Cotton Weed Management – Successes and Challenges Ahead

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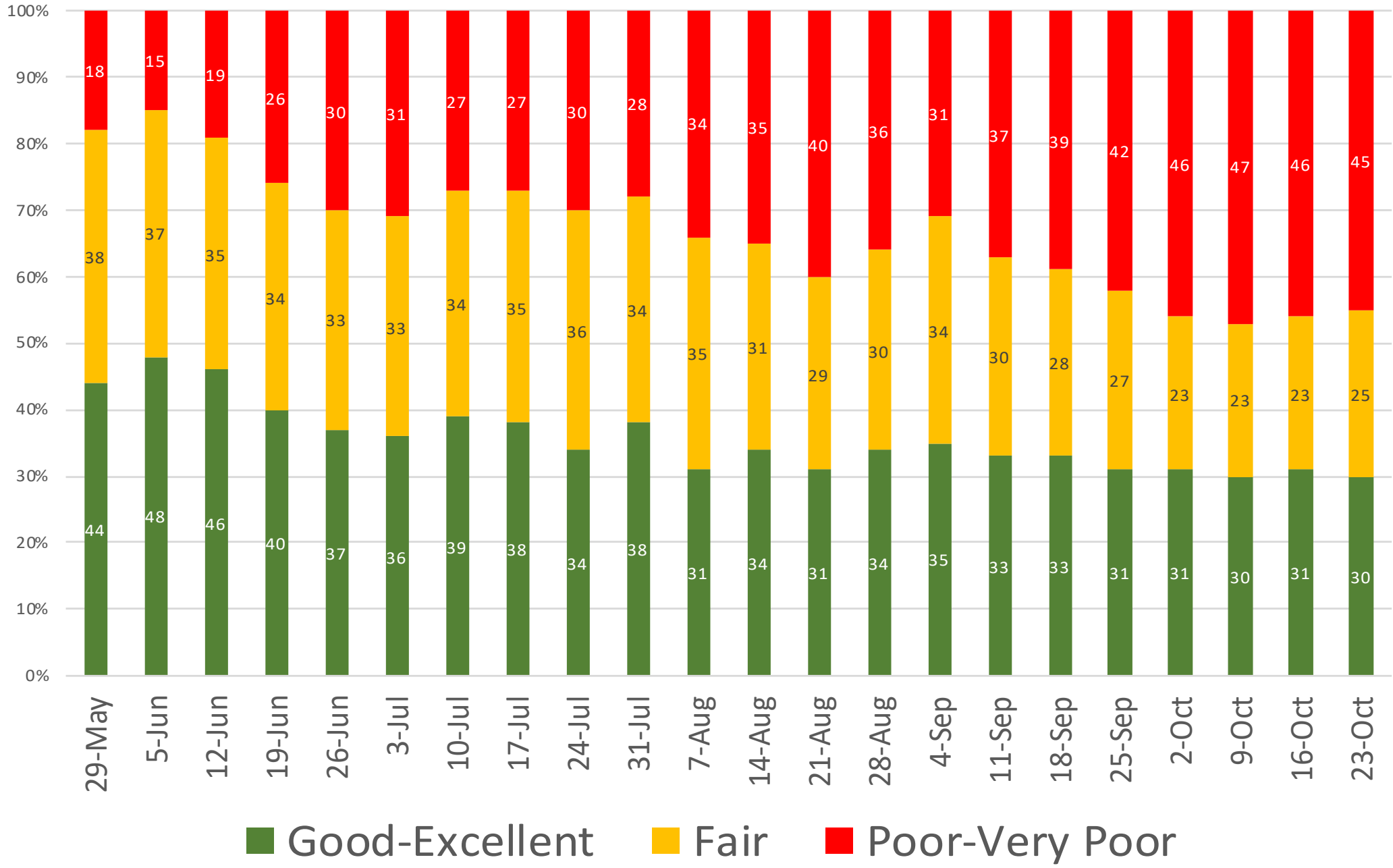
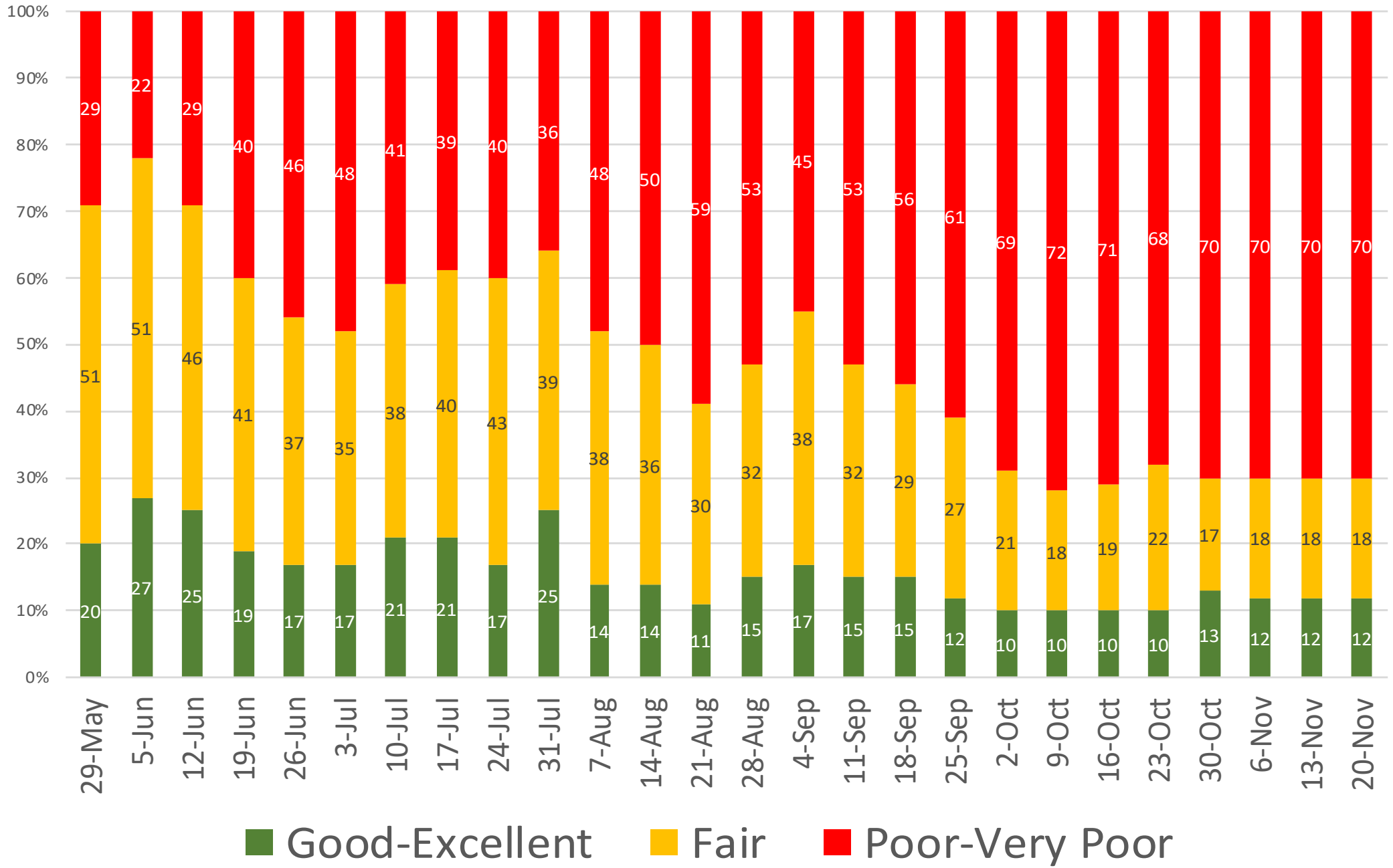
2022 U.S. Upland Cotton Crop Conditions



