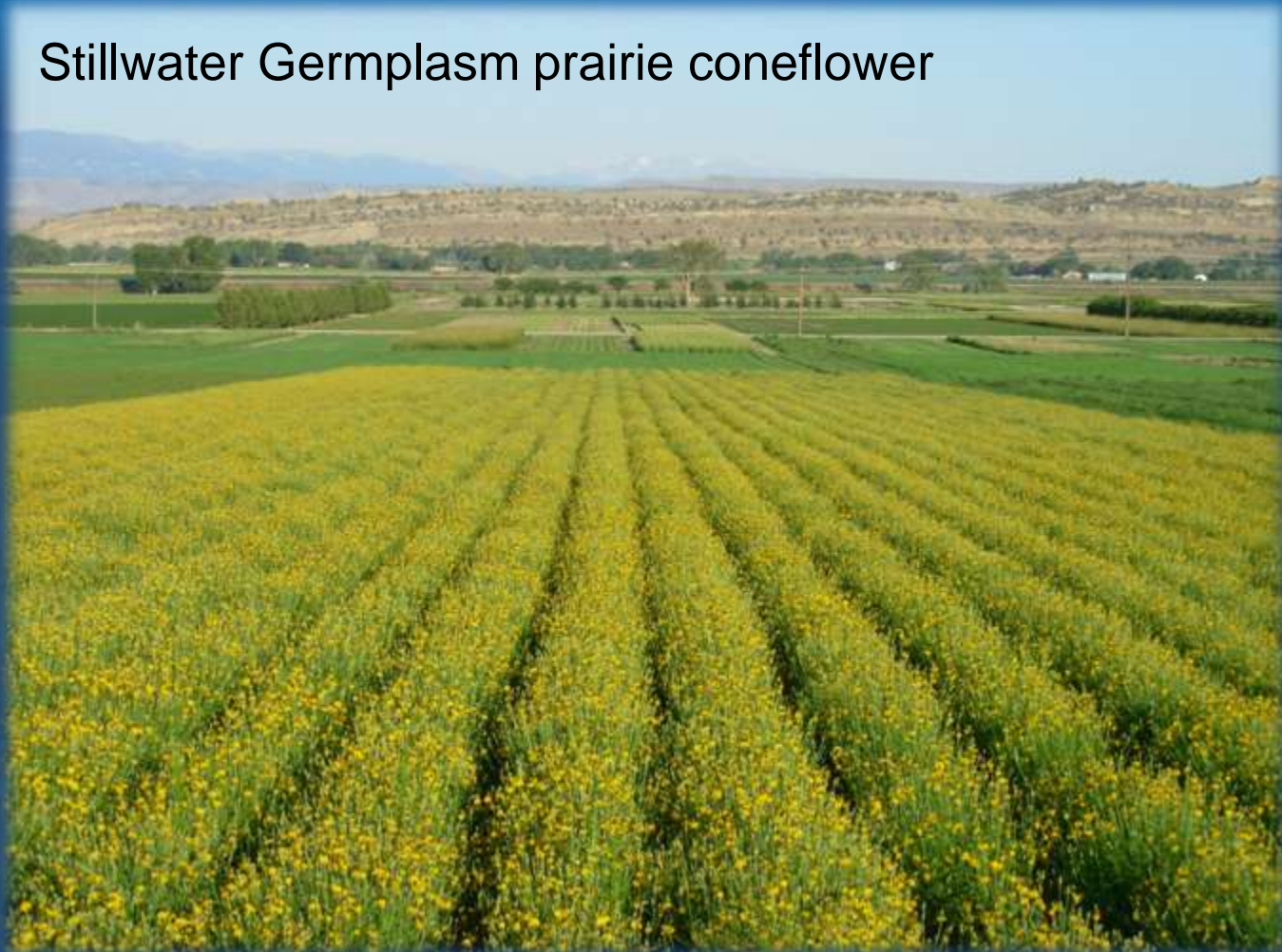


Herbicide Effects on Seed Production of Native Wildflowers

Stillwater Germplasm prairie coneflower



NRCS Plant Materials Program



BPMC uses plants to solve conservation problems on saline impacted sites, acid/heavy-metal contaminated conditions, wind & water eroded soils, resource consumptive landscapes, deteriorated forage systems, and impaired wildlife and pollinator habitat

<http://plant-materials.nrcs.usda.gov/mtpmc/>

Important Conservation Uses of Wildflowers



Wildflower Seed Production Issues

Weed infestation



Flowering dates



Seed readiness



Pollinator density



Herbicide incorporation

Labor expense



Floral chaff



Harvest equipment

Limitations in herbicide testing

- ▶ pesticide applicators license required
- ▶ lack of labeled products
- ▶ specific modes of action
- ▶ weed resistance to chemicals over time
- ▶ specialized application equipment
- ▶ unknown effects on desirable species



Herbicide Trial

▶ Phase I Test effects of 6 pre-emergence herbicides on 6 native species

▶ Phase II Test effects of 6 post-emergence herbicides on 6 native species



Both Phases Seeded November 22, 2005

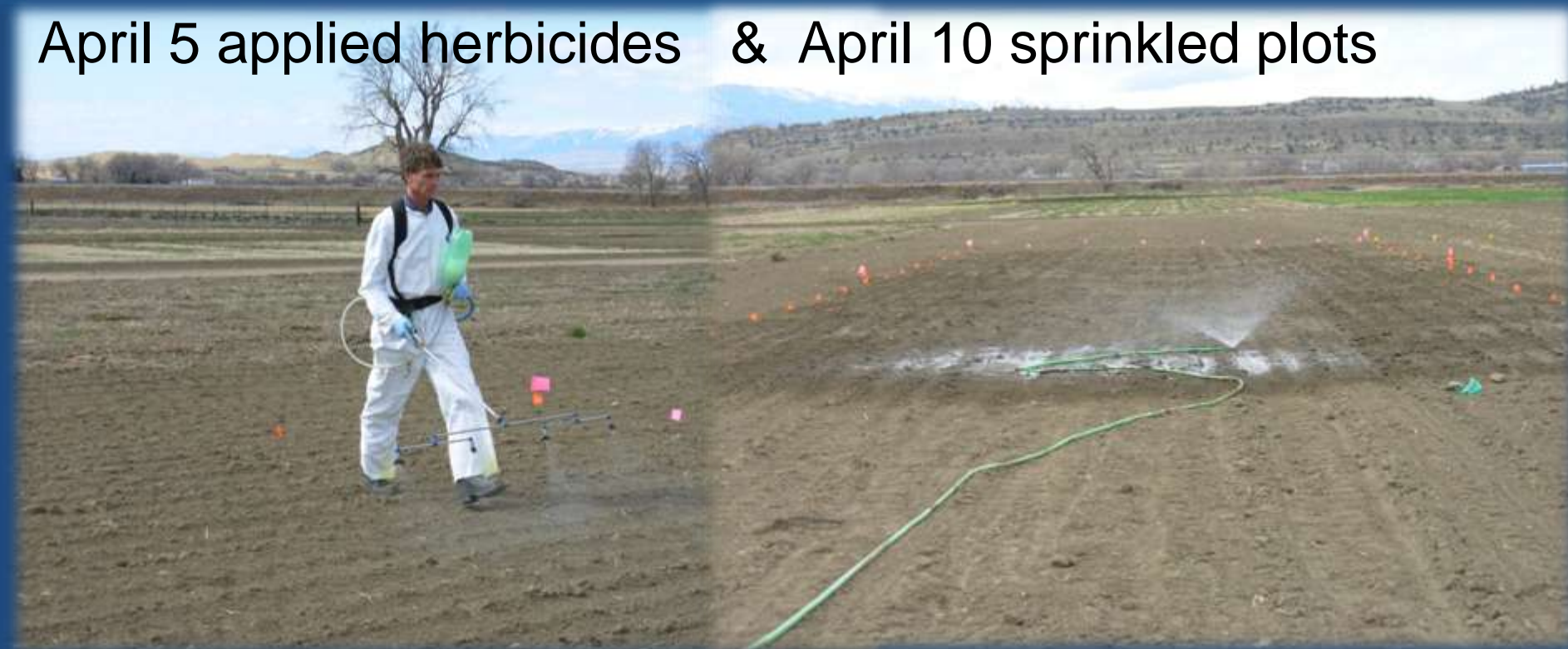
- ▶ 4 row plots @ 12 in spacing @ 25 PLS seeds/ft
- ▶ $\frac{1}{2}$ in seeding depth

