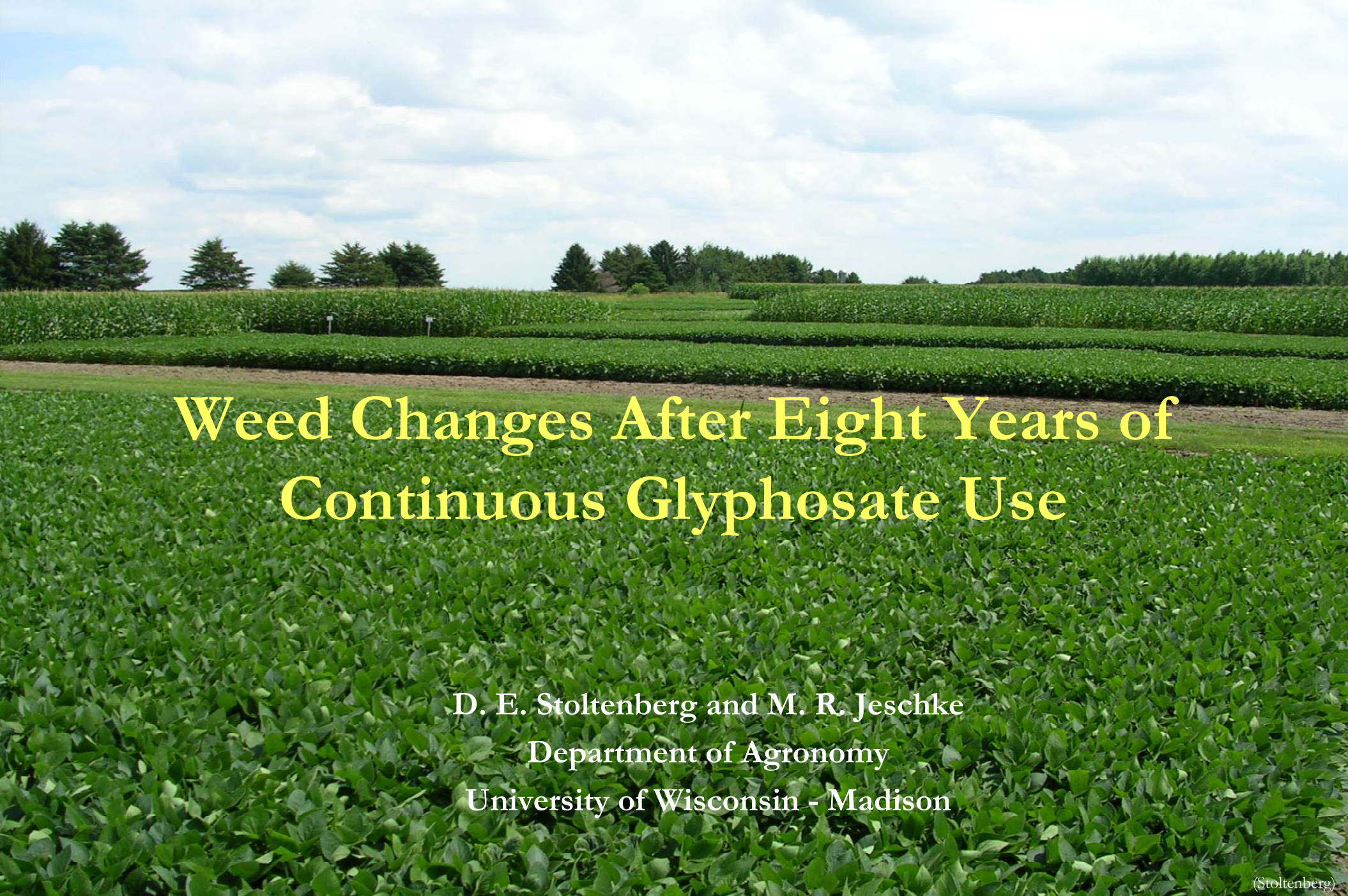

Weed Changes After Eight Years of Continuous Glyphosate Use

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Department of Agronomy
University of Wisconsin - Madison

