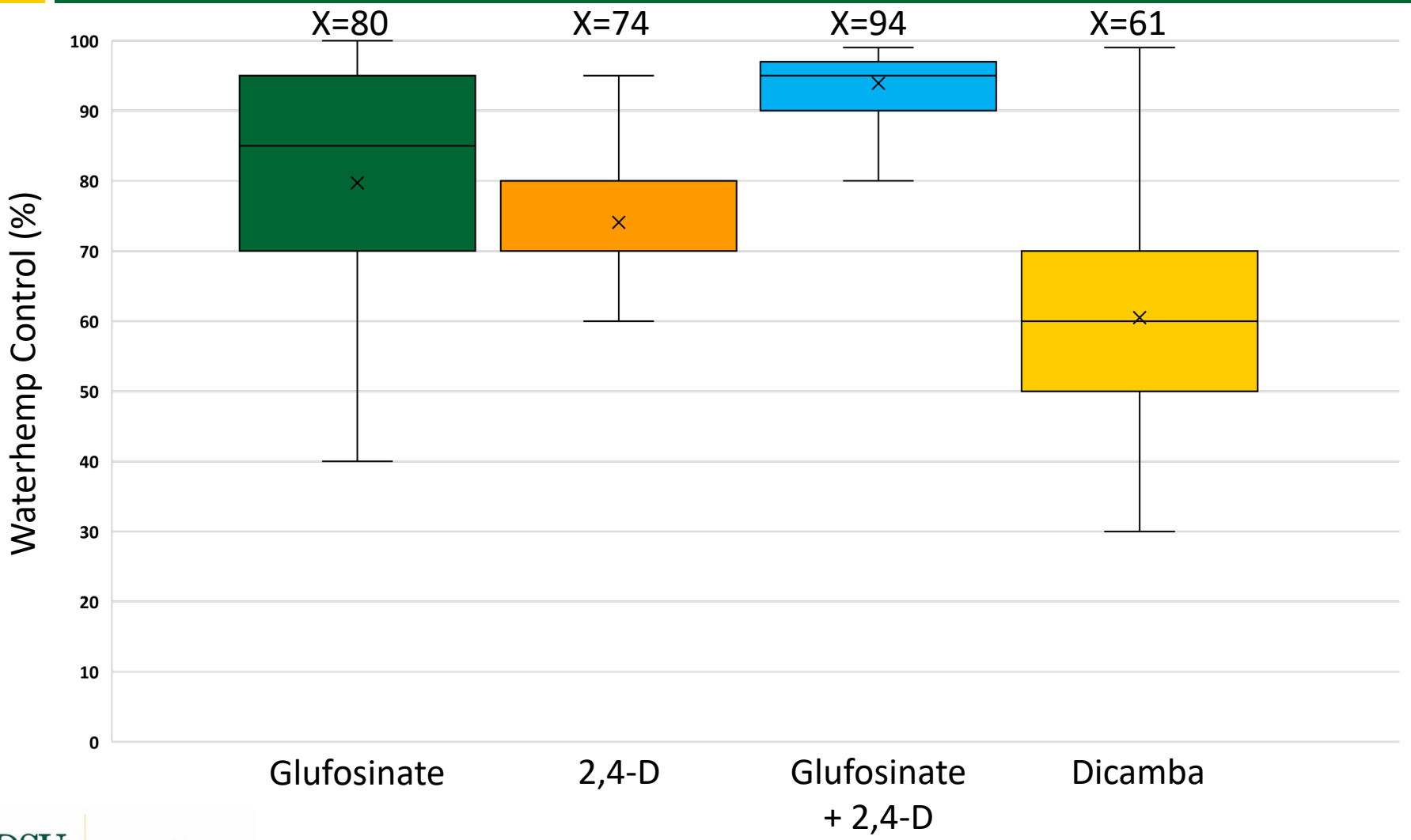
Xtendimax 22 – 75 B
Xtendimax 44 – 94 A

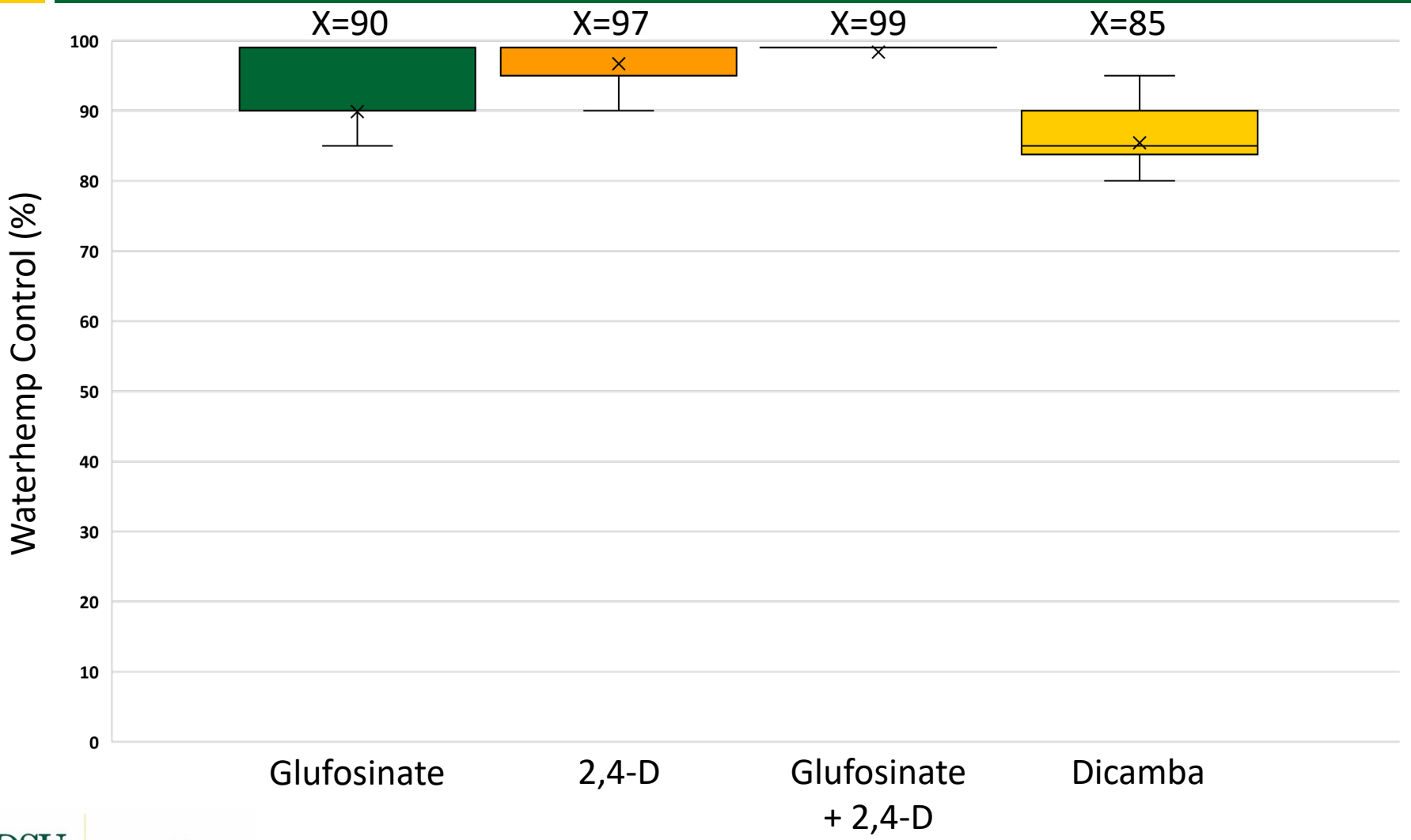
POST Waterhemp Control 2019-2023

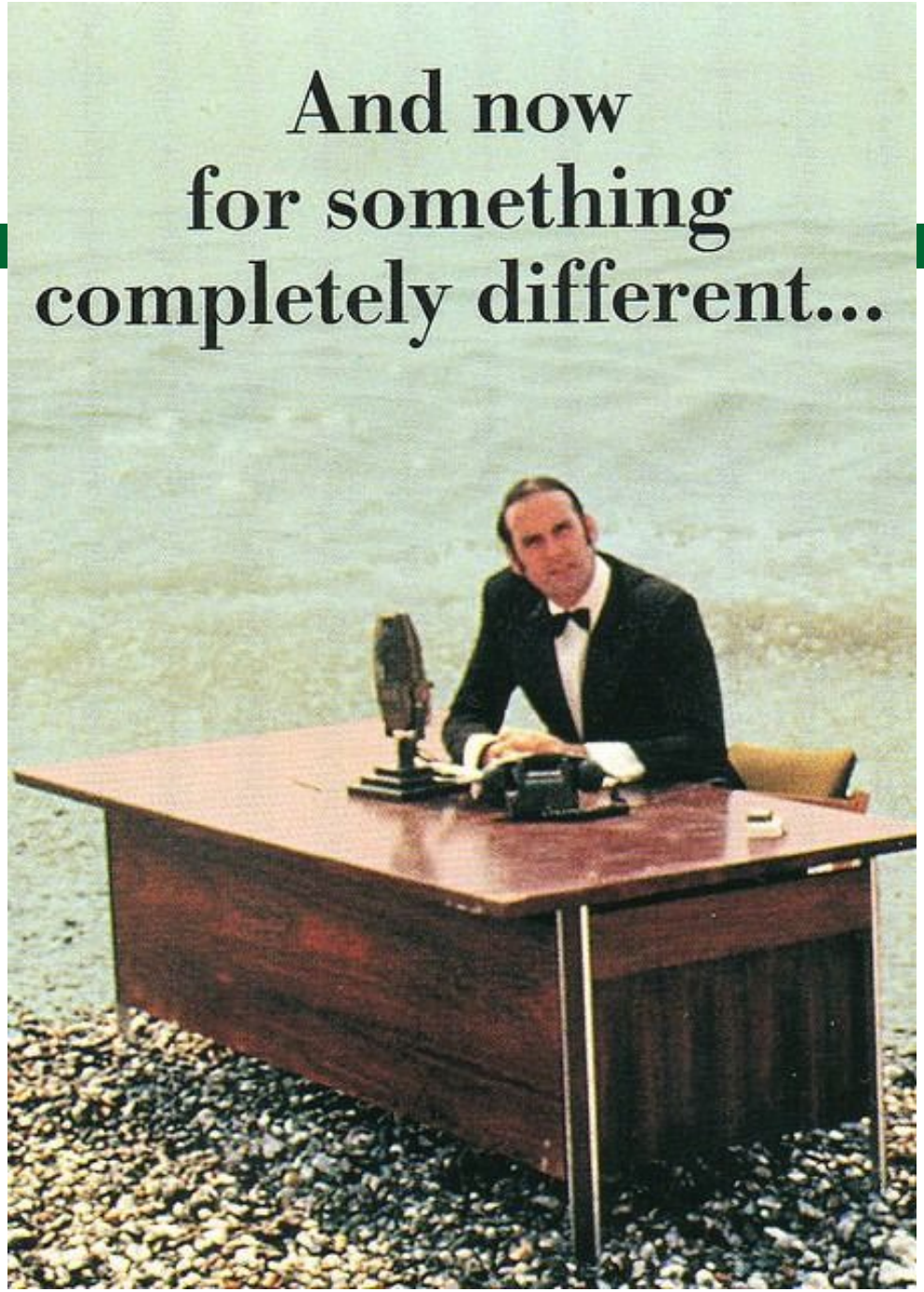
- POST applications at NW22
- 3-4 inch tall waterhemp
  - N=510
- POST alone or following a PRE
  - N = 332 or 178
- Glufosinate – 32 fl oz
- 2,4-D (Enlist One) – 32 fl oz
- Glufosinate + 2,4-D – 32 + 32 fl oz
- Dicamba (Engenia or Xtendimax) – 12.8 or 22 fl oz

Postemergence Only



Following PRE




And now
for something
completely different...

The silver bullet that wasn't: Rapid agronomic weed adaptations to glyphosate in North America

Christopher Landau[a,*], Kevin Bradley[b], Erin Burns[c], Michael Flessner[d], Karla Gage[e], Aaron Hager[f], Joseph Ikley[g], Prashant Jha[h], Amit Jhala[i], Paul O. Johnson[j], William Johnson[k], Sarah Lancaster[l], Travis Legleiter[m], Dwight Lingenfelter[n], Mark Loux[o], Eric Miller[p], Jason Norsworthy[q], Micheal Owen[h], Scott Nolte[r], Debalin Sarangi[s], Peter Sikkema[t], Christy Sprague[c], Mark VanGessel[u], Rodrigo Werle[v], Bryan Young[k] and Martin M. WilliamsII[a]