2022 Texas Cotton Crop Conditions



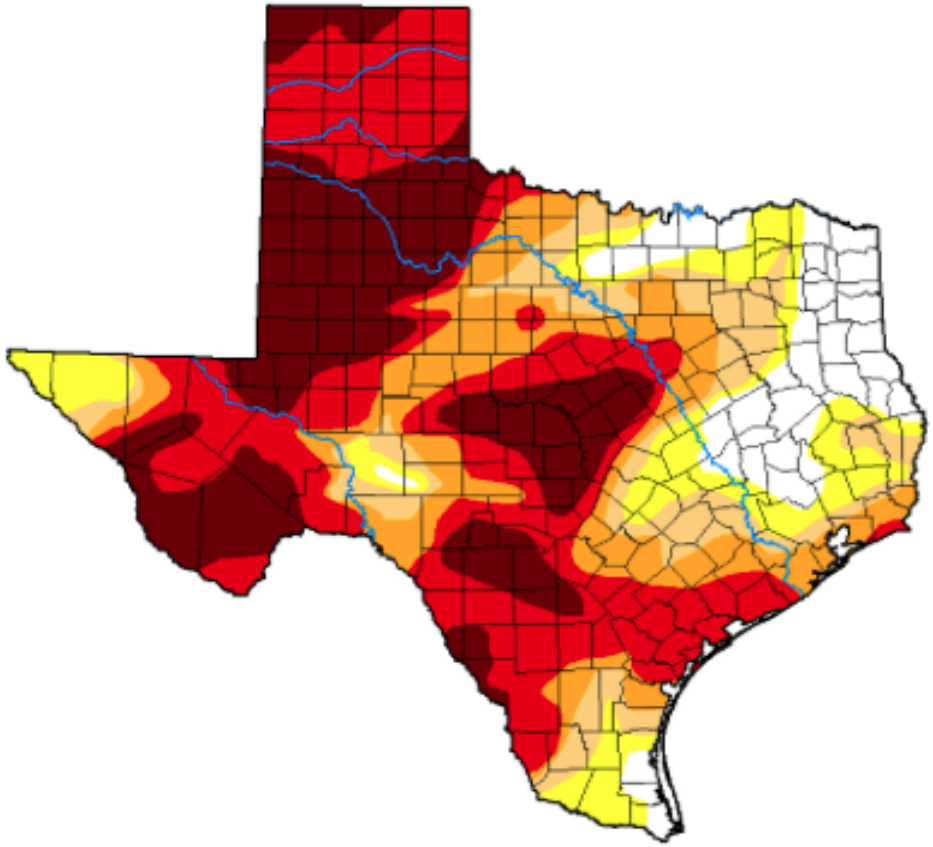
Estimated Upland Cotton Abandonment Rate from USDA "578" Crop Acreage Data

	2022*	2021	2020	2019	2018	AVG		2011 Benchmark
U.S.	27.96%	5.00%	19.87%	9.40%	15.69%	15.58%		26.92%
Texas	47.52%	7.92%	33.96%	16.91%	27.64%	26.79%		50.44%
Oklahoma	1.69%	0.97%	1.29%	2.94%	1.52%	1.68%		2.05%
Kansas	1.71%	5.27%	2.39%	7.58%	1.68%	3.73%		0.89%