(Stoltenberg)

Glyphosate-Resistant Crops

- Benefits
  - Highly effective weed management
  - Favorable herbicide characteristics
    - Environmental
    - Toxicological
  - Simplified weed management
- Risks
  - Less emphasis on integrated weed management
  - Changes in weed community composition
  - Selection for glyphosate-resistant weeds

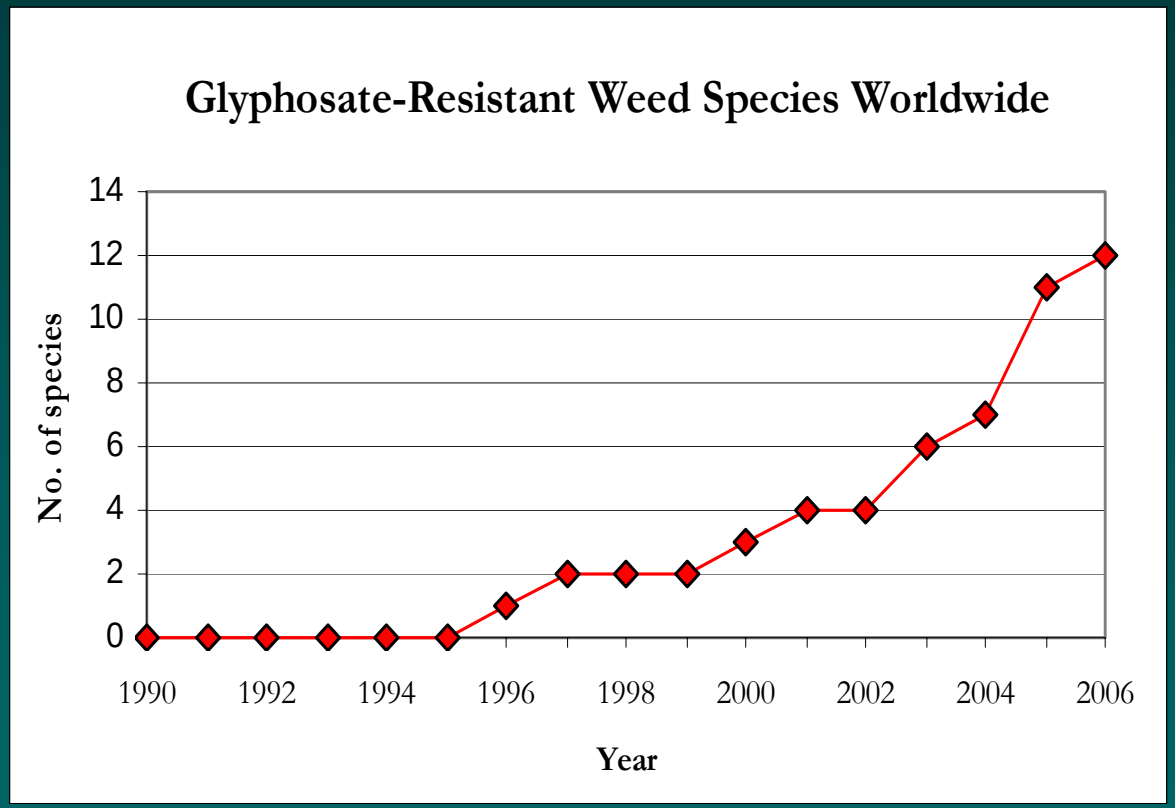
Potential Problem Weed Species

- **Broadleaf weeds**
  - Velvetleaf: difficult to control
  - Giant ragweed: difficult to control, extended emergence
  - *Amaranthus* species: variable sensitivity, late emergence
  - Eastern black nightshade: late emergence, less sensitive
  - Common lambsquarters: variable sensitivity