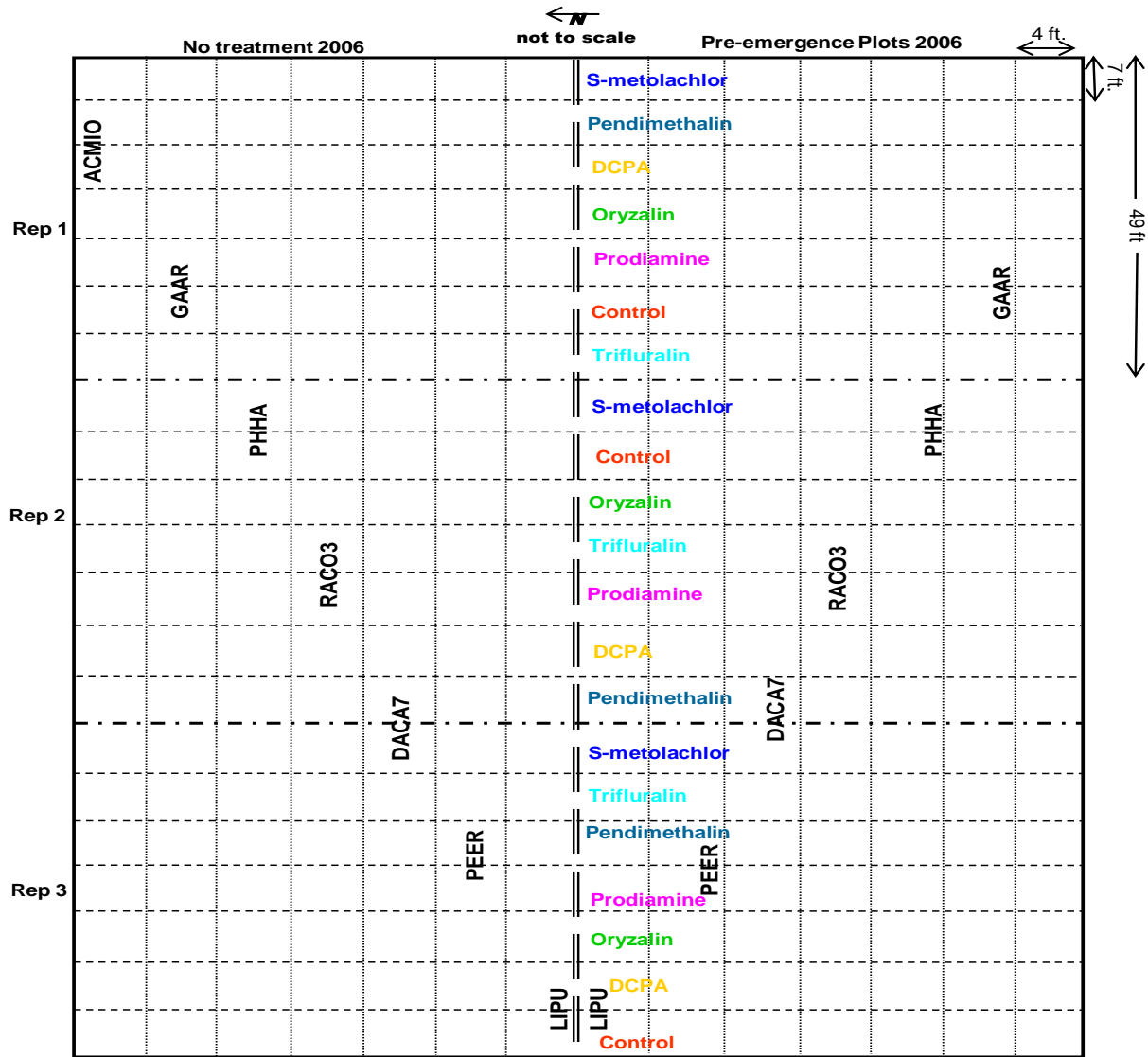


Phase I Pre-emergence herbicide application

- ▶ 2006 RCBD w/ 3 replications
- ▶ $\frac{1}{2}$ in moisture sprinkler-irrigated

April 5 applied herbicides & April 10 sprinkled plots





Species Code:

ACMIO *Achillea millefolium*
 DACA7 *Dalea candida*
 GAAR *Gaillardia aristata*
 LIPU *Liatis punctata*
 PEER *Penstemon eriantherus*
 PHHA *Phacelia hastata*
 RACO3 *Ratibida columnifera*

2006 pre-emergence treatments

Prodiamine 1.5 lb/ac
 DCPA 8 lb/ac
 S-metolachlor 2 pt/ac
 Pendimethalin 3 pt/ac
 Oryzalin 4 pt/ac
 Trifluralin 1.2 pt/ac
 Control

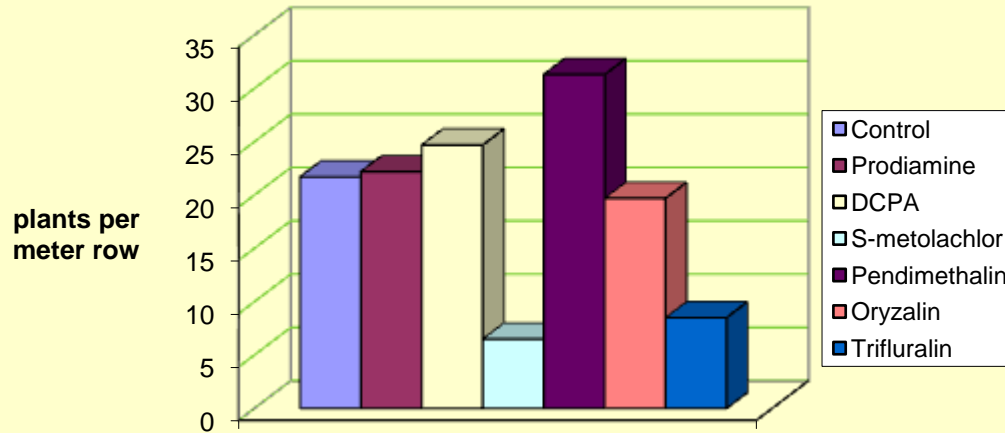
Phase I Establishment year 147 plots evaluated

- ▶ no significant difference in seeded densities except *Phacelia hastata*
- ▶ no significant difference weedy forb densities
- ▶ *Ratibida columnifera* height significantly shorter w/trifluralin, S-metolachlor & pendimethalin treatments

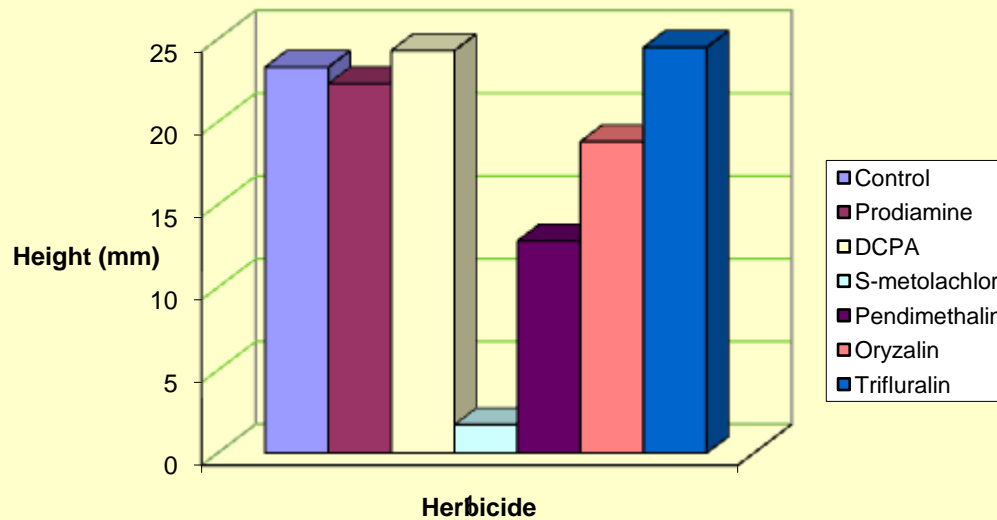
May 17, 2006



Phacelia hastata density



Phacelia hastata height



Phacelia hastata
Significantly fewer
&
shorter plants
in plots treated with
S-metolachlor