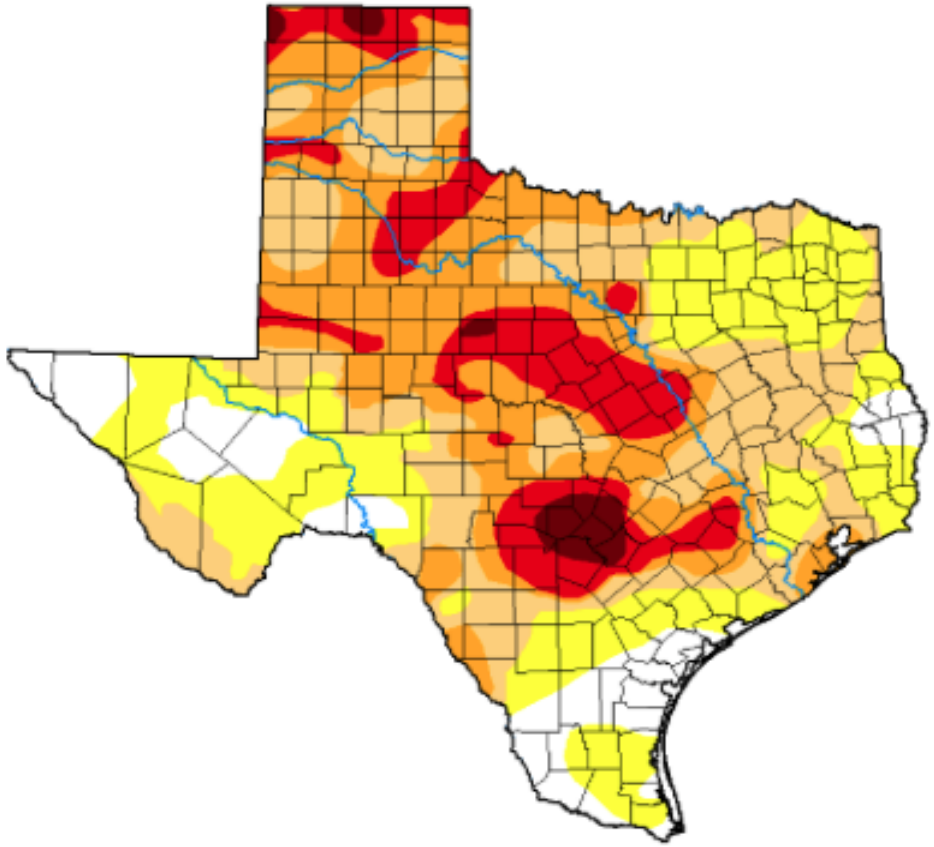
*Preliminary estimate based on November 1, 2022 USDA Crop Acreage Report. Final report will be released January 2023.

Drought Classification

None
D0 (Abnormally Dry)
D1 (Moderate Drought)
D2 (Severe Drought)
D3 (Extreme Drought)
D4 (Exceptional Drought)
No Data



May 10, 2022



November 15, 2022

Optimism?
Dedication?

"Traditional" Weed Management Challenges

Weed identification	Starting clean	Risk of preplant burndown to crop emergence	Effective incorporation of "yellows"	"Activation" of PREs	Coarse soil restrictions for PREs
Timely POST applications	Hardened-off / Stressed weeds	Thorough spray coverage	Control of perennial weeds	Controlling herbicide-resistant weeds	Need for multiple modes of action
"On-target" applications	Awareness of different crop germplasms	Do not allow "escaped" weeds to produce seeds	$$$ of weed management	Weather conditions – Too dry or too wet	Others

“Additional” Weed Management Challenges in 2023 and beyond

Herbicide availability & increased costs

Widespread development of HR weeds

Increased label restrictions

Herbicide Supplies in 2022

- In **2022**, planned for Liberty (glufosinate) and Roundup (glyphosate) supplies to be inadequate and RU pre-mixes to be in high demand
- Planned for limited clethodim supply, high demand for Gramoxone, and high demand for POST-applied residuals (*S*-metolachlor, Outlook, Warrant, Zidua)
- Dinitroaniline, "at-plant" herbicides, branded dicamba and 2,4-Ds, and flumioxazin should be readily available

Herbicide Supplies in 2023

- In **2023**, some concerns about Liberty (FiberMax and Stoneville cotton may have priority).
- Others concerns
  - Logistics - placement with retailers and requests for volume need to take place sooner the better.
  - Not specifically aware of any ai, inert, emulsifier, caps, jugs cardboard concerns, but…

Many Approaches

- Burndown with glyphosate and clethodim. PRE paraquat + Brake FX or Cotoran. EPOST dicamba + Dual Mag; glyphosate+glufosinate (2WAEP); Zidua applied via fertilizer (1-3WAEP); Layby hoods diuron + MSMA
- Preplant burndown: Glyphosate + 2,4-D + Valor in March. PRE: Paraquat + 2 of the following (Reflex, Direx, Cotoran, Warrant, Brake). POST 1 (18-21 DAP): Glyphosate + Liberty/Dicamba/2,4-D + Group 15. POST 2 (14 DA POST 1): Glyphosate + Liberty/Dicamba/2,4-D + Group 15. Layby: Glyphosate + Direx.
- Conventional tillage program - PRE/at-plant – Dual Magnum 1 pt/a + Reflex 1 pt/, Mid-POST 2-4" weeds – Tavium 56 oz/a + Roundup 32 oz/a, Layby/PD (as needed) – Direx 0.6 qt/a

- Start Clean
- Trifluralin PPI fb Caparol PRE
- Tavium + RUPM EPOST
- Engenia + Outlook + RUPM MPOST

Preplant Burndown

- ✓ Roundup
- ✓ 2,4-D
- ✓ “branded” dicamba
  - + Valor, FirstShot, Afforia, Leadoff
- ✓ Gramoxone, other paraquat formulations
- ✓ Aim
- ✓ ETX
- ✓ Reviton
- ✓ Arylex Active (group 4 ai’s)
  - Elevore (PP corn, soy)
  - Pixxaro (PP, POST small grains)

Preplant Incorporated

Nothing “new” about the dinitroaniline herbicides

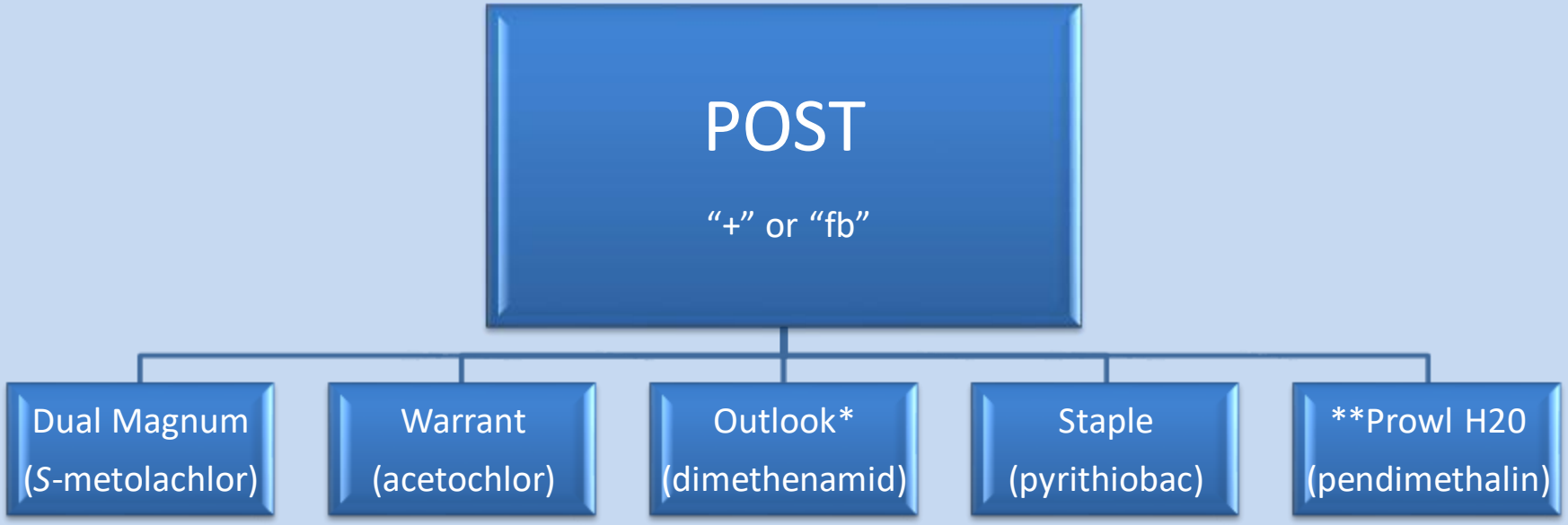
- ✓ Will provide 70 to 90% Palmer amaranth control
- ✓ Reduce selection pressure from POST herbicides