- **Grass weeds**
  - Giant foxtail: extended emergence period?
  - Shattercane: late emergence
  - Large crabgrass: late emergence
  - Fall panicum: late emergence

Confirmed Cases of Glyphosate-Resistant Weeds

- Rigid ryegrass (1996)
- Goosegrass (1997)
- Horseweed (2000)
- Italian ryegrass (2001)
- Hairy fleabane (2003)
- Buckhorn plantain (2003)
- Common ragweed (2004)
- Palmer amaranth (2005)
- Common waterhemp (2005)
- Johnsongrass (2005)
- Wild Poinsettia (2005)
- Giant ragweed (2006)



(Heap 2006, www.weedscience.org)

Objective

- Assess long-term weed community dynamics in a corn-soybean rotation as influenced by tillage system and glyphosate use
  - Weed species, density, and biomass
    - Soil weed seedbank
    - Plant population
  - Crop yield

- Tillage systems
  - Moldboard Plow **(MP)**
  - Chisel Plow **(CP)**
  - No Tillage **(NT)**

Weed Management Treatments

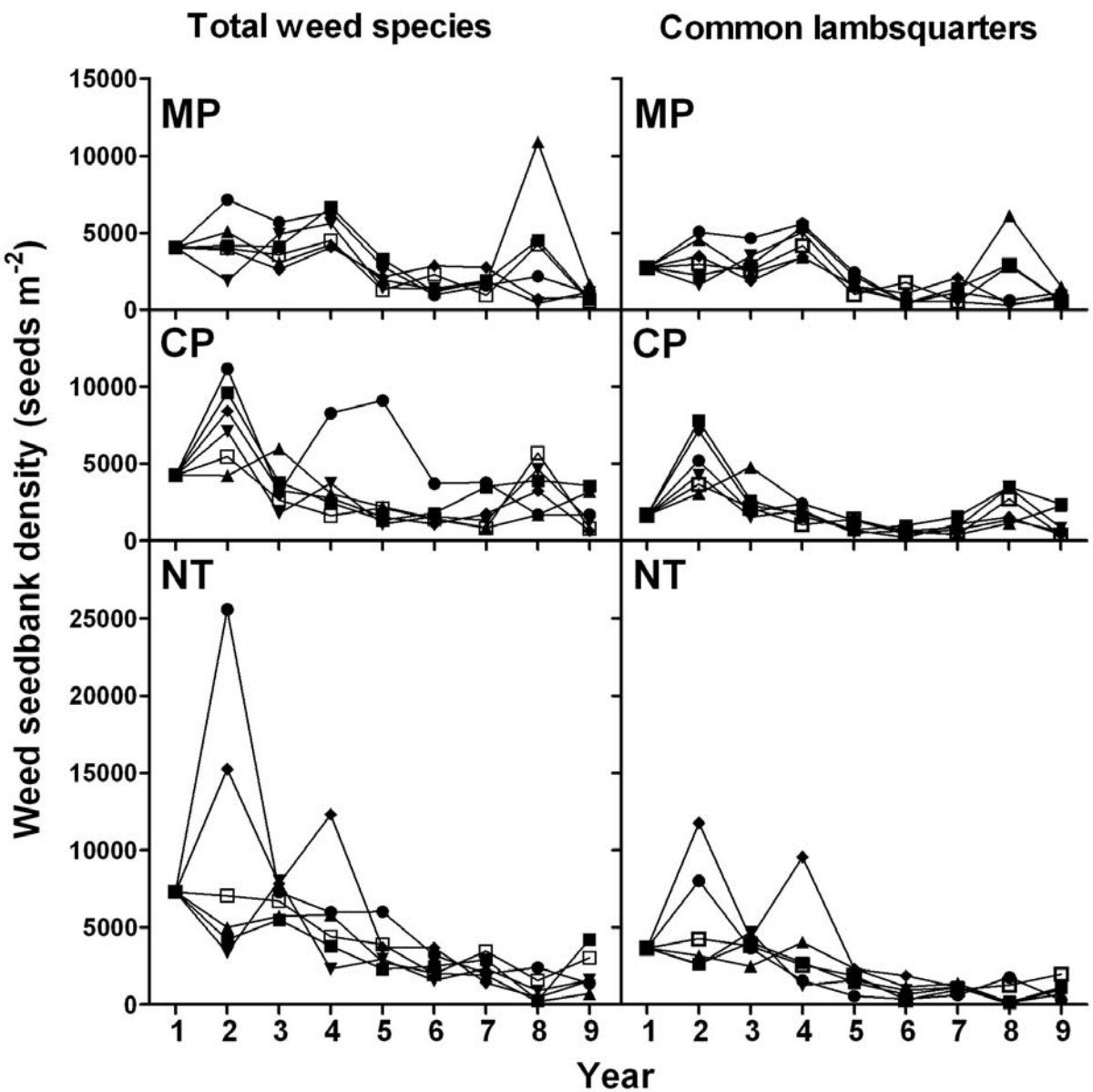
	SOYBEAN Even years (1998-2006)	CORN Odd years (1999-2005)
1.	Glyphosate POST	Glyphosate POST
2.	Glyphosate POST	Glyphosate POST + LPOST
3.	Glyphosate POST	Glyphosate POST + Cultivation
4.	Metolachlor PRE + Glyphosate POST	Metolachlor PRE + Glyphosate POST
5.	Glyphosate POST	Non-glyphosate herbicide program
6.	Non-glyphosate herbicide program	Non-glyphosate herbicide program