Abstract

The rapid adoption of glyphosate-resistant crops at the end of the 20th century caused a simplification of weed management that relied heavily on glyphosate for weed control. However, the effectiveness of glyphosate has diminished. A greater understanding of trends related to glyphosate use will shed new light on weed adaptation to a product that transformed global agriculture. Objectives were to (1) quantify the change in weed control efficacy from postemergence (POST) glyphosate use on troublesome weeds in corn and soybean and (2) determine the extent to which glyphosate preceded by a preemergence (PRE) improved the efficacy and consistency of weed control compared to glyphosate alone. Herbicide evaluation trials from 24 institutions across the United States of America and Canada from 1996 to 2021 were compiled into a single database. Two subsets were created; one with glyphosate applied POST, and the other with a PRE herbicide followed by glyphosate applied POST. Within each subset, mean and variance of control ratings for seven problem weed species were regressed over time for nine US states and one Canadian province. Mean control with POST glyphosate alone decreased over time while variability in control increased. Glyphosate preceded by a labeled PRE herbicide showed little change in mean control or variability in control over time. These results illustrate the rapid adaptation of agronomically important weed species to the paradigm-shifting product glyphosate. Including more diversity in weed management systems is essential to slowing weed adaptation and prolonging the usefulness of existing and future technologies.

The silver bullet that wasn't: Rapid agronomic weed adaptations to glyphosate in North America

Christopher Landau[a,*], Kevin Bradley[b], Erin Burns[c], Michael Flessner[d], Karla Gage[e], Aaron Hager[f], Joseph Ikley[g], Prashant Jha[h], Amit Jhala[i], Paul O. Johnson[j], William Johnson[k], Sarah Lancaster[l], Travis Legleiter[m], Dwight Lingenfelter[n], Mark Loux[o], Eric Miller[p], Jason Norsworthy[q], Micheal Owen[h], Scott Nolte[r], Debalin Sarangi[s], Peter Sikkema[t], Christy Sprague[c], Mark VanGessel[u], Rodrigo Werle[v], Bryan Young[k] and Martin M. WilliamsII[a]

- 24 Institutions
- 1996 to 2021
- Glyphosate ratings 14 to 28 DAT
  - 750 to 1200 g per ha (0.67 to 1.07 lb per A)
- Over 30,000 data points across 7 species

The silver bullet that wasn't: Rapid agronomic weed adaptations to glyphosate in North America