Preemergence

Caparol (prometryn)	Direx (diuron)	Cotoran (fluometuron)
Dual Magnum (*S*-metolachlor)	Warrant (acetochlor)	Prowl H20
Staple (pyrithiobac)	Reflex/Sinister (fomesafen)	Brake (fluridone)

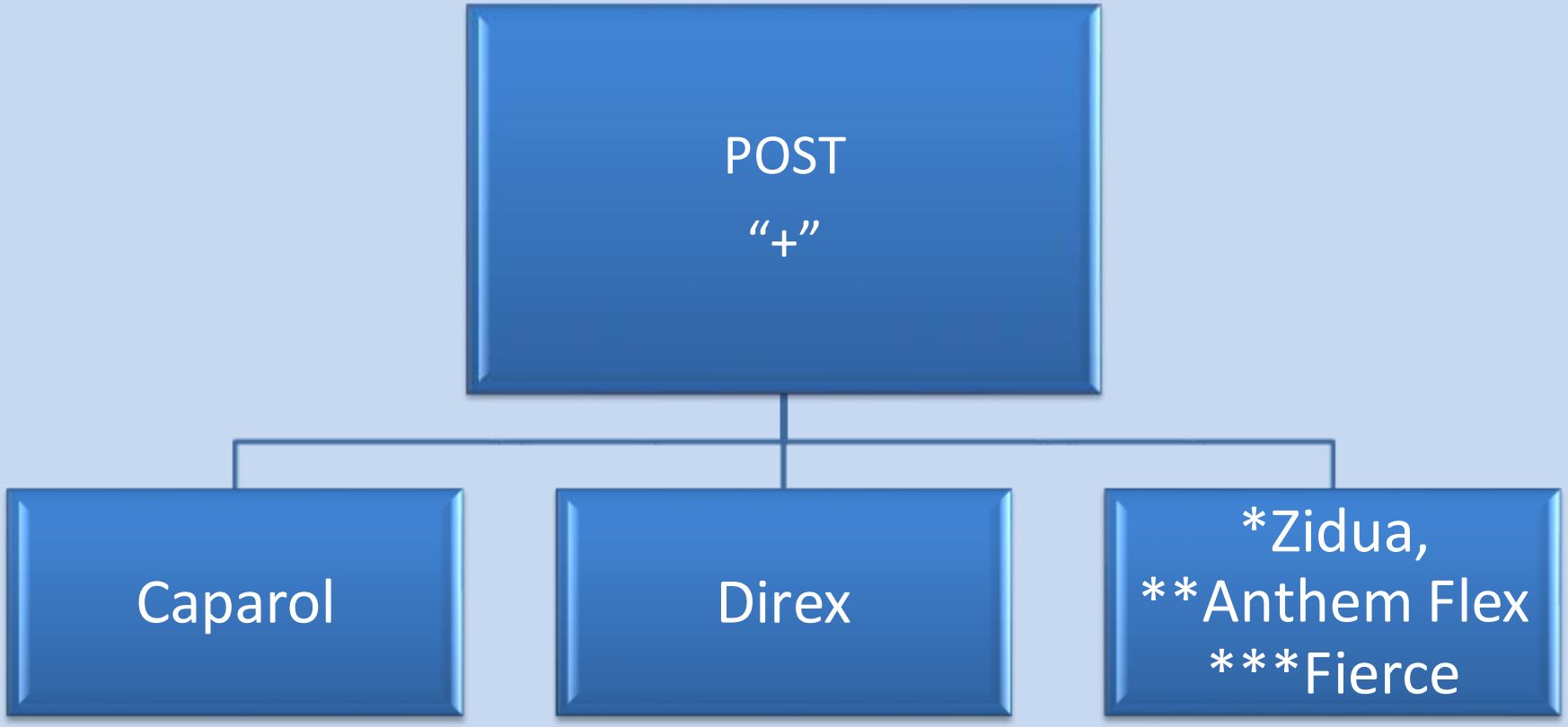
- ✓ Match weed pest with appropriate herbicide
- ✓ Check the label for soil texture restrictions, rates, rotational restrictions
- ✓ Need to be “activated”

Early-Postemergence and/or Mid-Postemergence



- ✓ Treat when weeds are small and active growing
- ✓ Residuals need to be "activated"
- ✓ Know the "plant-back" restrictions
- ✓ *1st true leaf to mid-bloom
- ✓ **may be used between the 4- and 8-leaf stage