Weed Management Results 1998-2006
(Stoltenberg)

Weed Species Composition in the Soil Seedbank and Plant Population 1999-2005

	Soil Seedbank		Plant Population	
Weed Species	1999	2005	1999	2005
	% of total			
Common lambsquarters	70	65	33	34
Redroot pigweed	12	11	20	6
Giant foxtail	16	11	33	29
Velvetleaf	2	2	8	2
Shattercane	0	3	1	2
Giant ragweed	0	3	0	23
Large crabgrass	0	1	0	1
Other	0	3	5	4

Viable Weed Seedbank Density 1998-2006



■ Gly POST in soybean and corn

▲ Gly POST in soybean
Gly POST + LPOST in corn

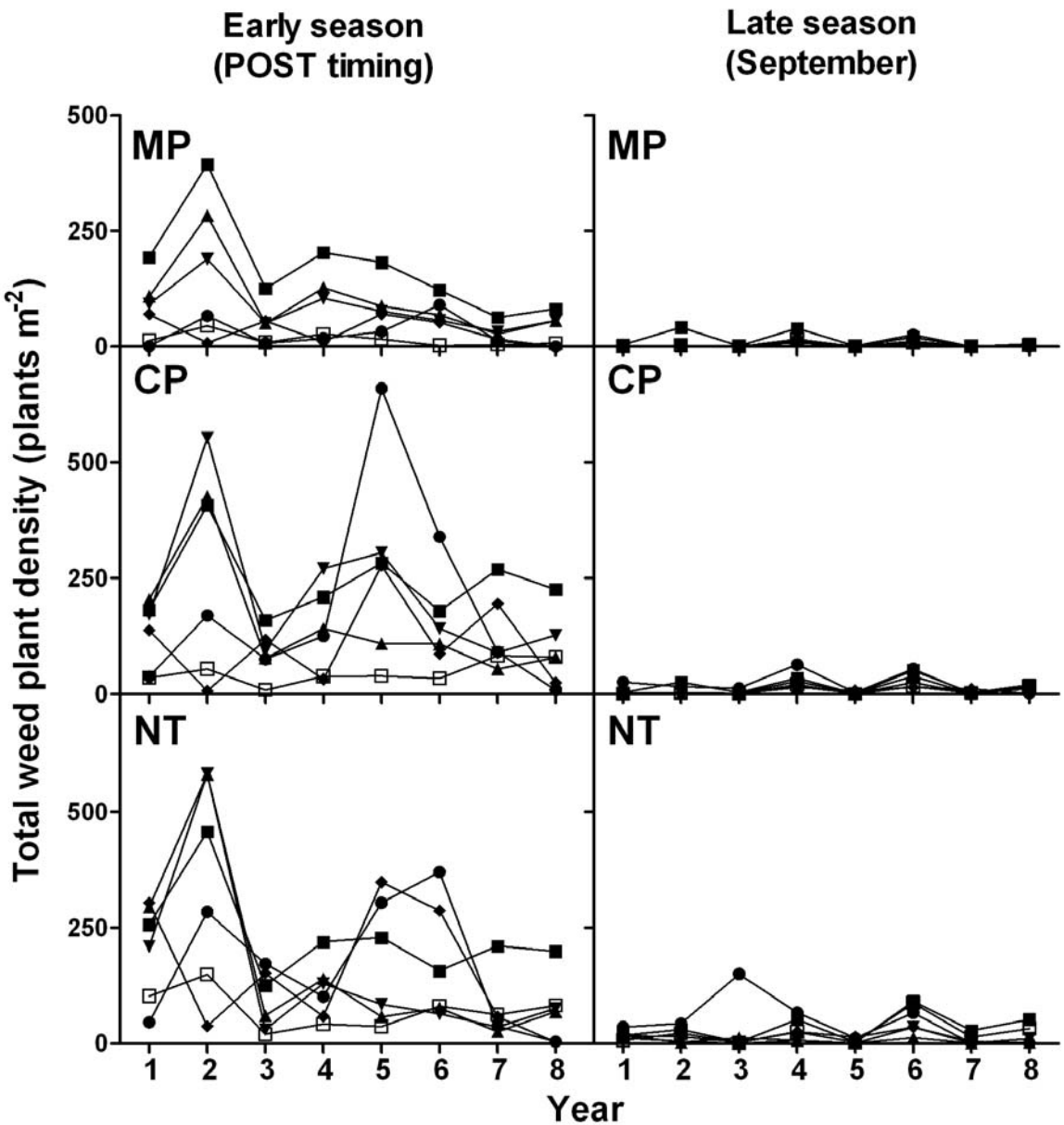
▼ Gly POST in soybean
Gly POST + cultivation in corn