Phase I Establishment year 2nd evaluation

- ▶ seeded densities declined except *Gaillardia aristata*
- ▶ height *Penstemon eriantherus* significantly shorter in DCPA & oryzalin treatments

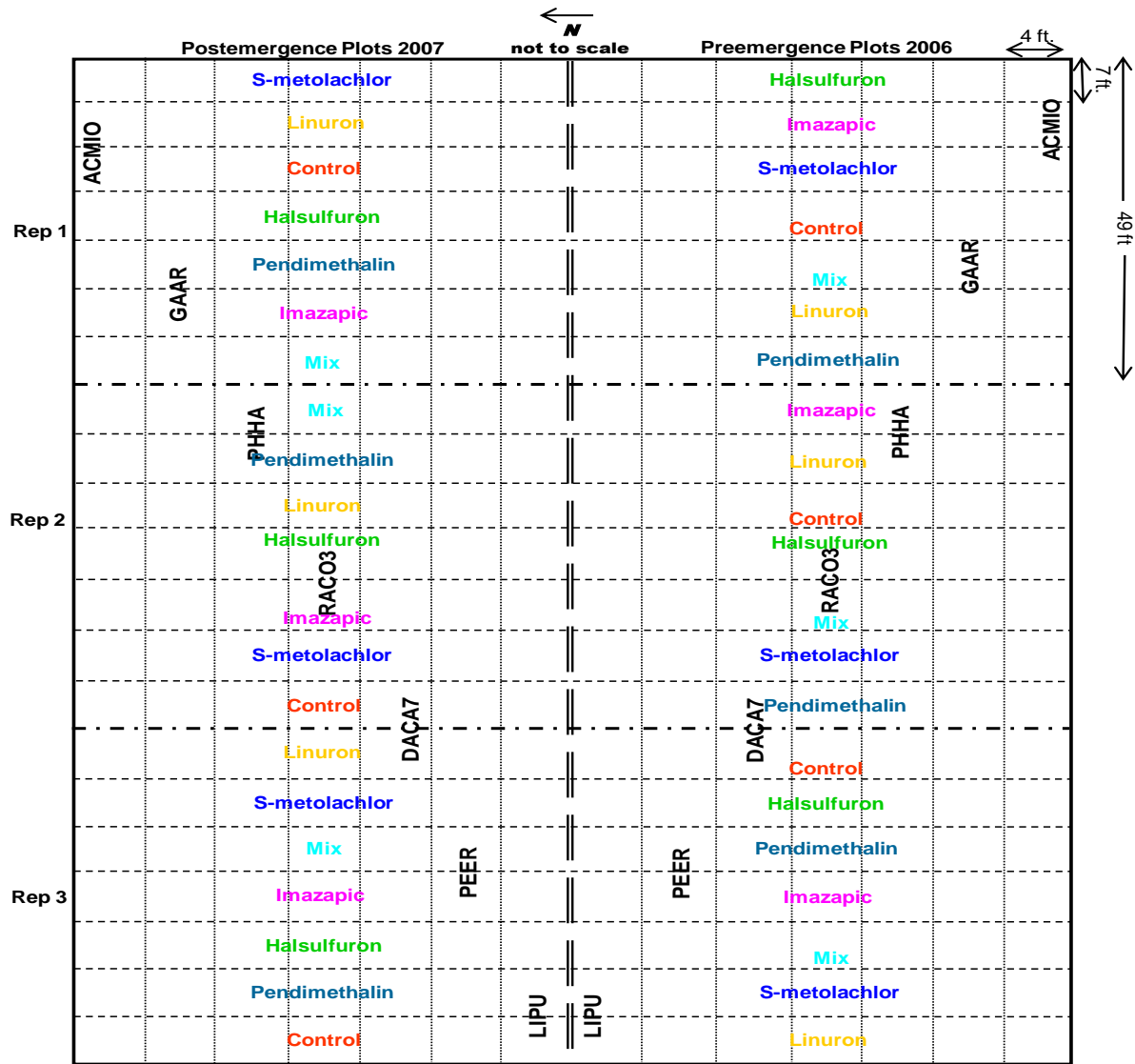


Phase II Post-emergence herbicide applications

- ▶ 147 plots prev. treated w/pre-emergence herbicides
- ▶ 147 plots not previously treated
- ▶ each RCBD w/3 replications

May 15, 2007





Species Code
 ACMIO *Achillea millefolium*
 DACA7 *Dalea candida*
 GAAR *Gaillardia aristata*
 LIPU *Liatris punctata*
 PEER *Penstemon eriantherus*
 PHHA *Phacelia hastata*
 RACO3 *Ratibida columnifera*

2007 post-emergence treatments
 Linuron 1.5 lb/ac
 S-metolachlor 2 pt/ac
 Halosulfuron 1 oz/ac
 Imazapic 6 oz/ac
 Pendimethalin 2 pt/ac
 Mix Imazapic+Pendimethalin 4 oz + 2 pt/ac
 Control

Phase II Post-emergence herbicide applications

- ▶ 147 plots prev. treated w/post-emergence herbicides
 - ▶ RCBD w/3 replications

May 28, 2008



Third-year evaluations & seed harvests

- ▶ 147 plots prev. treated w/post-emergence herbicides
 - ▶ RCBD w/3 replications