Postemergence-Directed / Layby

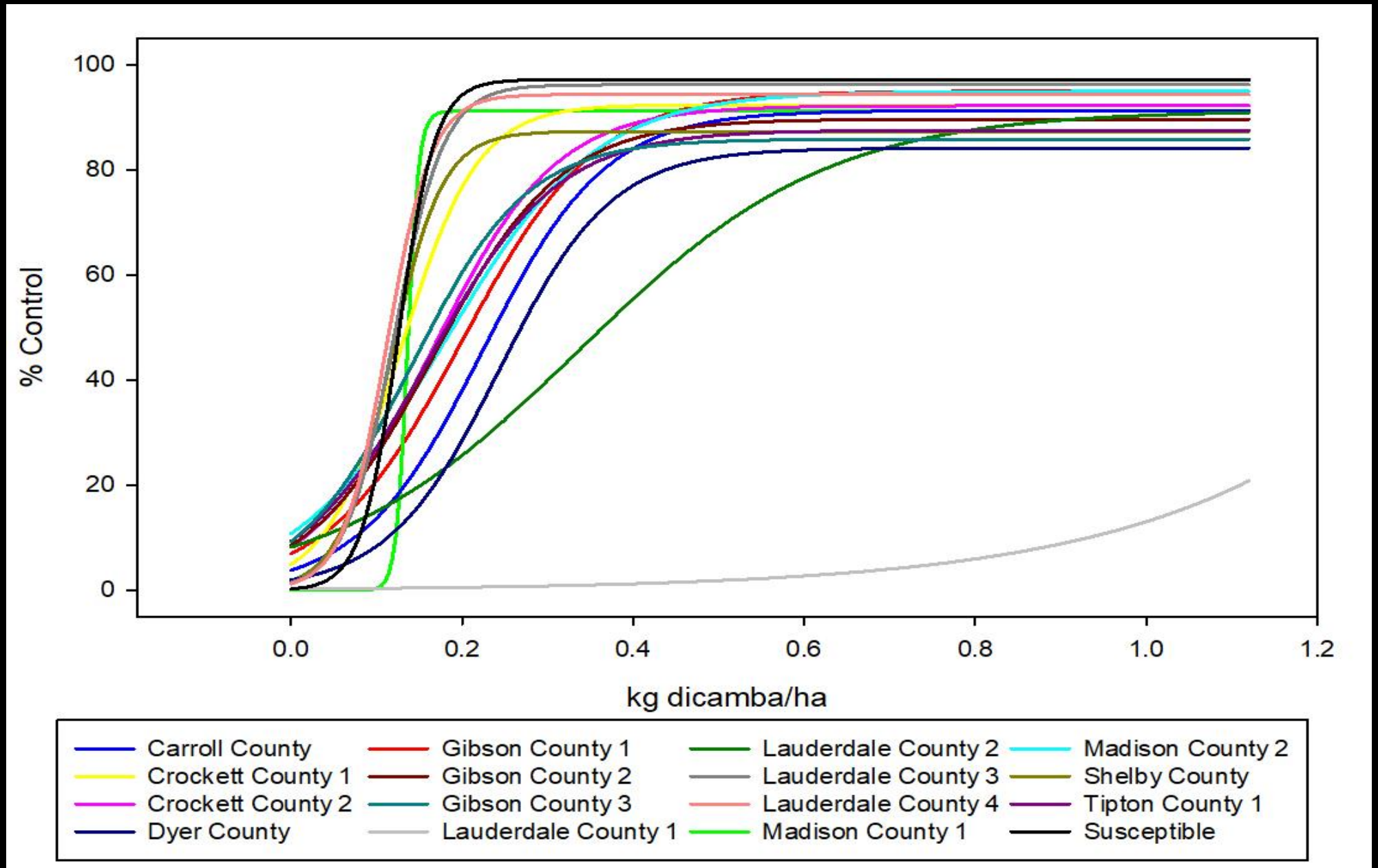


✓ Treat when weeds are small and actively growing
✓ Residuals need to be "activated"
*5-leaf to beginning bloom
** 6-inches to beginning of bloom
*** 6-inches, layby at 16-inches