□ Metolachlor PRE + Gly POST
in soybean and corn

♦ Gly POST in soybean
Non-glyphosate herbicides in corn

● Non-glyphosate herbicides in
soybean and corn

Total Weed Plant Density 1998-2005



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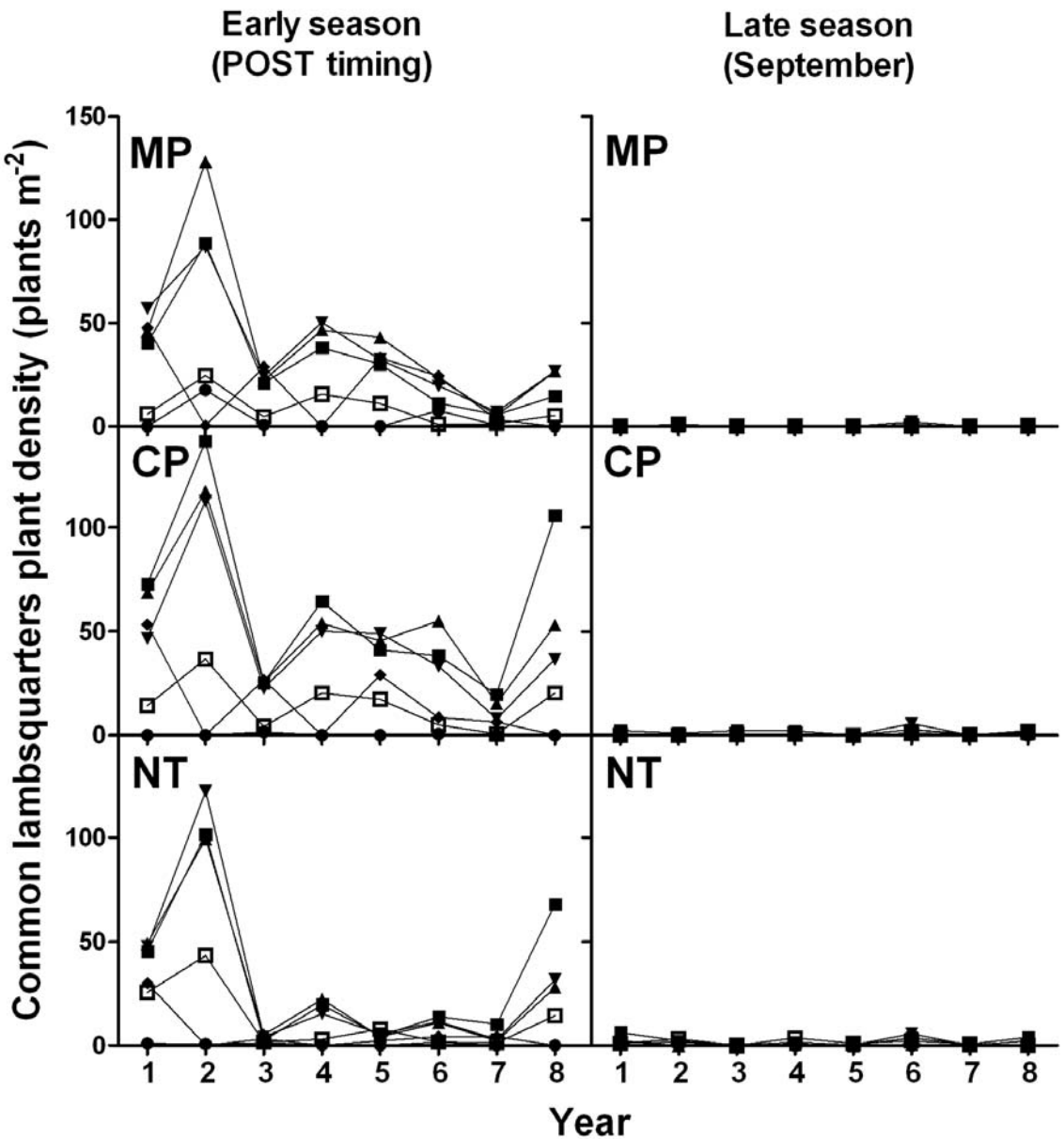
Common Lambsquarters Plant Density 1998-2005



