Giant ragweed response to tillage and management

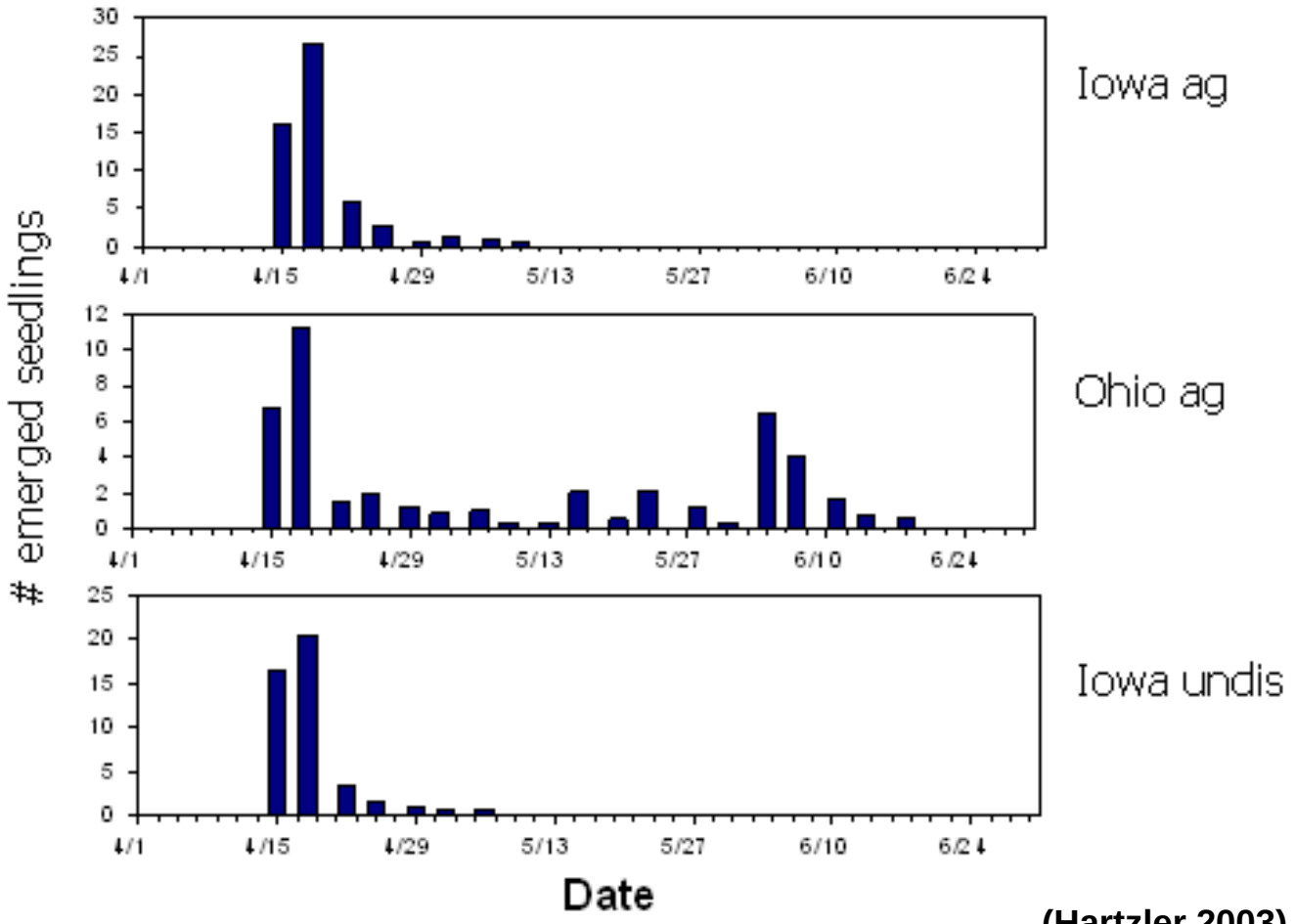
M. R. Jeschke and D. E. Stoltenberg
Department of Agronomy
University of Wisconsin-Madison

Weediness of Giant Ragweed

- Germinates and emerges over a wide range of soil temps and moisture
- Rapid growth rate
- Very competitive with crop species
- Extended period of germination

Giant Ragweed Emergence Patterns

Figure 3. Emergence patterns of three giant ragweed biotypes.