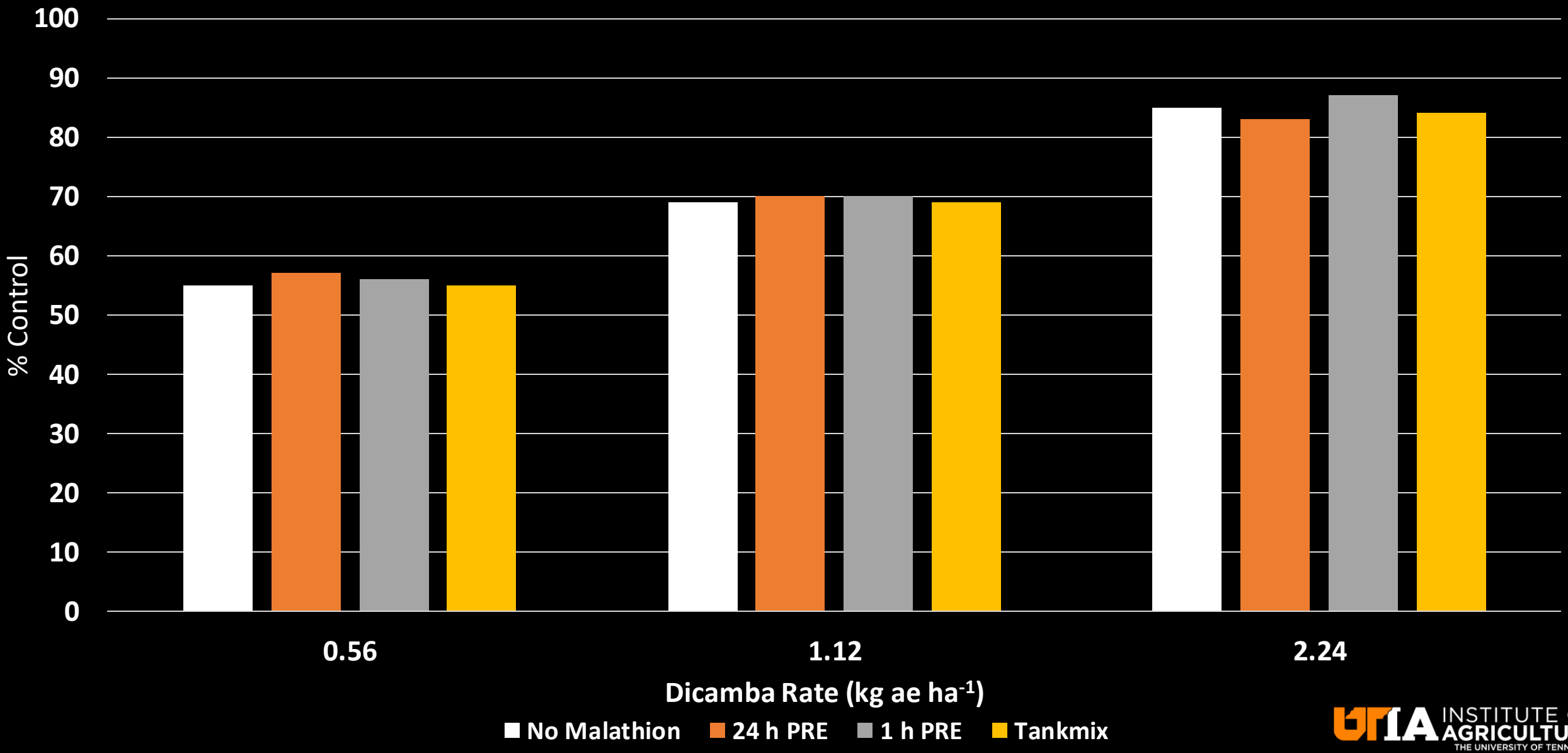
Herbicide-Resistant Weeds

- More GR weeds
  - New GR "mechanisms of resistance"
- More reports of PPO, Liberty, Group 15, and paraquat resistance,…
- More fields with Palmer amaranth escapes following dicamba and/or 2,4-D

% Palmer amaranth Control 21 DAT



% Palmer amaranth Control 28 DAT



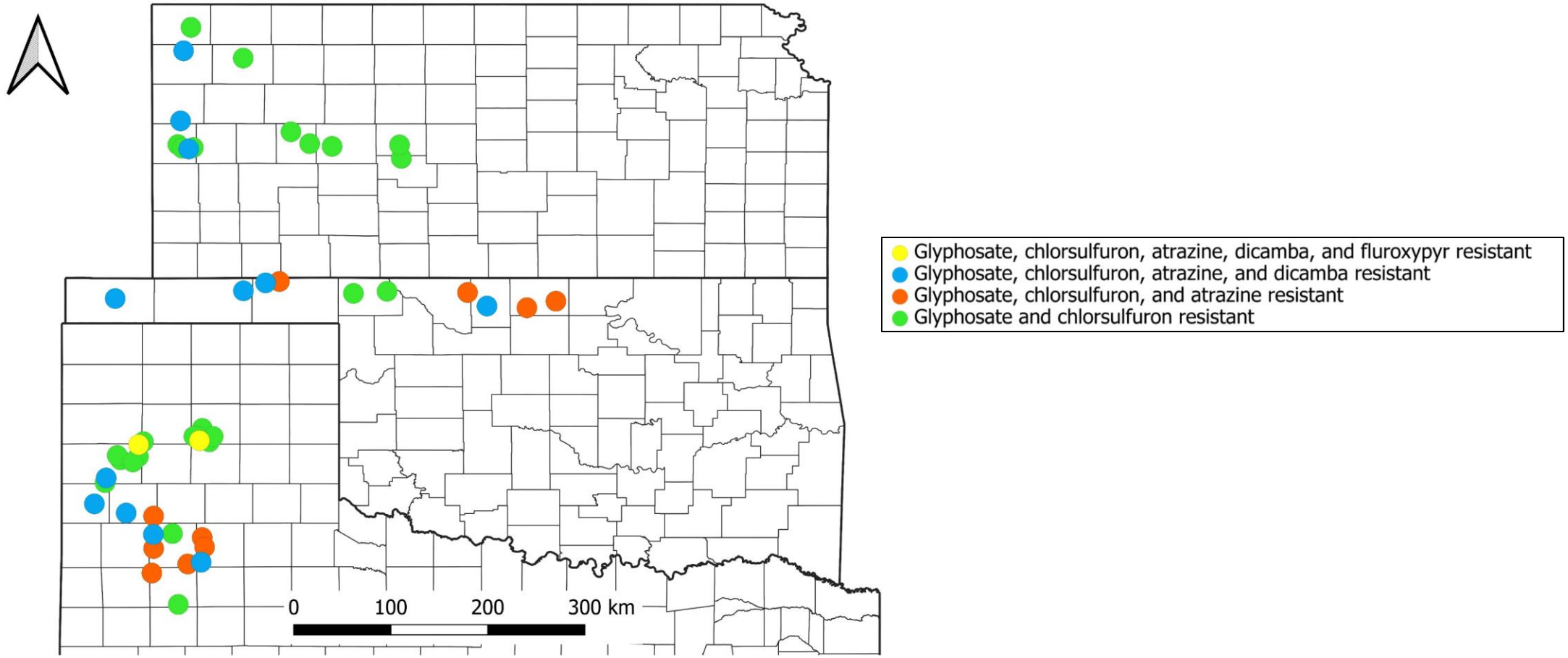
HERBICIDE RESISTANT WEEDS

NEWEST CONCERNS: KOCHIA (DICAMBA, GLYPHOSATE, 2,4-D), PALMER AMARANTH (DICAMBA, HPPDS)