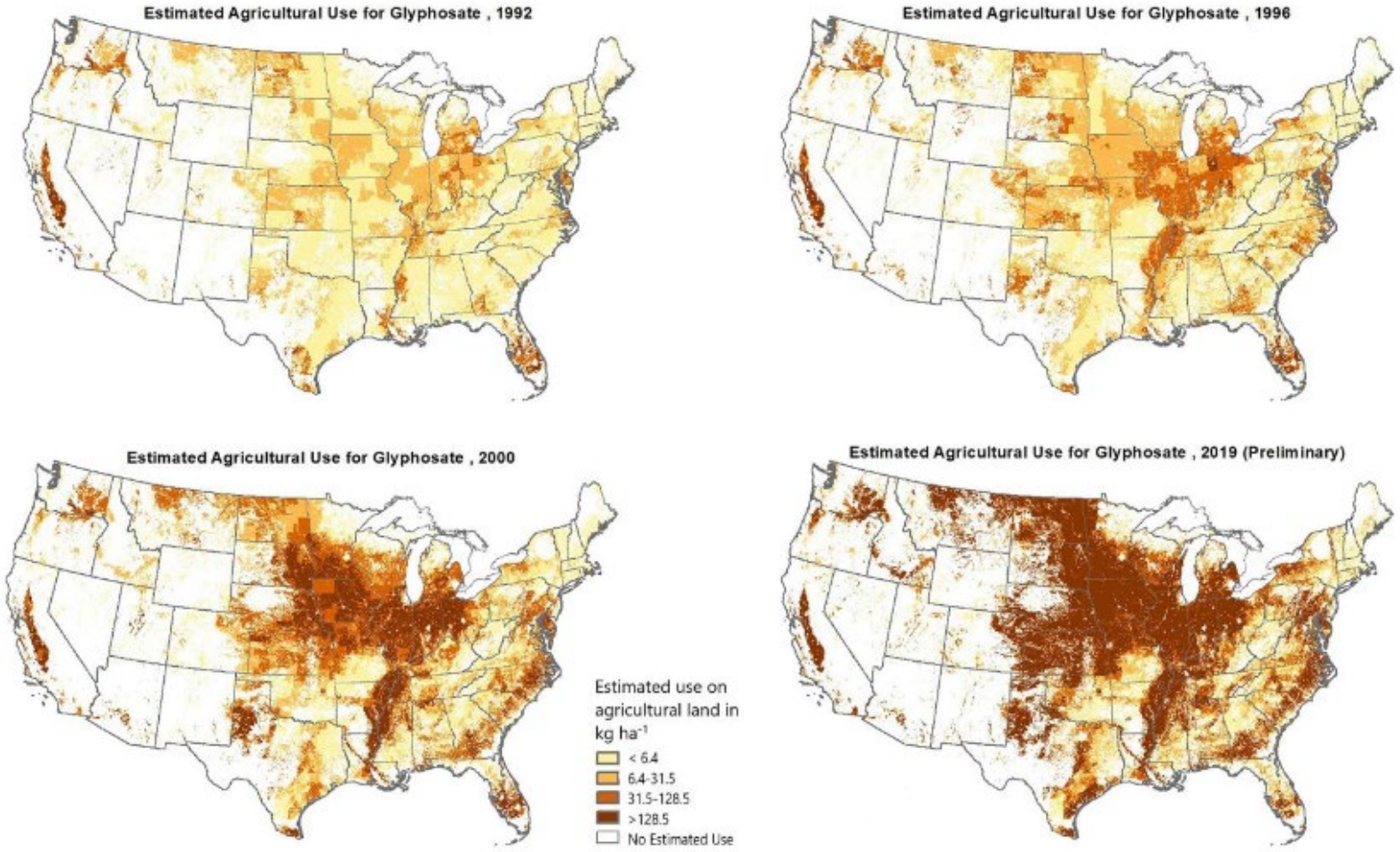


Fig. 1. Estimated glyphosate use in the United States of America from 1992 to 2019. Constructed from figures from USGS-NAWQA (6).