June 13 through October 9, 2008

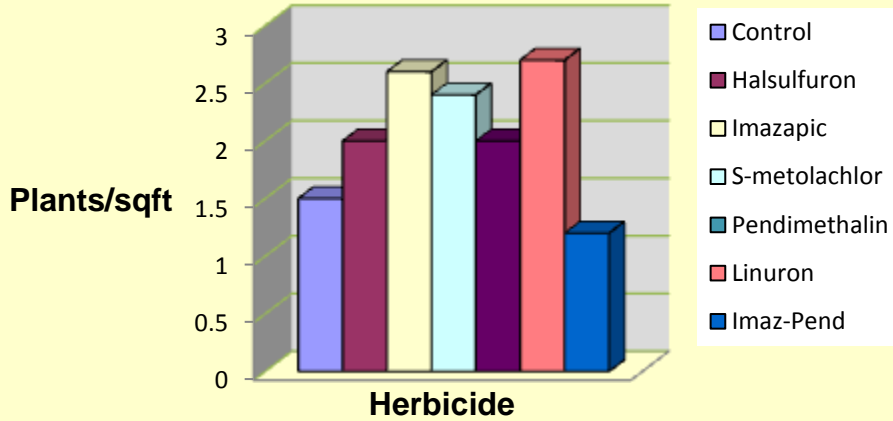




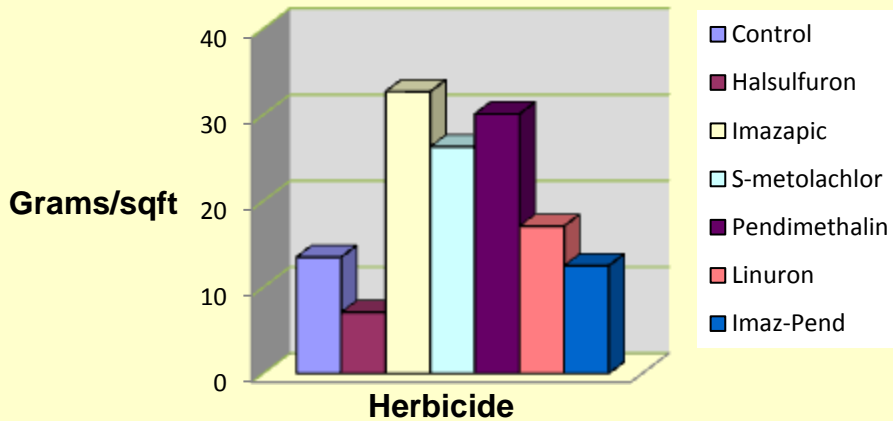
Phase I + Phase II 2007



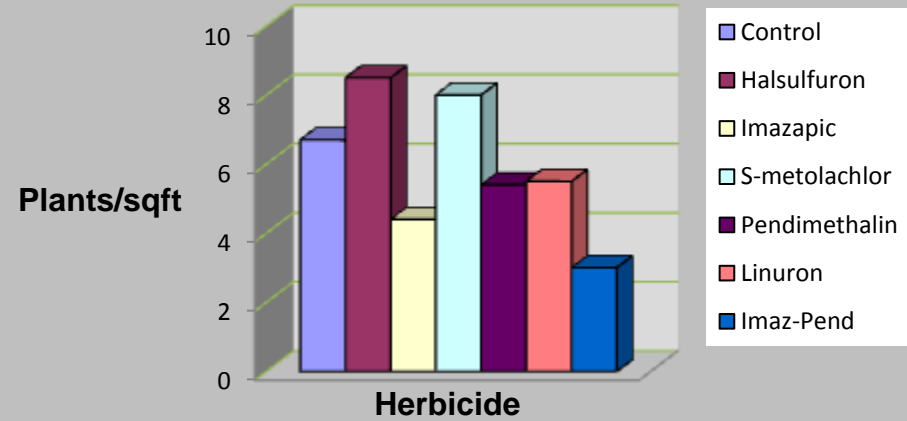
Dalea candida



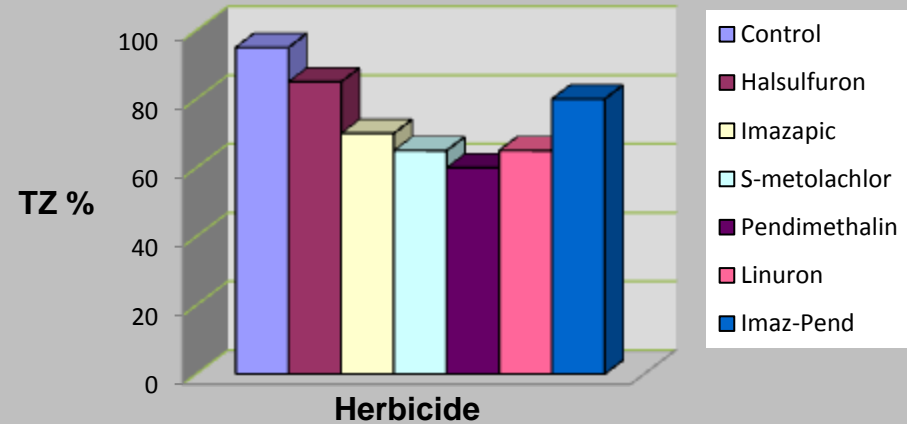
Seed production



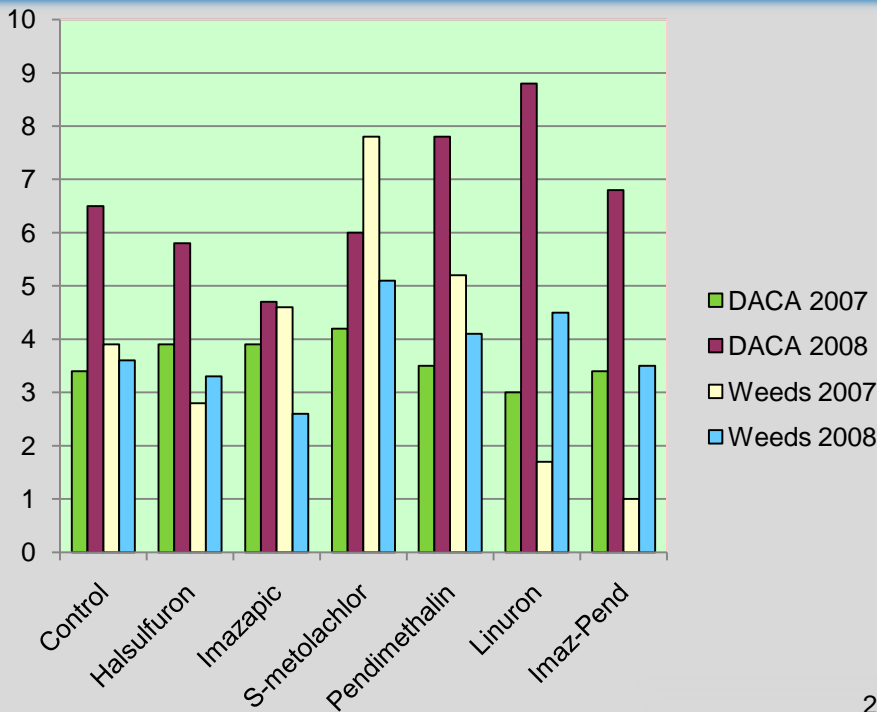
Broadleaf weeds



Seed viability

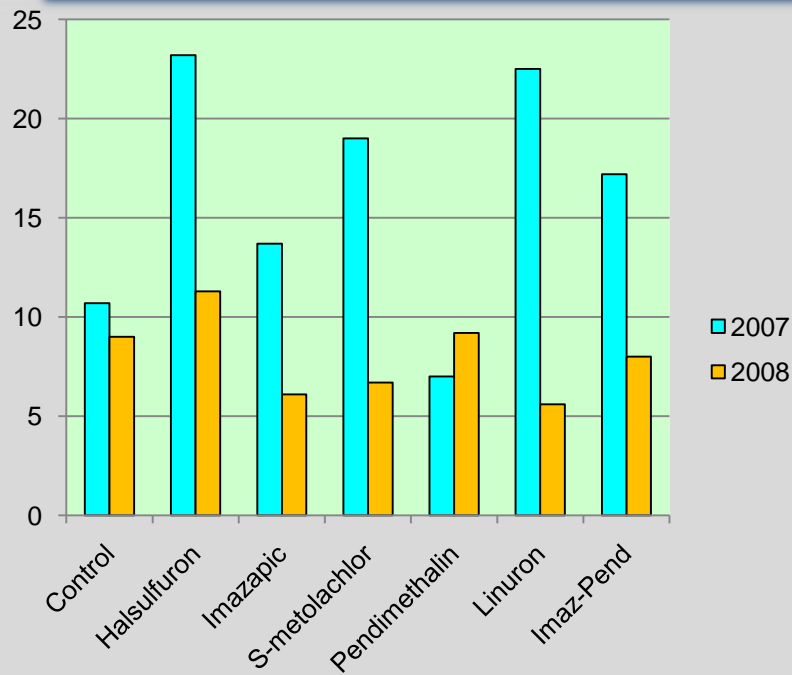


Plants/sqft