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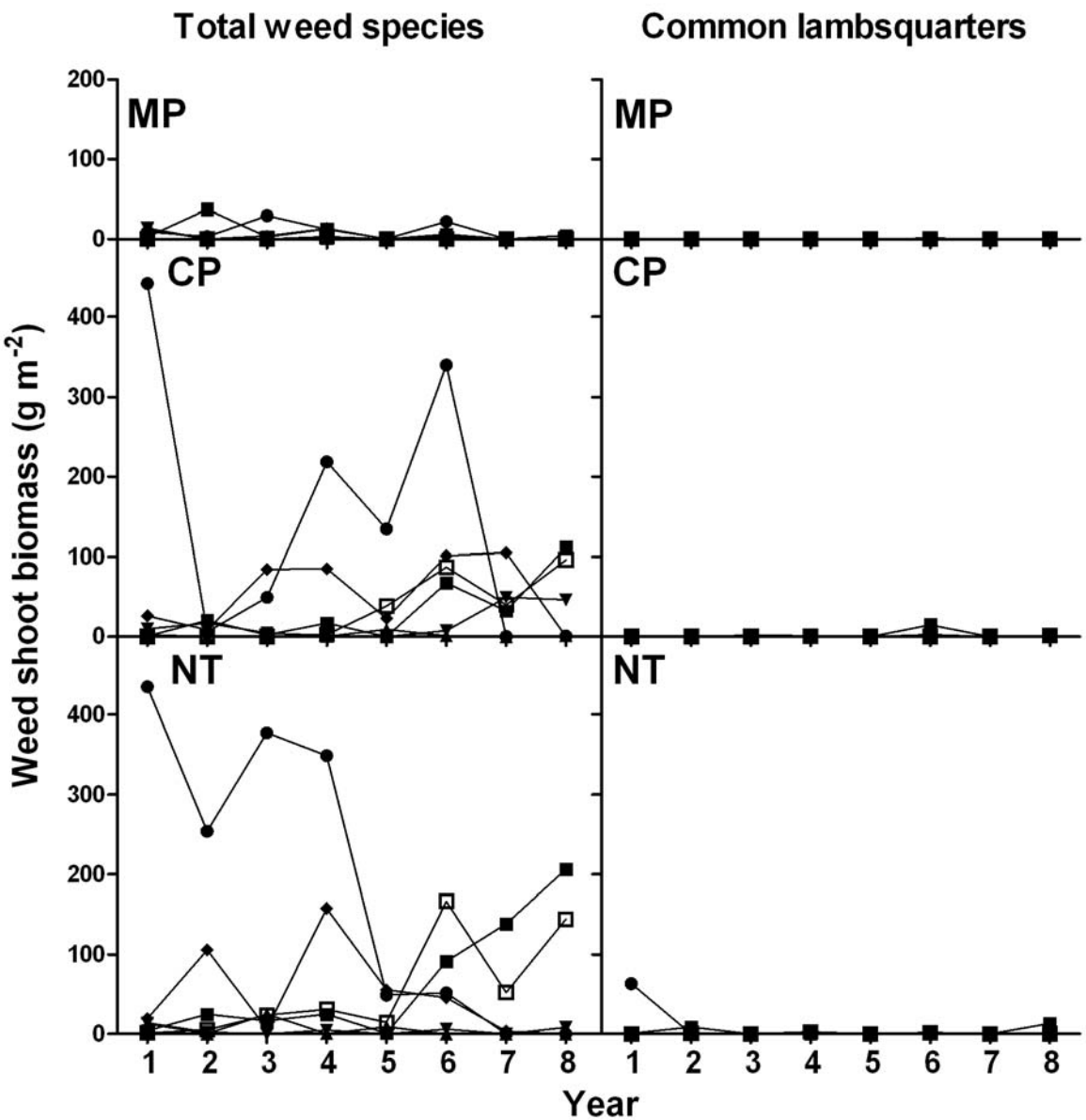
Late-Season Weed Shoot Biomass 1998-2005