(Hartzler 2003)

Research

- Conducted from 1998-2004 at UW Arlington ARS
- **Objective:** Determine weed population dynamics in glyphosate-resistant corn and soybean systems as influenced by
  - primary tillage system
  - crop rotation
  - glyphosate use intensity

Tillage and Crop Rotation

- Primary tillage systems
  - Moldboard Plow (MP)
  - Chisel Plow (CP)
  - No Tillage (NT)
- Crop rotation
  - Continuous Corn (CC)
  - Corn-Soybean Rotation (CS)

Weed Management

- **Glyphosate POST:** **GLY**
- **Glyphosate POST and LPOST:** **GLY + GLY**
- **Glyphosate POST + inter-row cultivation**
  - in corn only: **GLY + CULT**
- **Glyphosate POST rotated annually with a non-glyphosate herbicide program:** **GLY // NON-GLY**
- **Non-glyphosate grass herbicide PRE + glyphosate POST:** **NON-GLY PRE + GLY**
- **Non-glyphosate herbicide program:** **NON-GLY**

Giant Ragweed Population Dynamics

- Plant densities were very low from 1998-2000
- By 2001, giant ragweed was the dominant weed species in some treatments
- By 2004, giant ragweed populations occurred in most treatments
- High plant densities were associated with high seedbank densities

Results: Primary Tillage

- Chisel plow system was associated with much greater giant ragweed densities than moldboard plow or no-tillage
  - Attributed to a greater proportion of giant ragweed seeds at optimal soil depths for germination, emergence, and seedling growth in chisel plow