Dalea candida Phase II Effects 2007-2008

Seed
Production
Gm/sqft

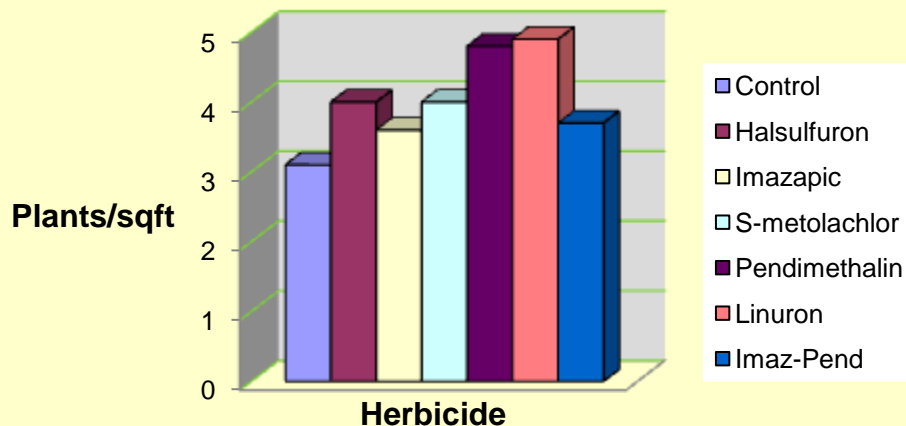




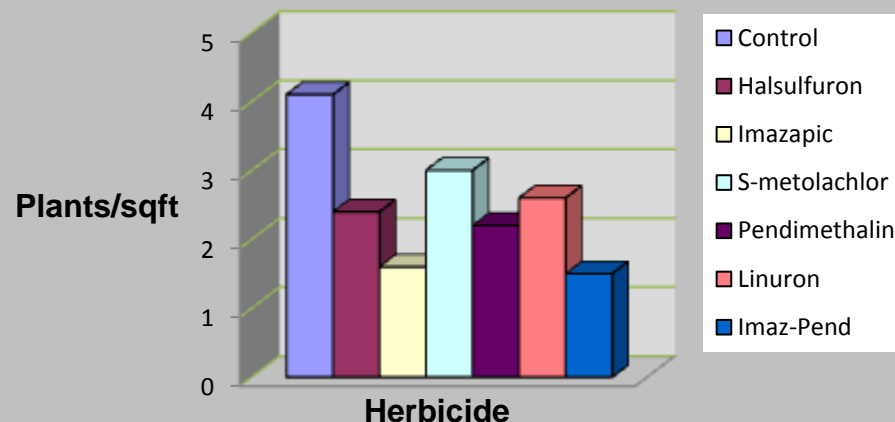
Phase I + Phase II 2007



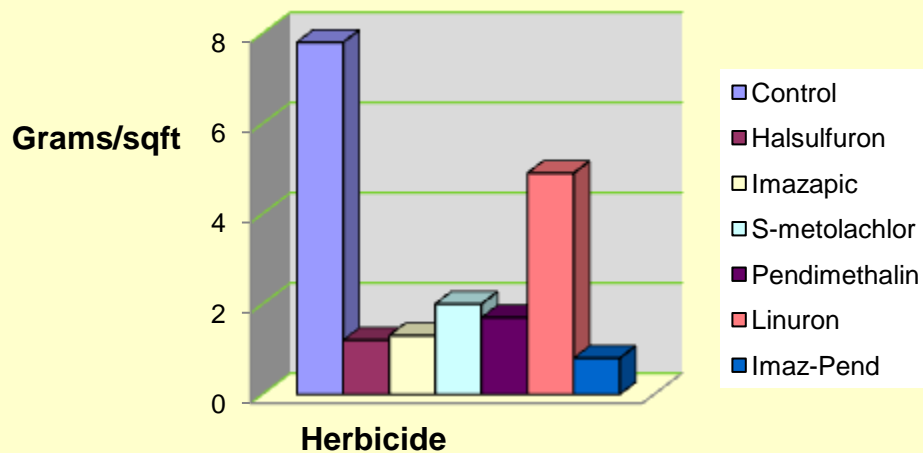
Gaillardia aristata



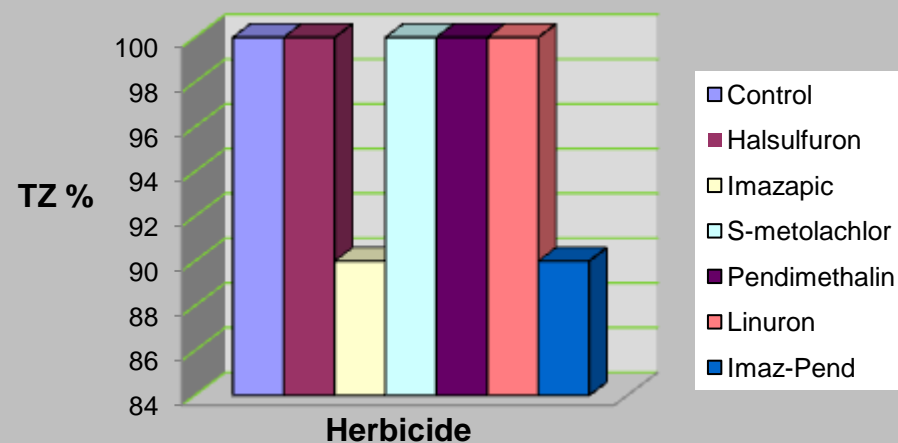
Broadleaf weeds



Seed Production

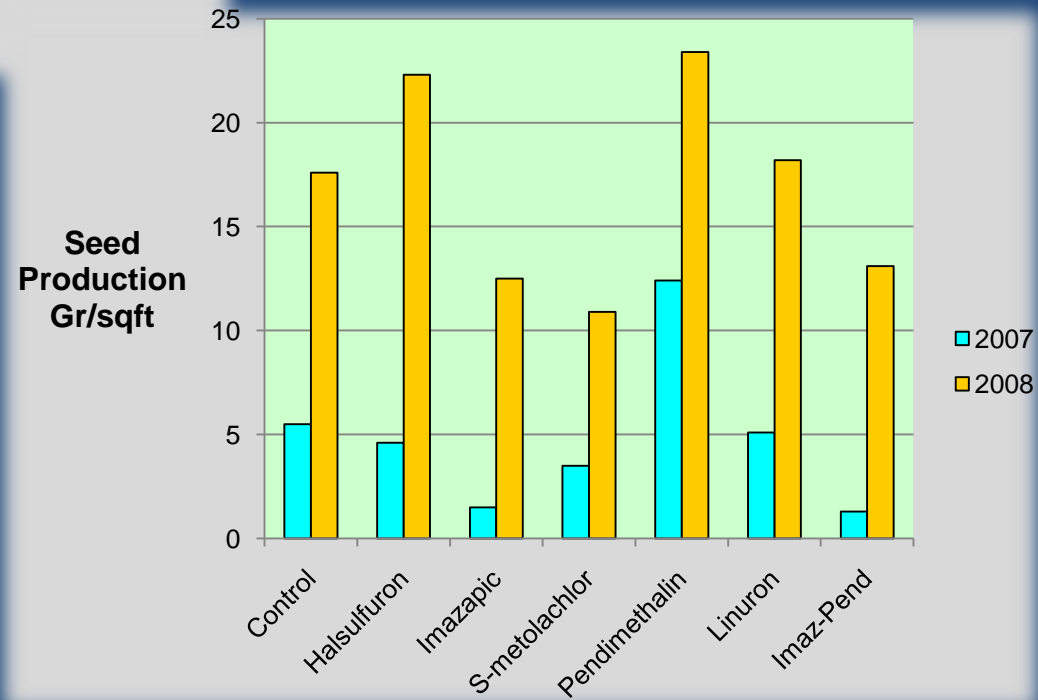
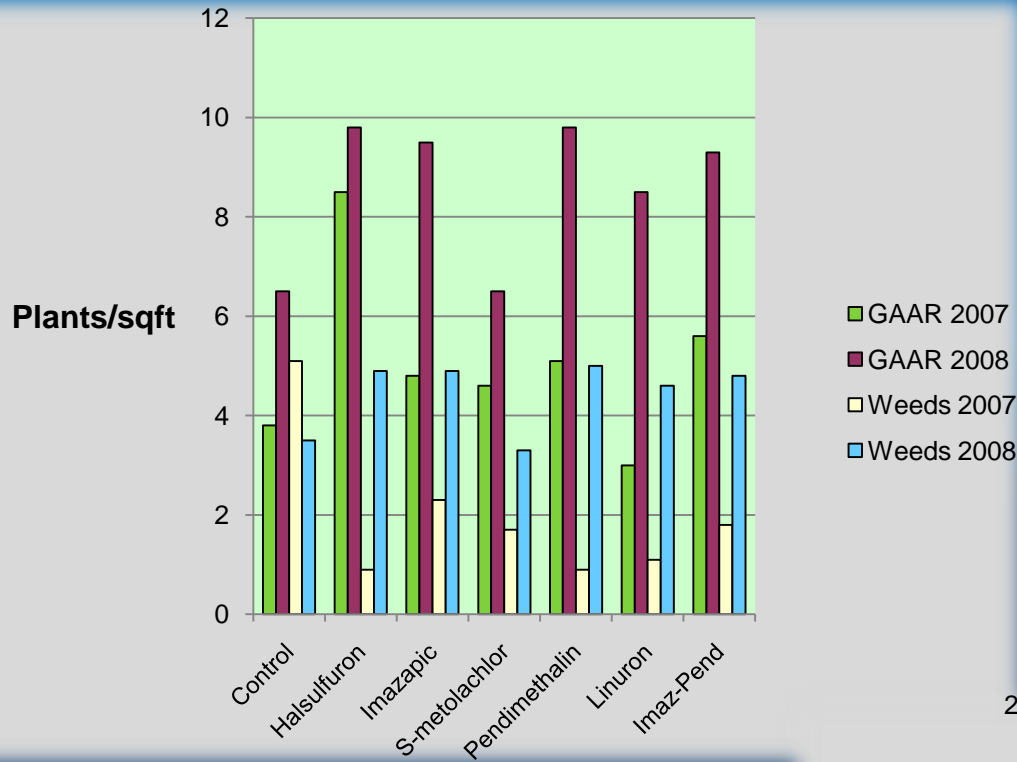