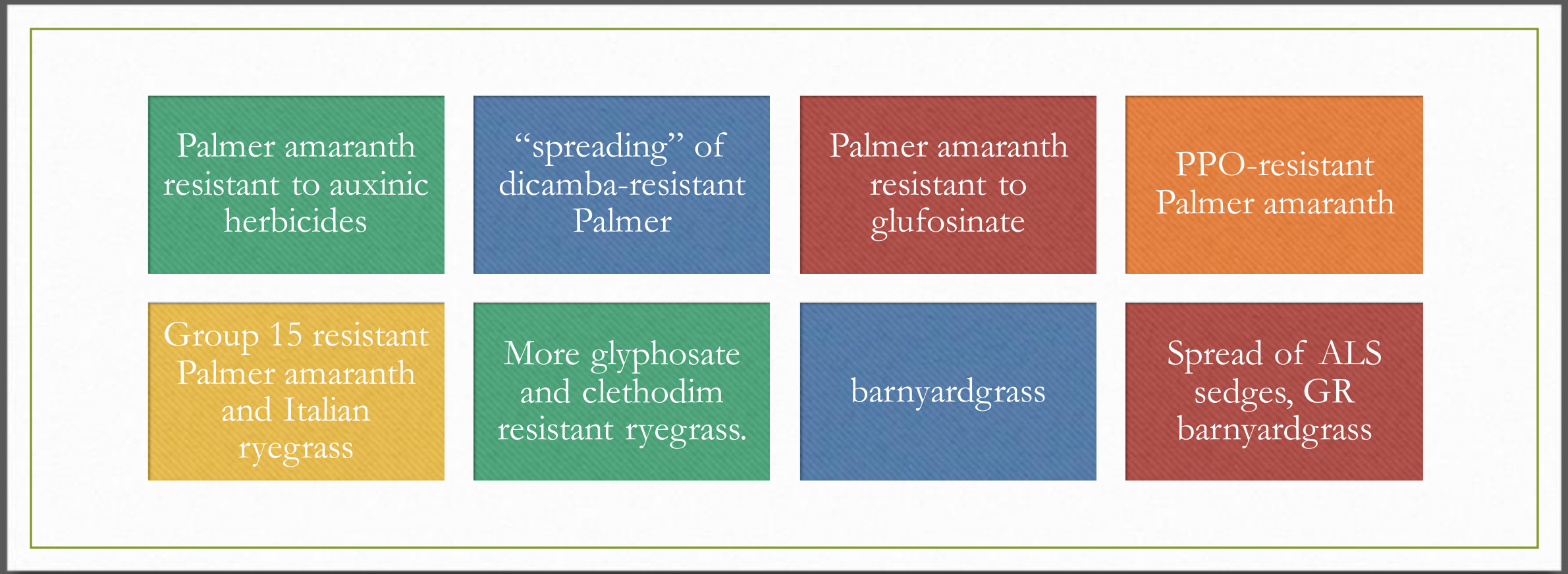
What are the Top 3 to 5 “Most Troublesome” Herbicide-Resistant Weeds in your state?

Palmer amaranth	Italian ryegrass	Junglerice	Goosegrass	Prickly sida
Spiderwort	Morningglory	Johnsongrass	Weedy rice	Common ragweed
Horseweed	Barnyardgrass	Waterhemp	Ragweed parthenium	kochia

Visual response of multiple herbicide-resistant kochia to glyphosate (a), chlorsulfuron (b), atrazine (c), dicamba (d), and fluroxypyr (e) at 21 DAT

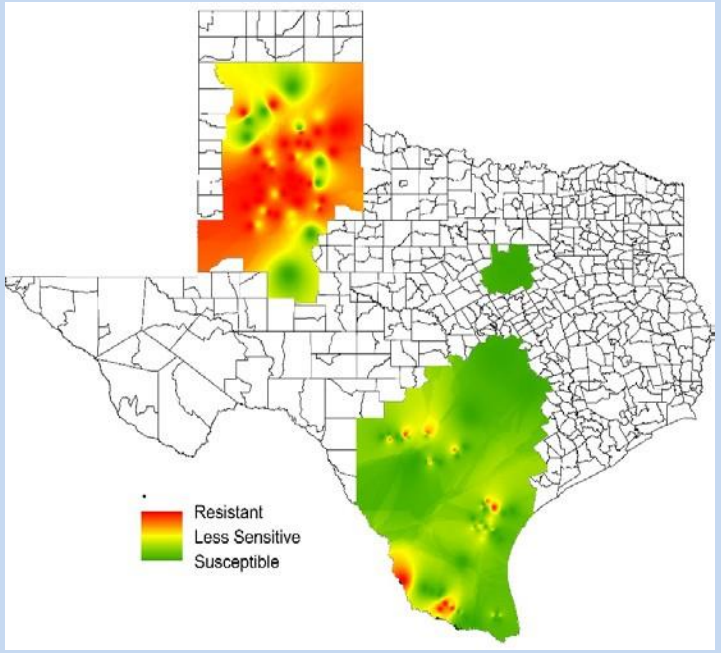


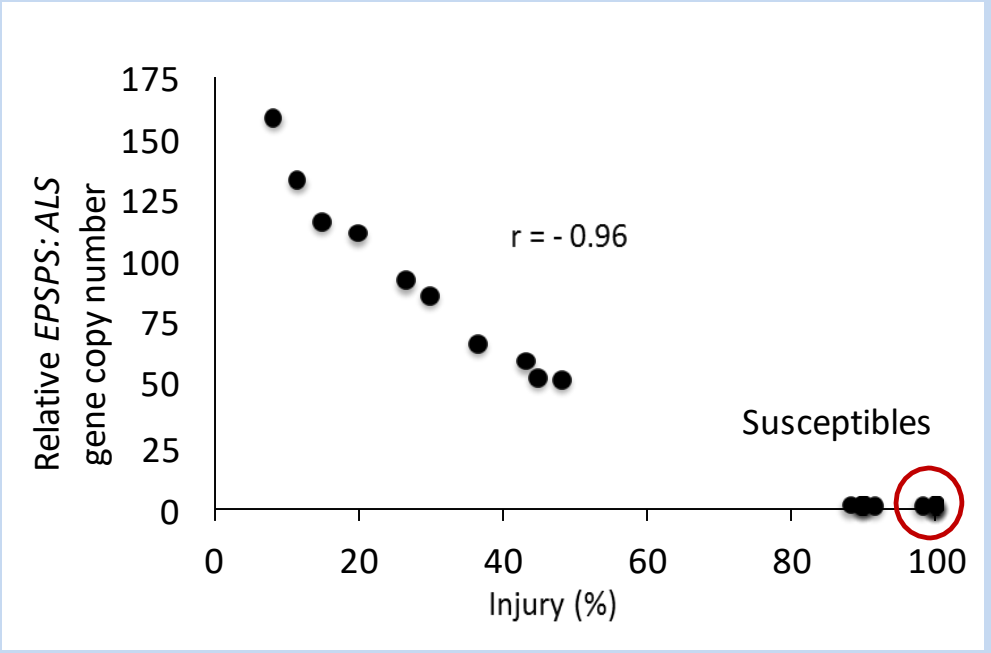
Distribution of multiple herbicide-resistant kochia populations in KS, OK, and TX



What is the "Next" Herbicide-Resistant Weed Concern in your state?