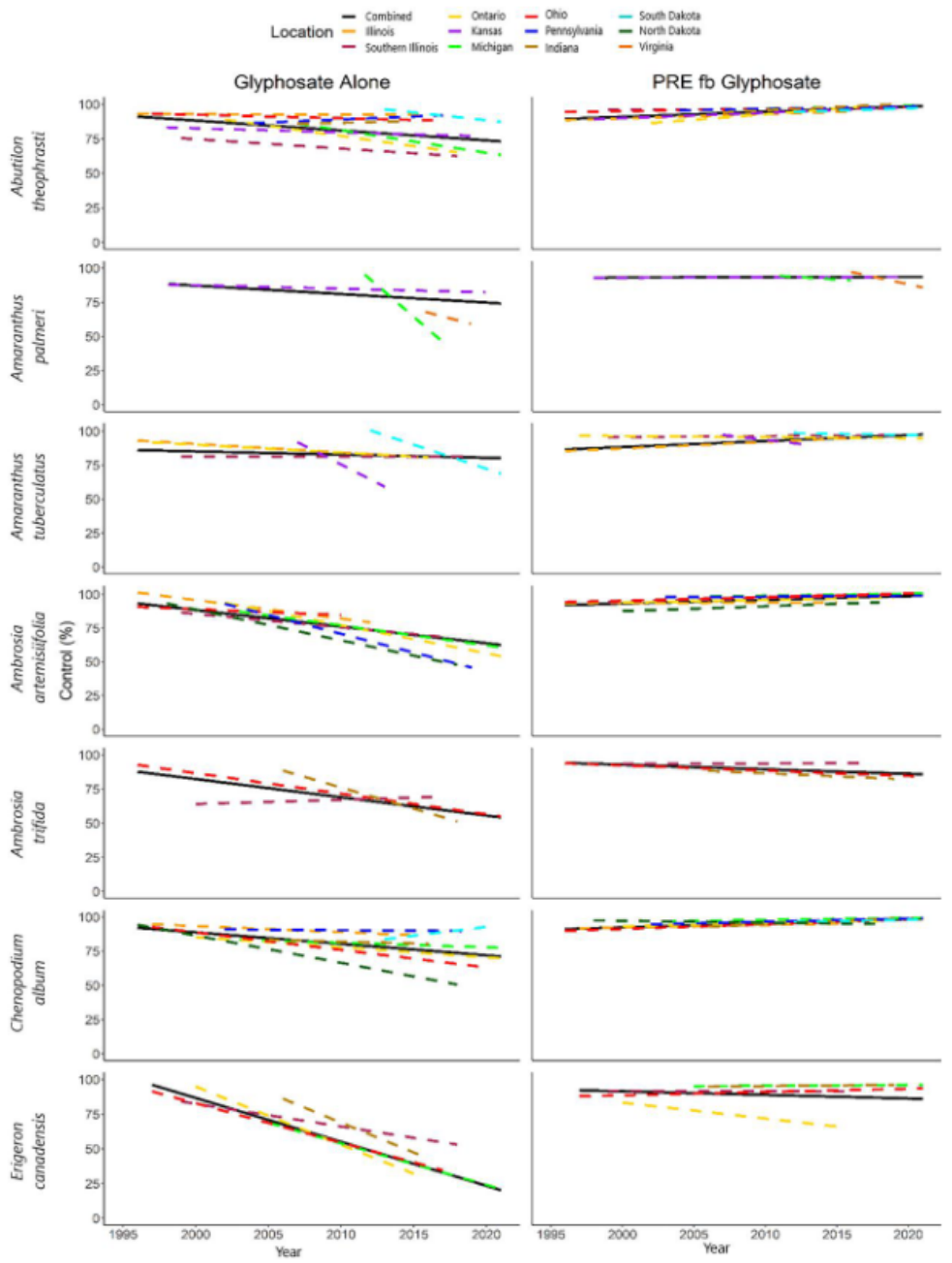
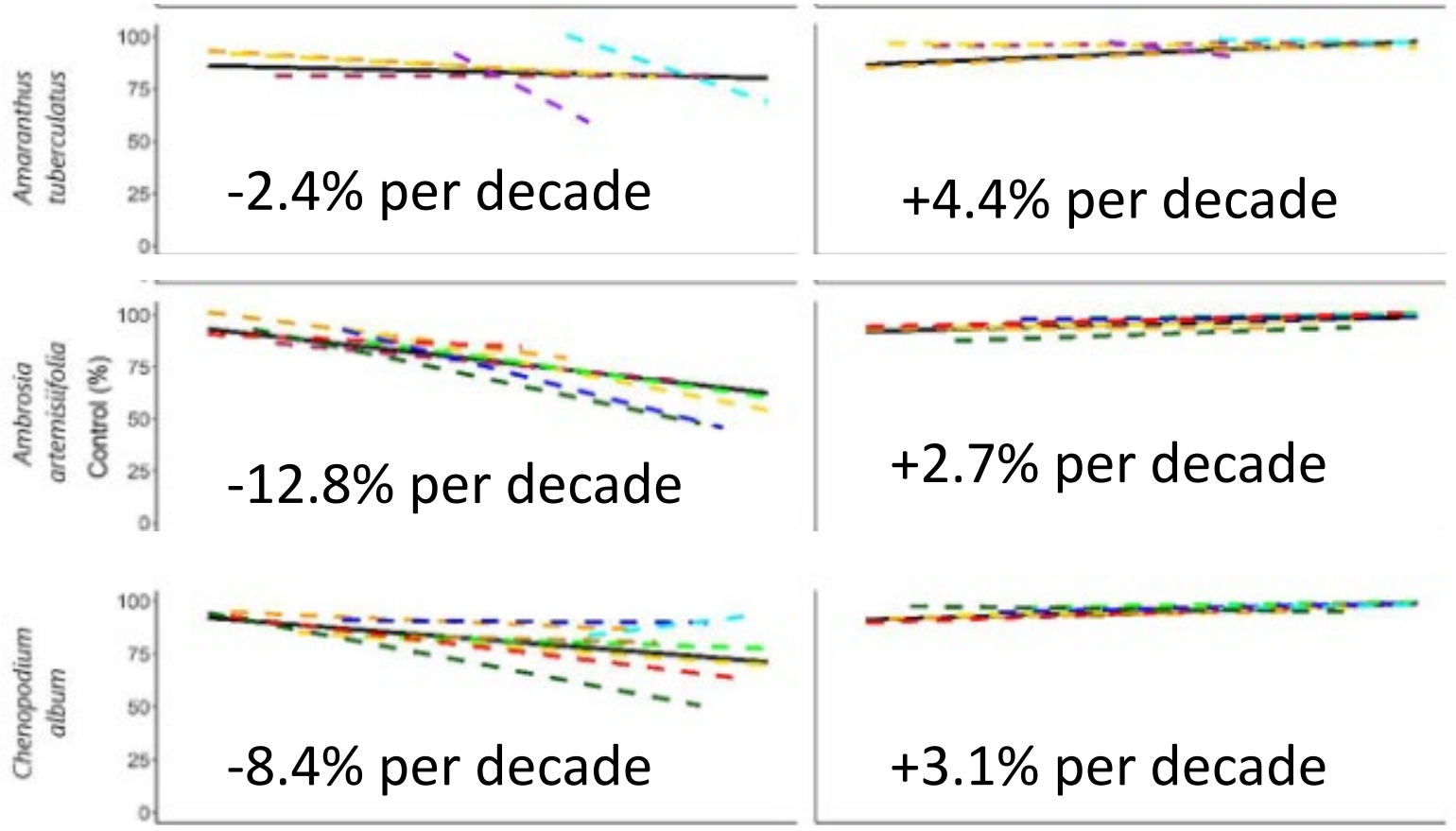


Fig. 2. Weighted regression models for percent weed control of seven weed species treated with POST glyphosate alone and POST glyphosate following a labeled PRE herbicide over time. Separate regression models were constructed for up to 11 sites. A combined weighted regression model was created for each weed species by combining data from all locations with 50 or more observations for a given weed species. gly, glyphosate; fb, followed by; PRE, preemergence.