Seed viability



Gaillardia aristata

Phase II Effects 2007-2008

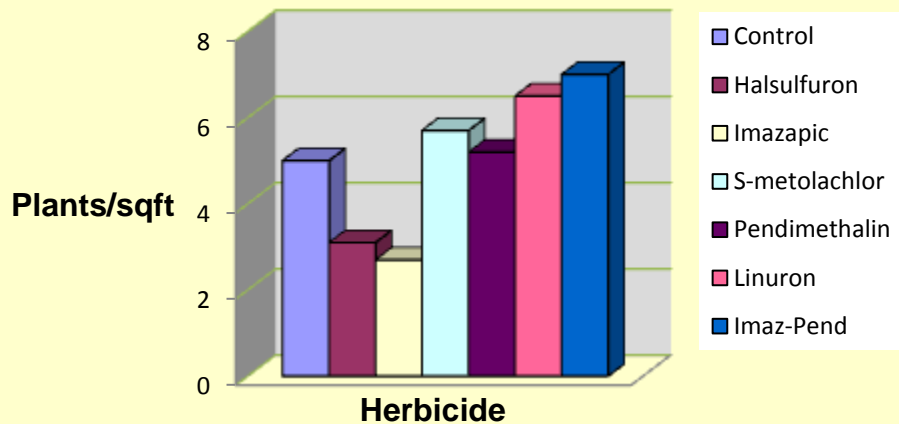




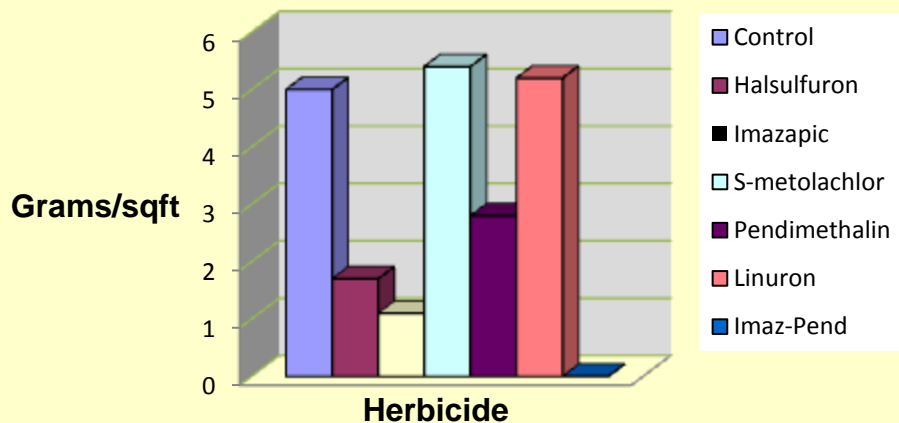
Phase I + Phase II 2007



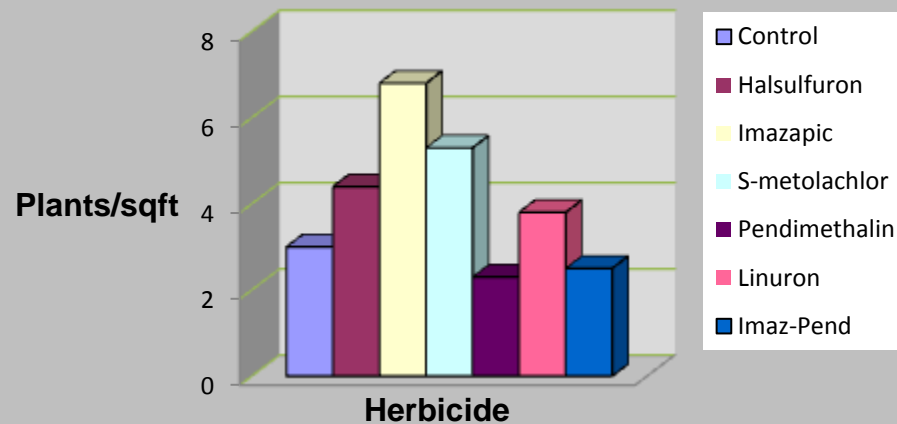
Liatris punctata



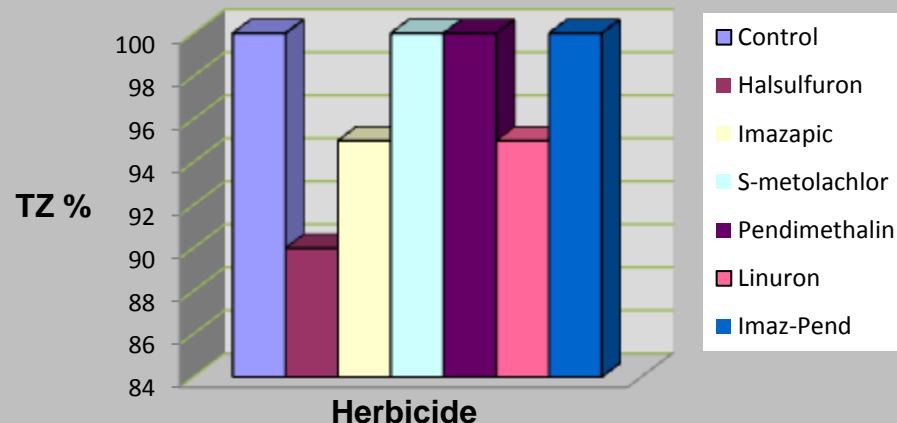