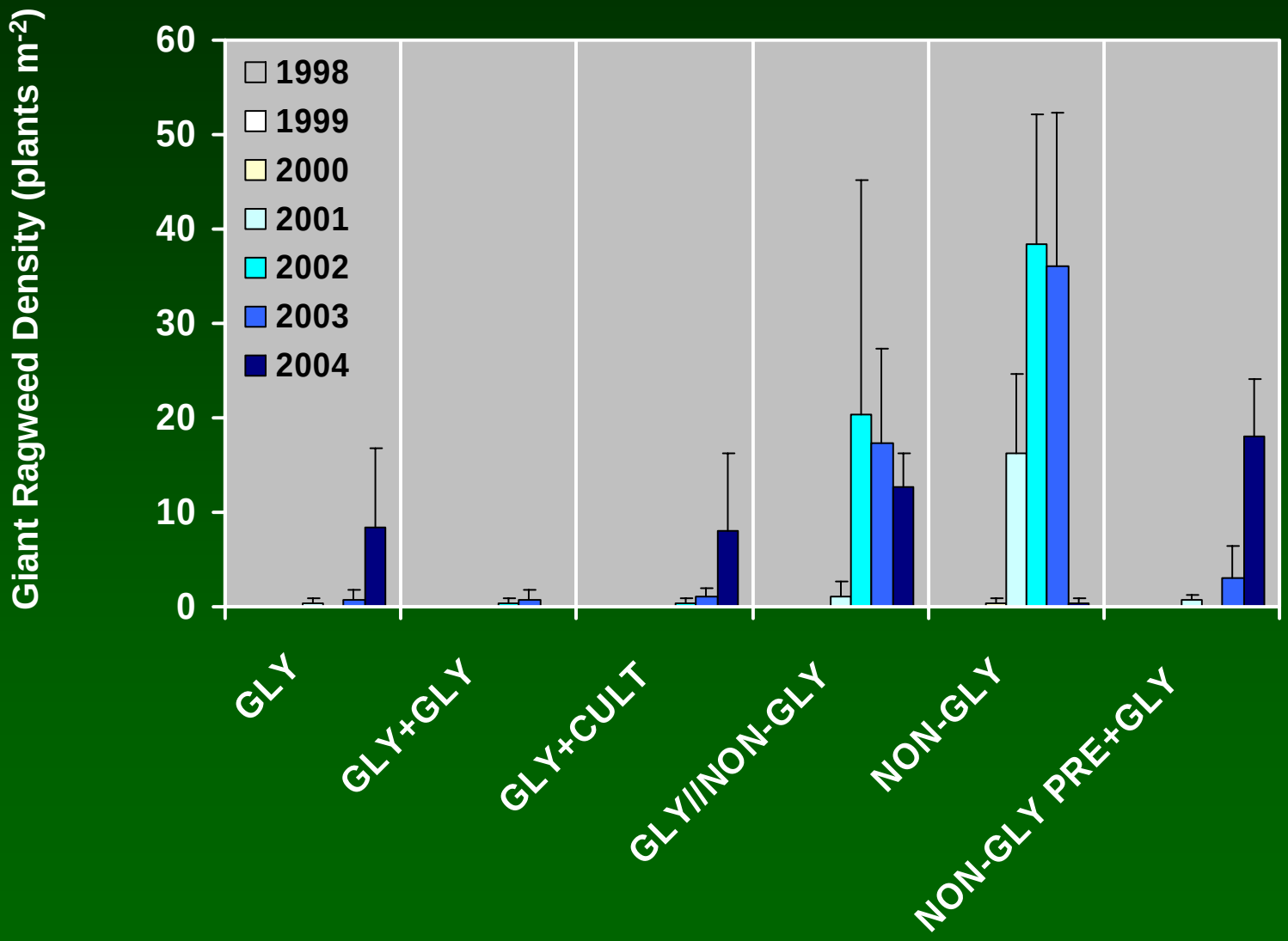
Results: Crop Rotation

- Continuous corn system was associated with greater giant ragweed densities than corn-soybean rotation
  - Likely due to greater early season competition in narrow-row soybean