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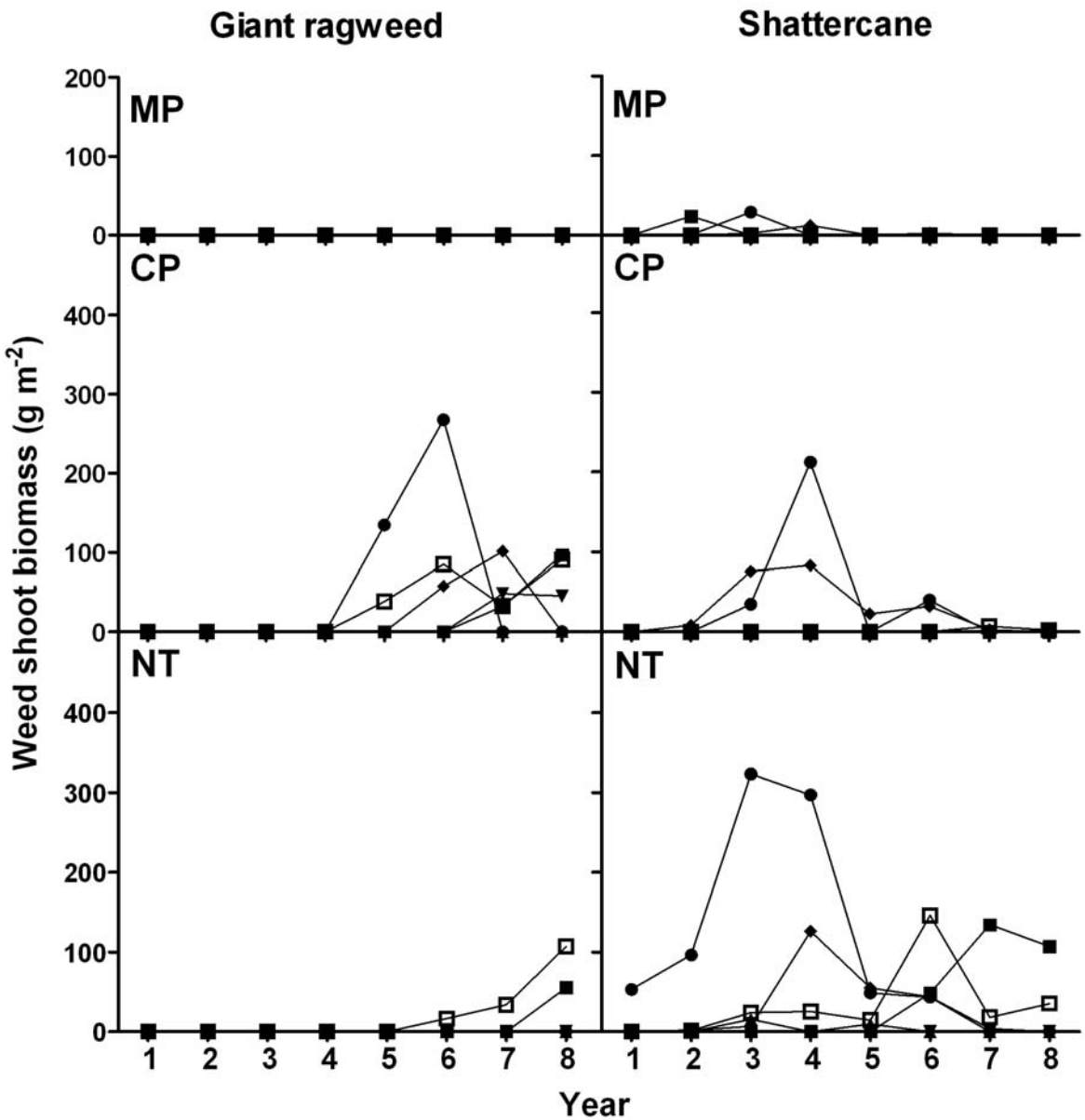
Late-Season Weed Shoot Biomass 1998-2005



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Non-glyphosate herbicides in corn

● Non-glyphosate herbicides in
soybean and corn


No-Tillage Corn-Soybean Rotation 1998-2006
Glyphosate burndown fb glyphosate POST
(Photo Aug 2006)
(Stoltenberg)

No-Tillage Corn-Soybean Rotation 1998-2006

Glyphosate burndown fb glyphosate POST in soybean

Glyphosate burndown fb glyphosate POST + LPOST in corn

(Photo Aug 2006)

(Stoltenberg)


No-Tillage Corn-Soybean Rotation 1998-2006
Glyphosate burndown fb
non-glyphosate herbicide program
(Photo Aug 2006)
(Stoltenberg)

Summary

- **Common lambsquarters was the most abundant broadleaf species over time**
  - **Treatment efficacy was consistently high over eight years**
    - **Application conditions typically optimal for glyphosate**
    - **Integrated management practices**
  - **Viable seedbank density decreased for most treatments**

- **Giant ragweed and shattercane developed as difficult management problems in CP and NT**
  - **Developed relatively rapidly in non-glyphosate herbicide programs**
    - **Attributed to limited efficacy of specific non-glyphosate herbicides**
  - **Developed more slowly over time in glyphosate POST treatments**
    - **Attributed to later, extended emergence periods for both species**