Seed production



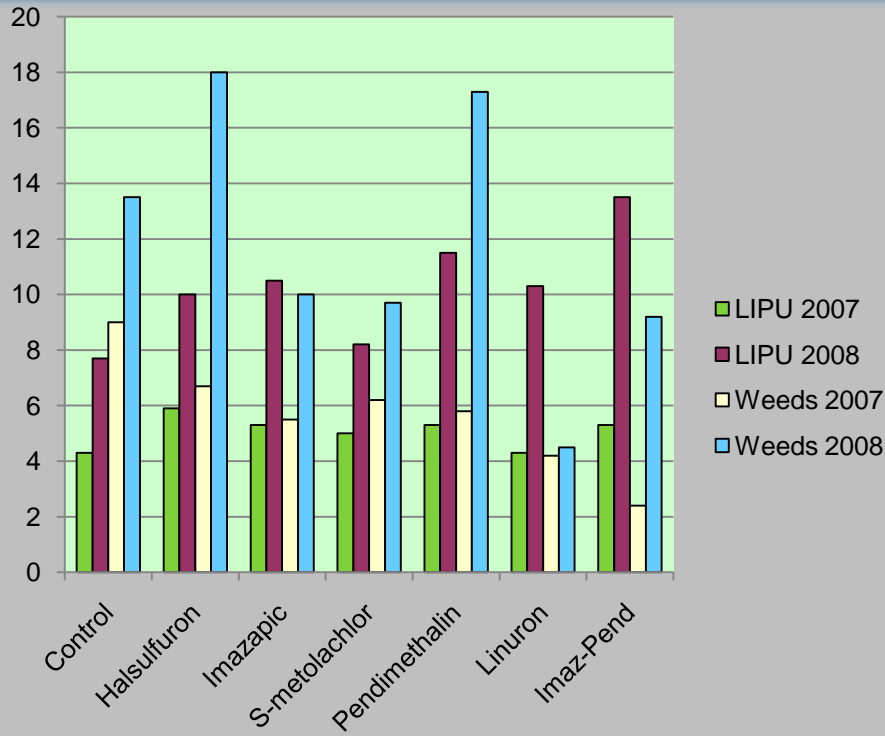
Broadleaf weeds



Seed viability

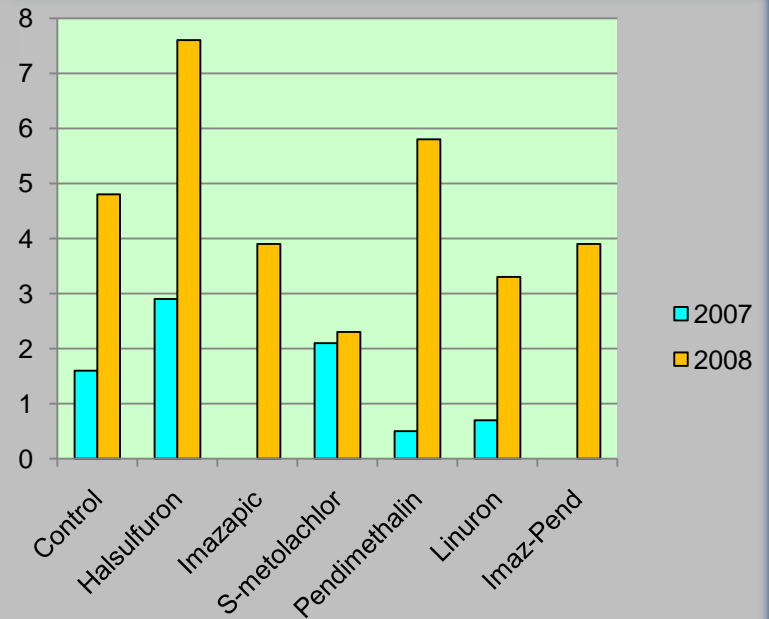


Plants/sqft



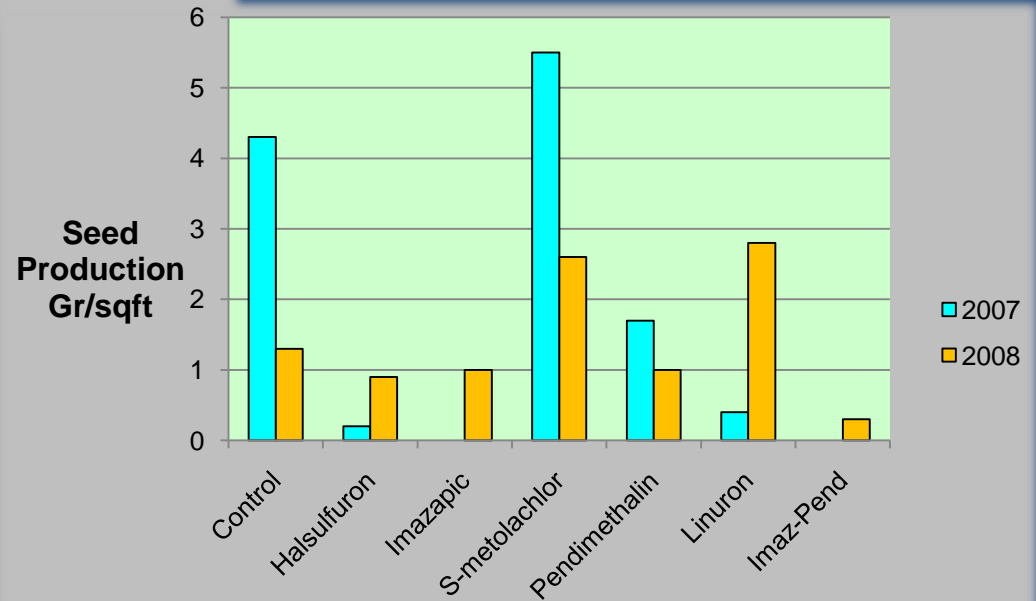
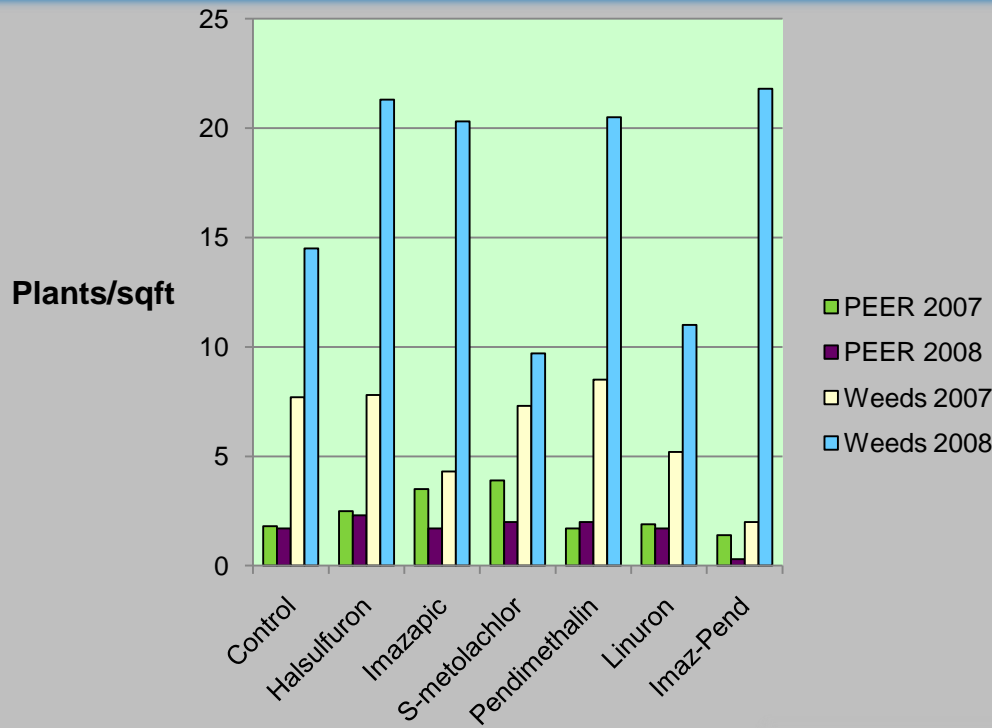
Liatris punctata Phase II Effects 2007-2008