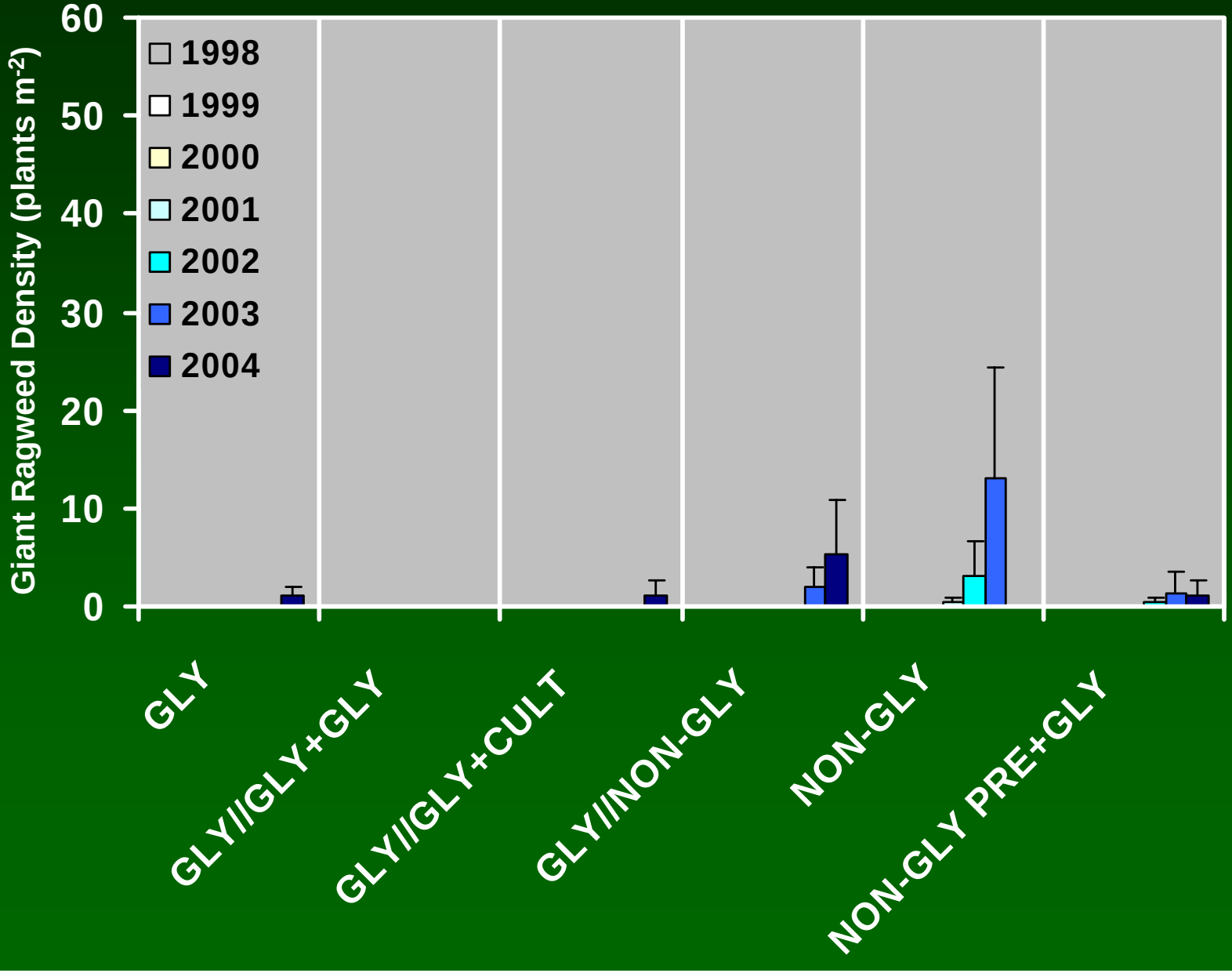
Results: Weed Management

- Giant ragweed densities were consistently low in glyphosate POST/LPOST treatment across tillage and rotation systems
- Giant ragweed became dominant in non-glyphosate treatments within 3 years
- Densities gradually increased over the last 3 years in glyphosate POST treatments