Glyphosate resistance in Palmer amaranth in Texas





Garetson, Singh et al. (2017)

Label Changes for 2023

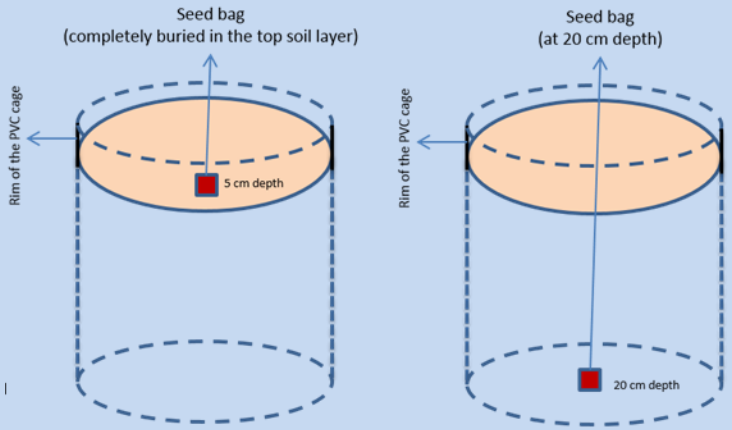
- EPA released a summary of dicamba-related incident reports for 2021
  - > 1 million acres of non-DT soybean were allegedly damaged by off-target movement of dicamba
  - Other crops and non-agricultural plants and trees
  - Believe numbers "understate" incidences
- "Some" additional label restrictions for branded dicamba are coming, but when?
  - 24(a) and 24(c)
- New Enlist Duo and Enlist One labels – some changes
- What is the future status of Diuron? Cotoran? Gramoxone? Atrazine? Glyphosate? Others?

Late-season Seed Production in Palmer Amaranth (2014-2016)

- In the HP
  - 20,000 early Aug
  - 2,000 early Sep
  - 100's early Oct
  - 1's early Nov

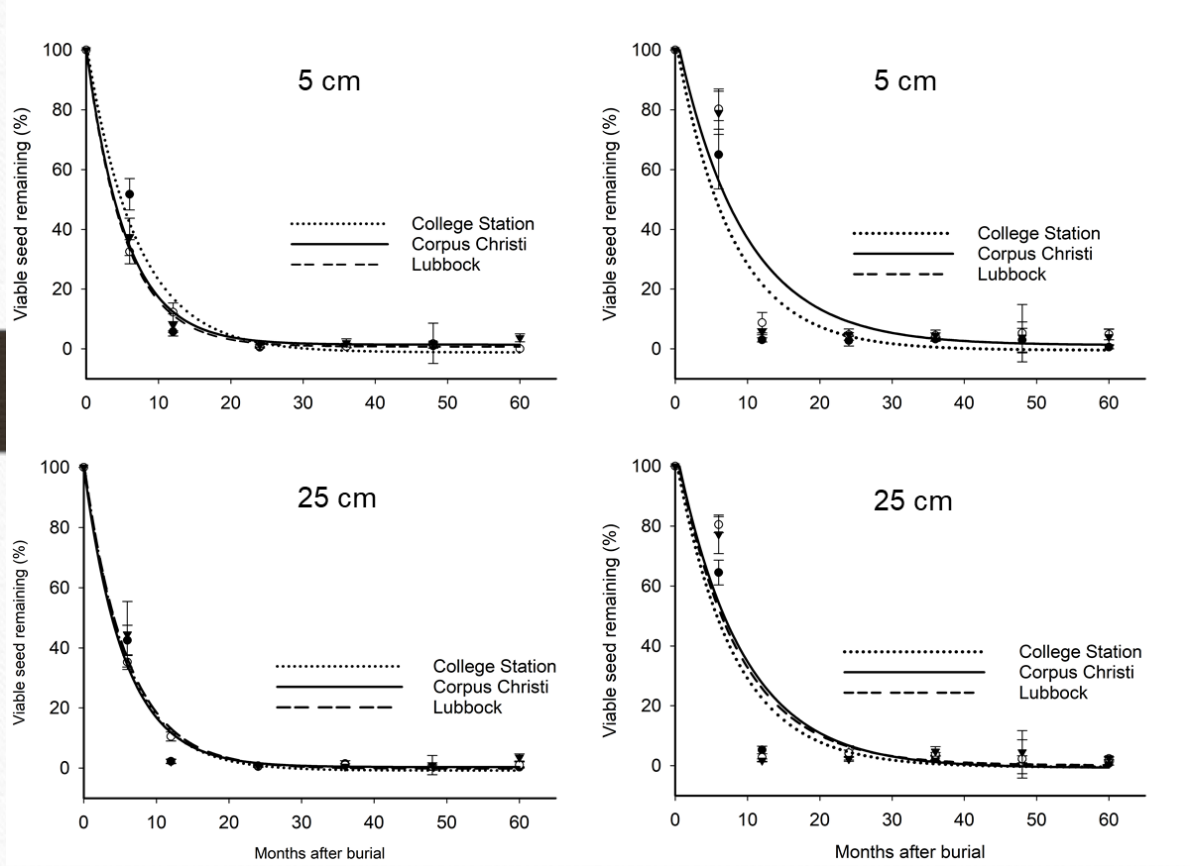
Seedbank longevity of Palmer amaranth and Common Waterhemp

- 3 locations: Lubbock, College Station, Corpus Christi
- 5-year study
- 200 seed were placed in nylon micromesh bags
- Buried: Mar 31, 2016
- 2 depths: 2- and 8-inches
- 2 weeds: PA, WH
- Retrieval times (months):
  - 06 (Sep 30, 2016)
  - 12 (Mar 31, 2017)
  - 24 (Mar 31, 2018)
  - 36 (Mar 31, 2019)*
  - 48 (Mar 31, 2020)*
  - 60 (Mar 31, 2021)*



Palmer amaranth

Waterhemp



Depth (cm)	Species	Retrieval time (months)	Viable seed (%)		
			College Station	Corpus Christi	Lubbock
5	Palmer amaranth	60	0.3	1.0	3.5
25	Palmer amaranth	60	0	0	1.3
5	Waterhemp	60	0.7	2.4	2.5
25	Waterhemp	60	0.6	4.9	4.0