Seed Production
Gr/sqft



Penstemon eriantherus

Phase II Effects 2007-2008

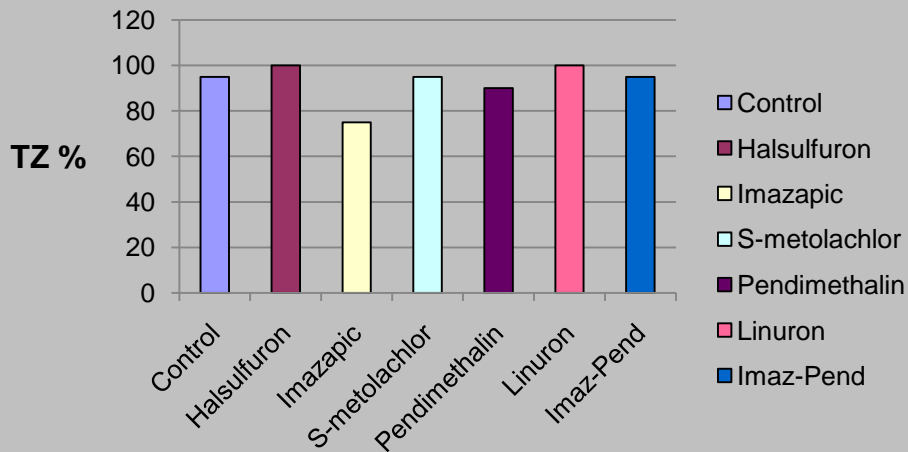


Phacelia hastata

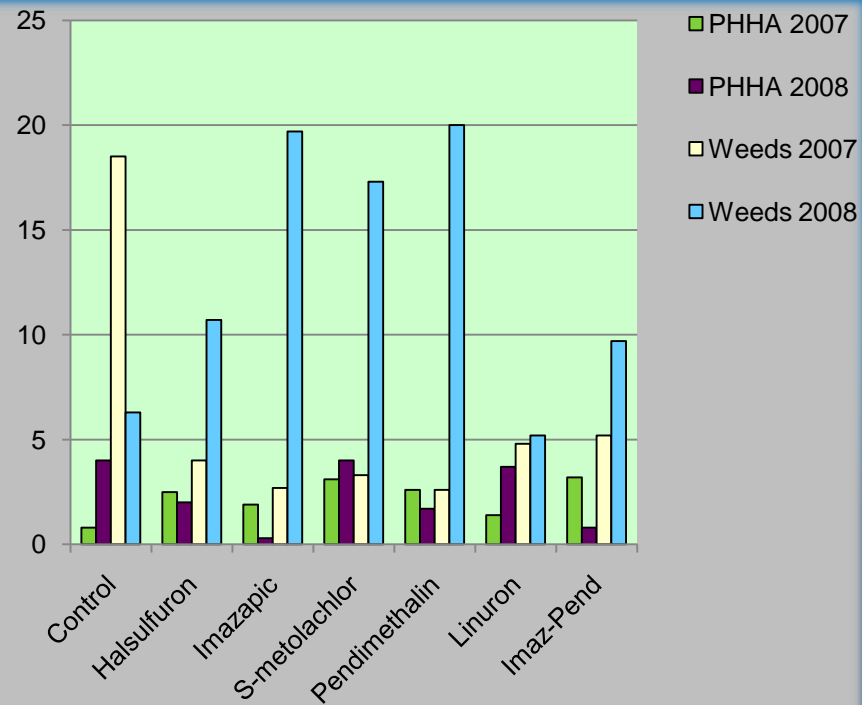
Phase II 2007-2008



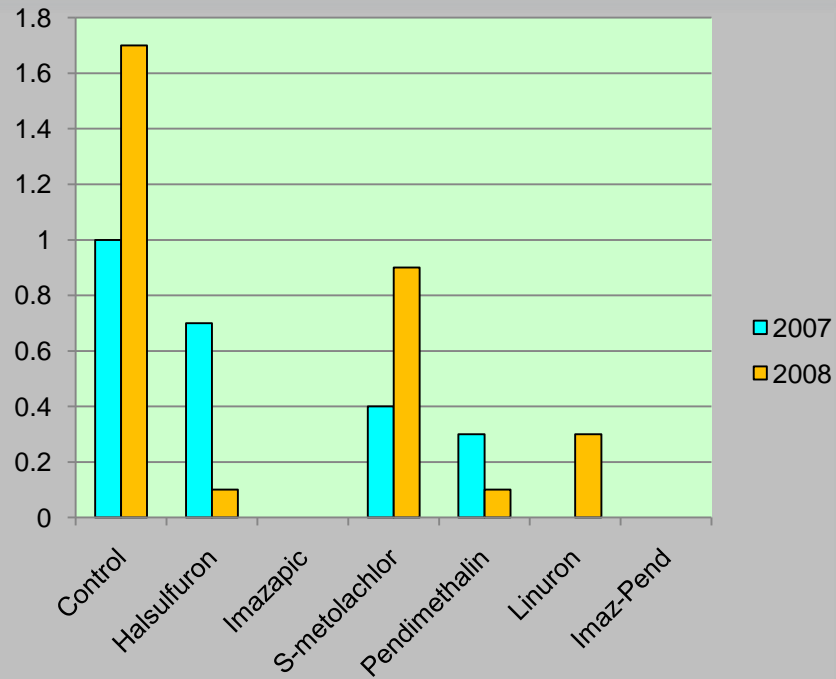
Seed Viability 2007



Plants/sqft



Seed Production Gr/sqft

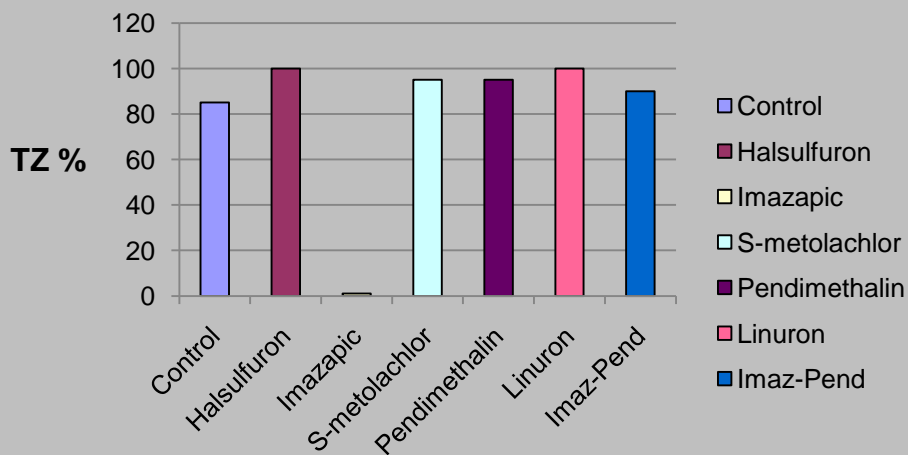


Ratibida columnifera

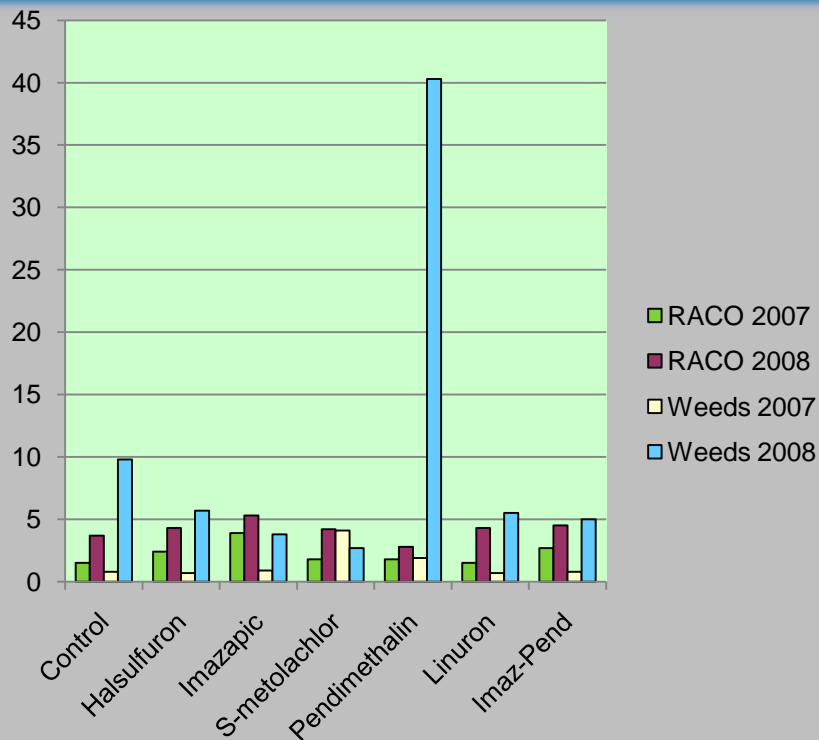
Phase II 2007-2008



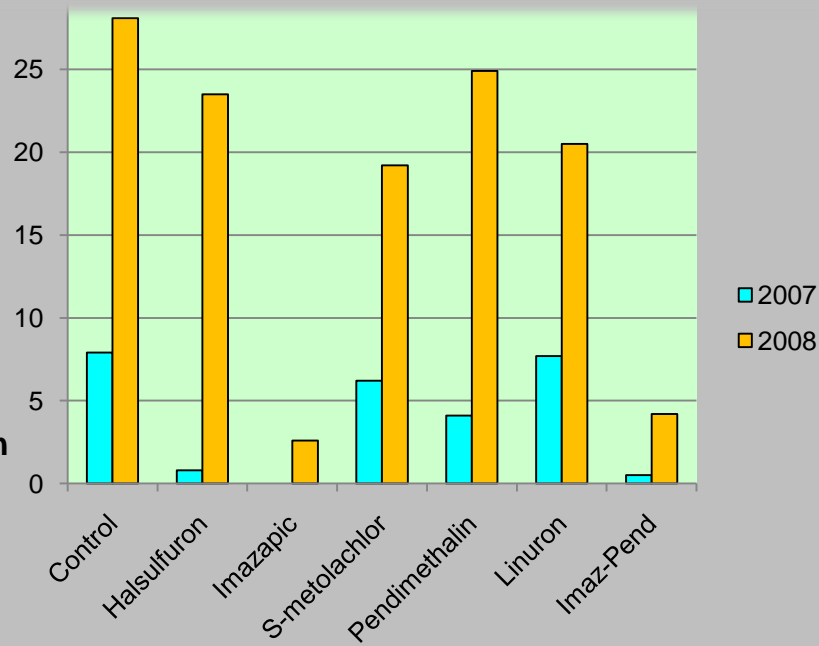
Seed Viability 2007



Plants/sqft



Seed Production Gr/sqft



Conclusions--No Silver Bullet!

- ▶ Timing of herbicide application is critical
- ▶ Potential impacts on pollinators if flowering
- ▶ Long-lived seeded species fairly stable over time
- ▶ Short-lived seeded species decline
- ▶ Flowering & seed set can be delayed
- ▶ Herbicide effectiveness species-specific
- ▶ Seed production improved by YR-3
- ▶ Seed viability mostly not affected
- ▶ TZ seed tests critical but expensive
- ▶ Hand-weeding unavoidable
- ▶ More studies needed in cooperation with chemical companies for supplemental labeling

Bridger PMC Field Day

June 17, 2010

10 a.m. 'till the cows come home

Tours of studies, demonstration plots, field production areas, seed cleaning/seed storage facility, equipment, greenhouse, & more!