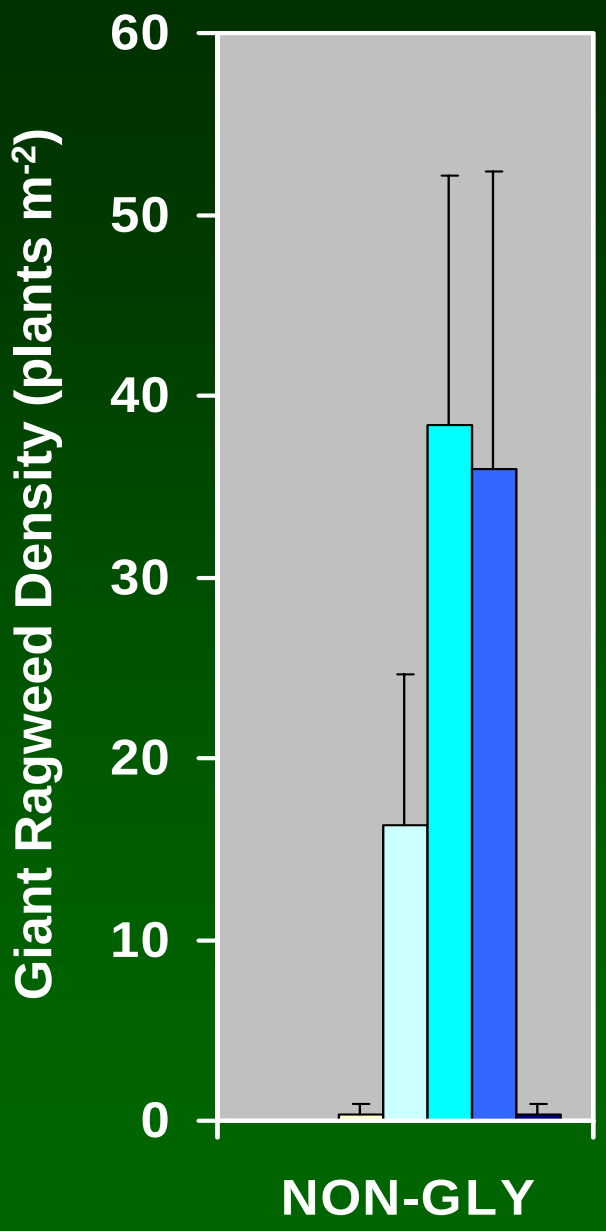
CC-CP Giant Ragweed Late-Season Density



CS-CP Giant Ragweed Late-Season Density



Continuous Corn



1998
1999
2000
2001
2002
2003
2004

Atrazine 1.0 lb/A +
Dual II Magnum 1.25 lb/A +
Python WDG 0.025 lb/A PRE

Accent Gold WDG 2.43 oz/A +
Atrazine 0.5 lb/A POST

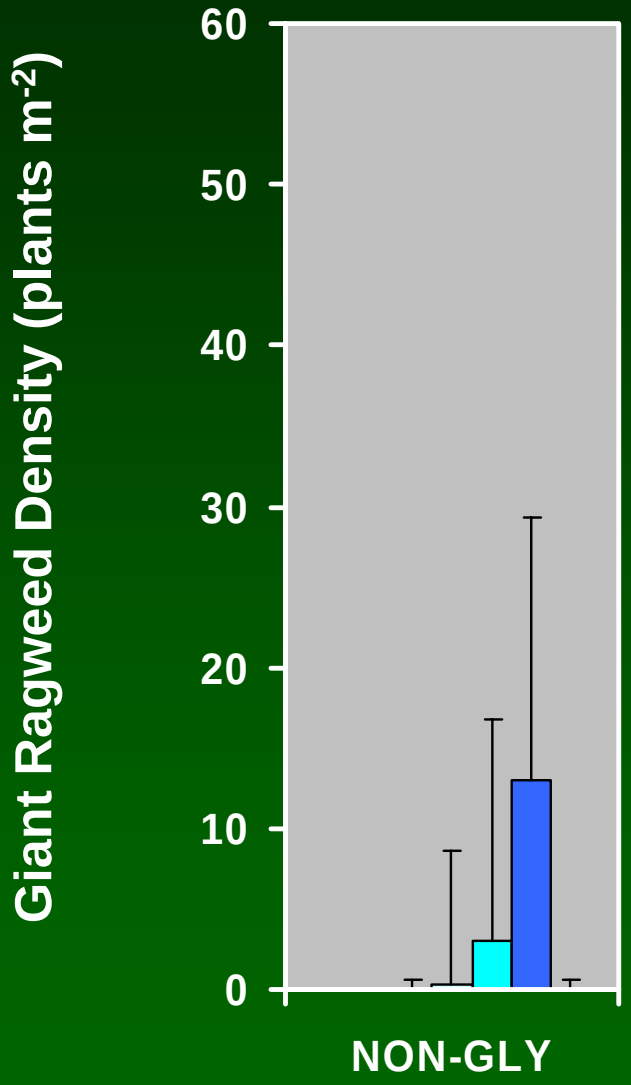
Accent Gold WDG 2.43 oz/A
Atrazine 0.5 lb/A POST