Weed Control with Glyphosate (1996-2021)

No PRE

Following PRE



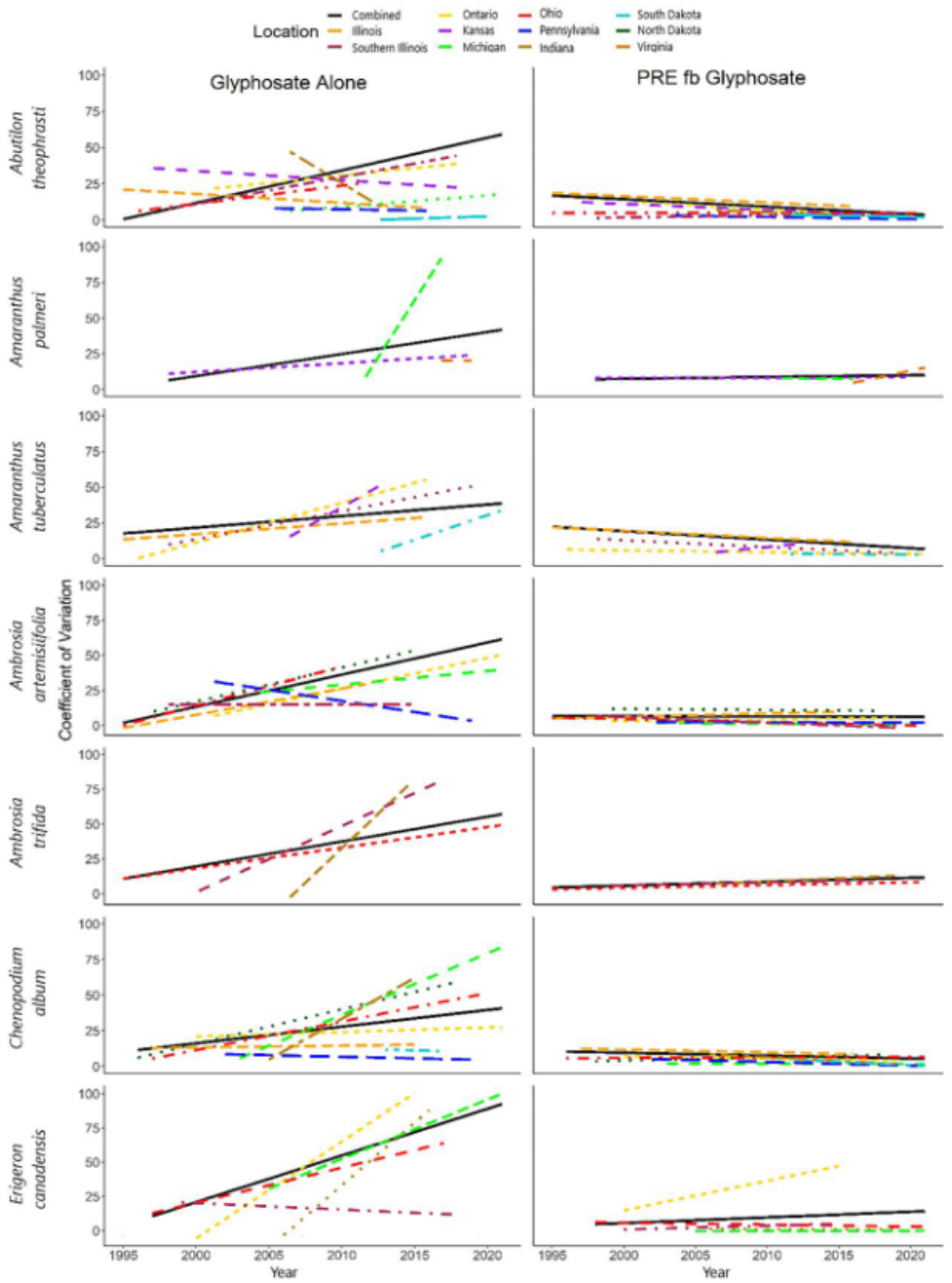
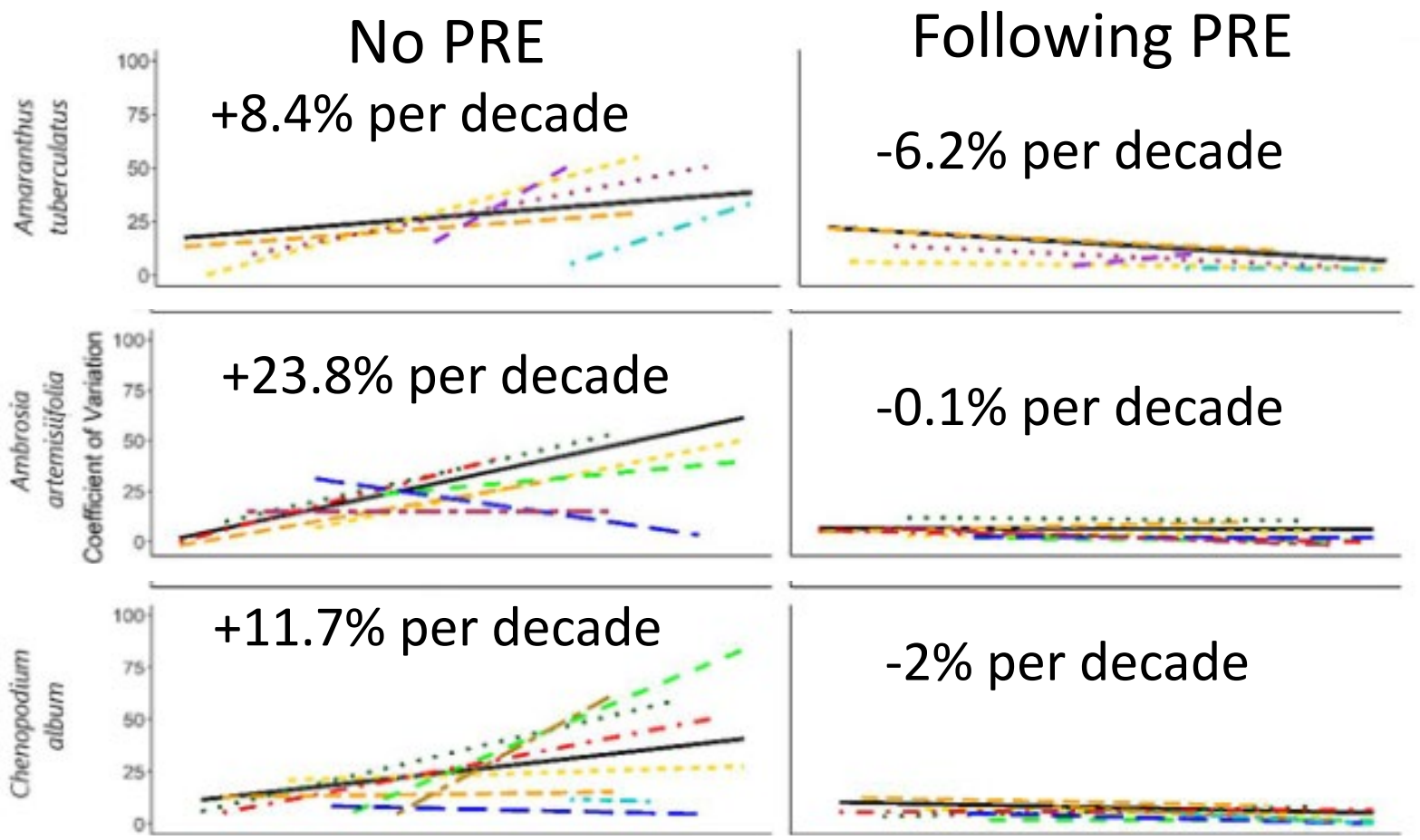


Fig. 3. Regression models for coefficients of variation (standard deviation of control within a given year/mean control in a given year * 100) of percent weed control of seven weed species treated with POST glyphosate alone and POST glyphosate following a labeled PRE herbicide over time. Separate regression models were constructed for up to 11 locations. A combined regression model was created for each weed species by combining data from all locations with 50 or more observations for a given weed species. gly, glyphosate; fb, followed by; PRE, preemergence.

Variability in Control with Glyphosate



War Against Weeds Podcast

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The Ohio State University Weed Science

MU Extension University of Missouri

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