Accent 0.503 oz/A +
Distinct 2.8 oz/A LPOST

Lumax 2.96 lb/A PRE

Accent 0.503 oz/A +
Distinct 2.8 oz/A POST

Corn-Soybean Rotation



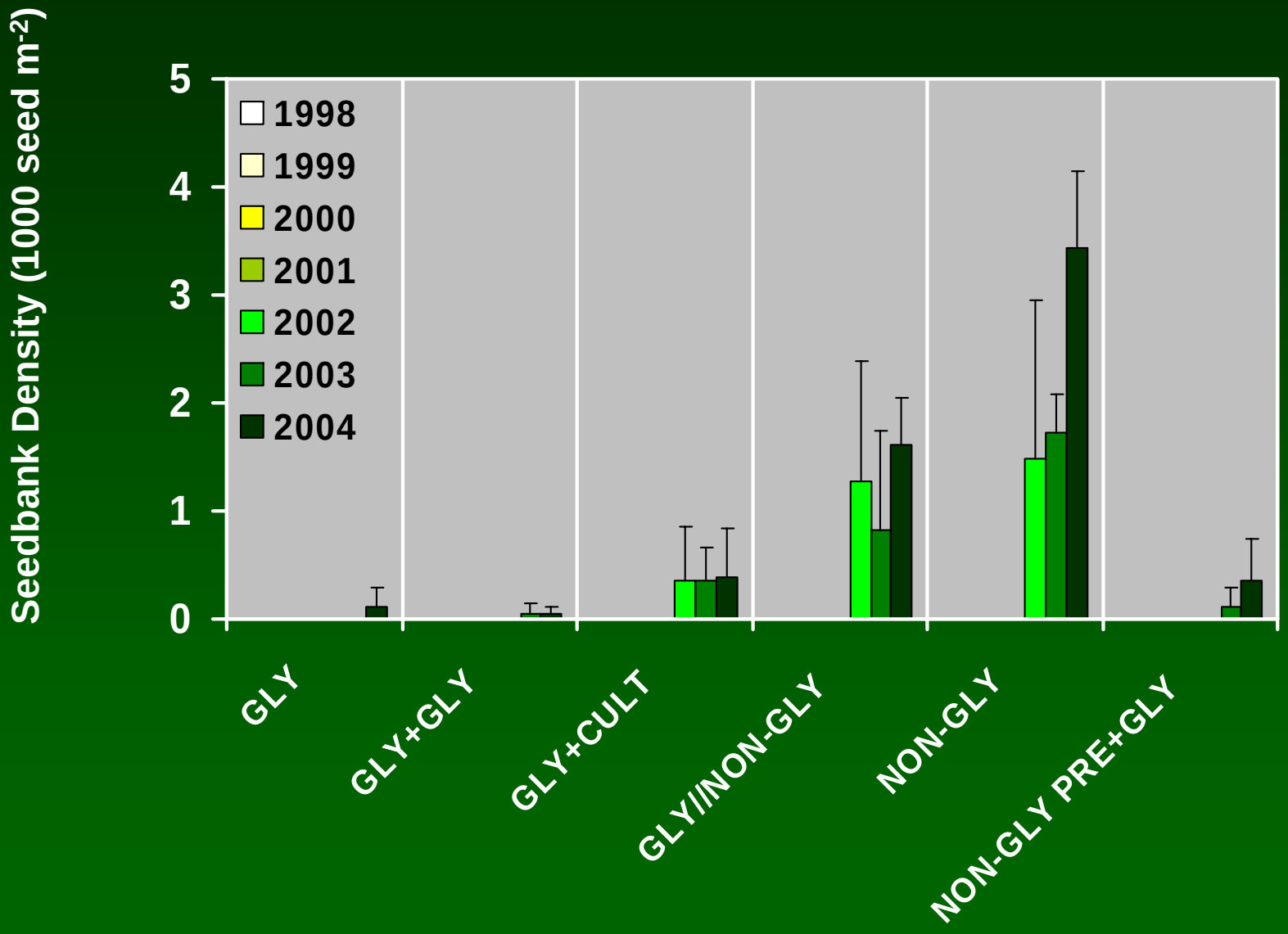
1998 — Dual II Magnum 1.27 lb/A + Python WDG 0.06 lb/A PRE

2000

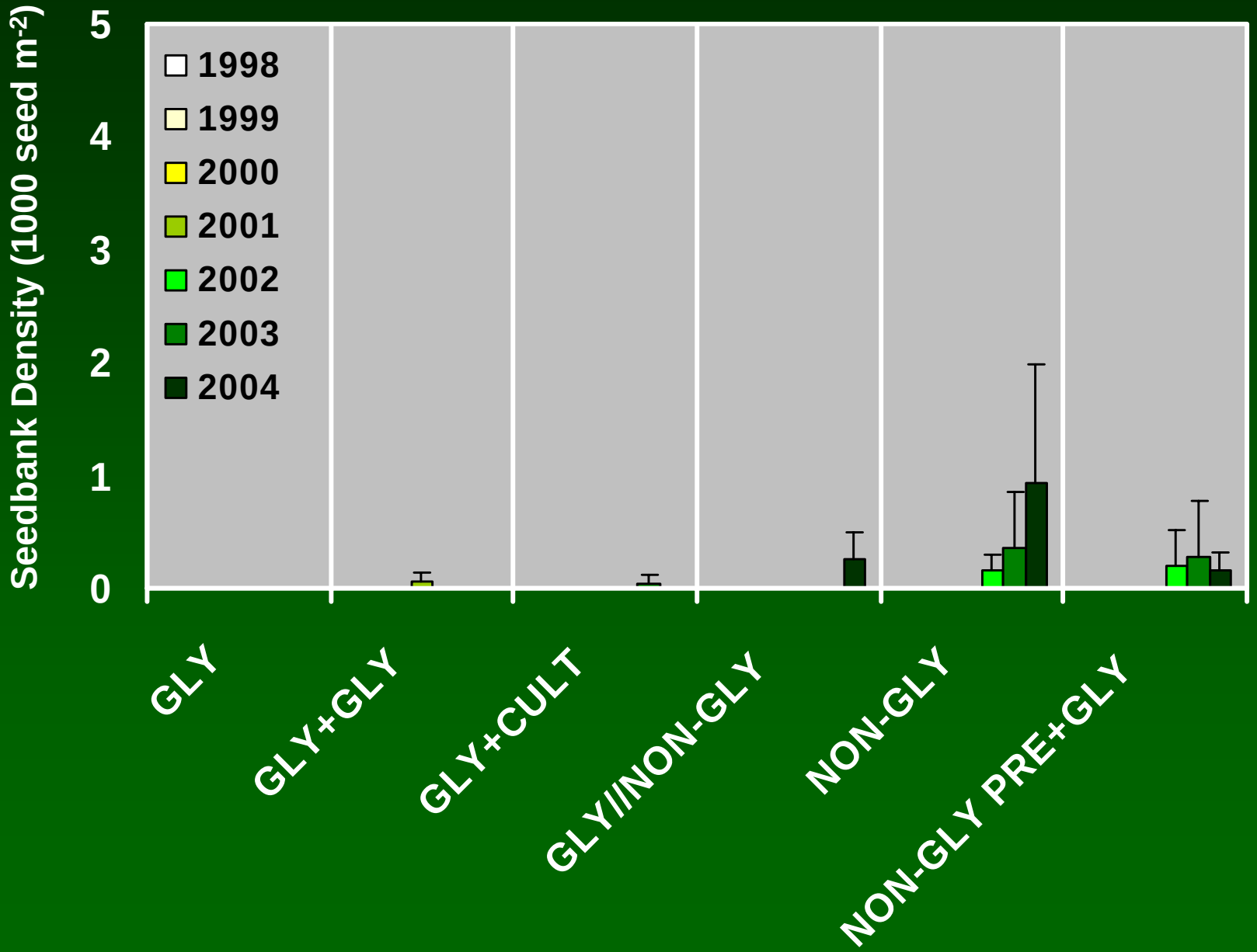
2002 — FirstRate 0.63 oz/A + Authority 3.0 oz/A PRE; Poast Plus 0.1875 lb/A POST

2004 — FirstRate 0.63 oz/A + Authority 3.0 oz/A PRE; FirstRate 0.25 oz/A + Poast Plus 0.1875 lb/A POST

CC-CP Giant Ragweed Seedbank Density



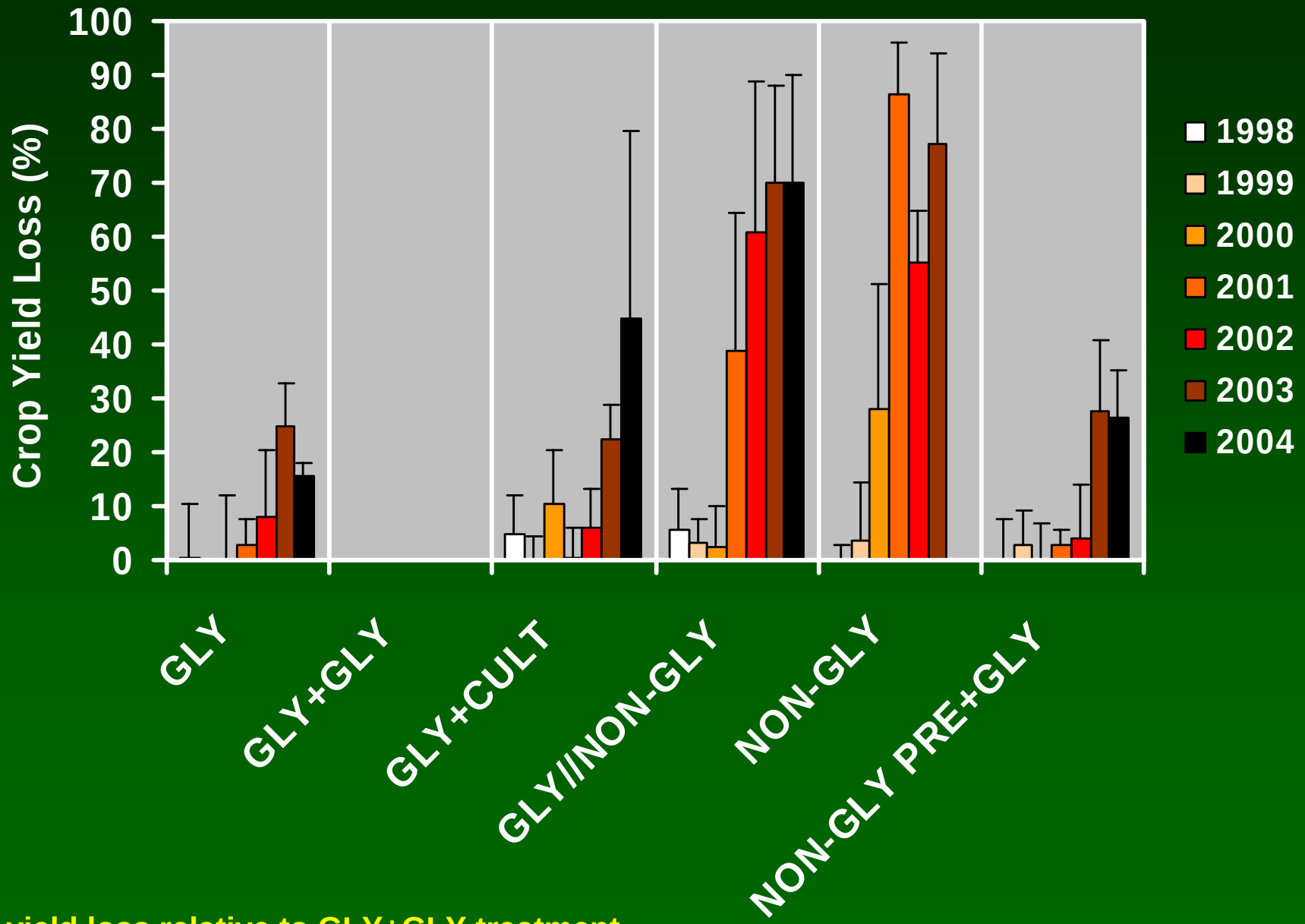
CS-CP Giant Ragweed Seedbank Density



Crop Yield Loss due to Giant Ragweed

- High giant ragweed densities were associated with up to 87% corn yield loss and 45% soybean yield loss
- Large yield losses in the continuous corn, chisel plow system were primarily attributable to competition with giant ragweed

CC-CP Corn Yield Loss*



* Crop yield loss relative to GLY+GLY treatment

Giant ragweed density 17 plants/m^2

Weed-free

Conclusions

- Giant ragweed established and became dominant within 3 years
- Giant ragweed management was of greatest risk in the continuous corn, chisel plow system
- Extended emergence was likely a critical factor affecting giant ragweed population dynamics
  - The most effective treatments over time were associated with effective management of late-emerging giant ragweed