Managing Herbaceous Perennials in the Tahoe Basin's Sensitive Habitats

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Lake Tahoe field study

Background

- Small invasions of perennials in Tahoe Basin
  - Knapweeds
  - Toadflax
  - Perennial Pepperweed
- Herbicides cannot be sprayed in sensitive areas
- Volunteer crews available for field work

Purpose of study

- Quantify if applying herbicide on a cut surface will:
  - Effectively control plants
  - Minimizes environmental impact
- Provide land managers with an effective management option in sensitive areas with large volunteer pools

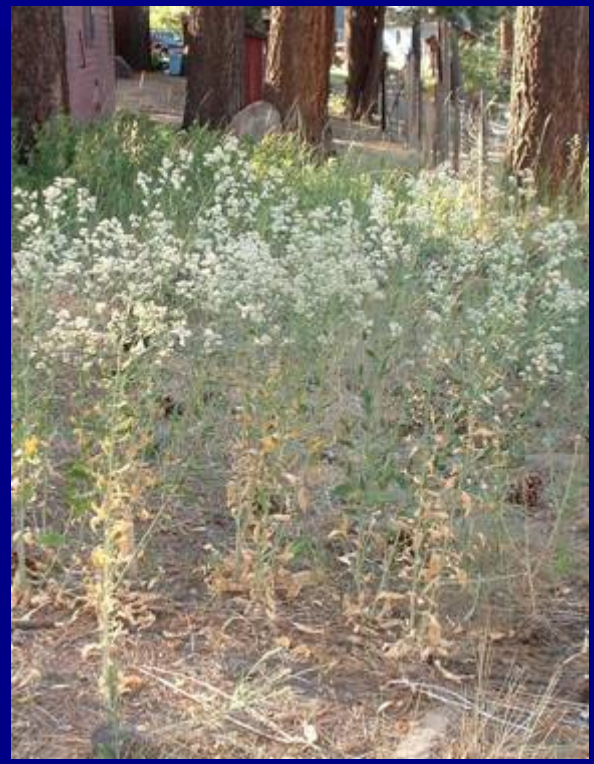
Study Species

Dalmatian toadflax

(*Linaria genistifolia* ssp. *dalmatica*)

Diffuse knapweed

(*Centaurea diffusa*)



Perennial pepperweed/ Tall whitetop

(*Lepidium latifolium*)

Methods evaluated

Klipkleen / Dip & clip

(greenhouse and field)

Cut and drop

(greenhouse only)

Herbicides and rates used

Table 1. Rate of herbicides and active ingredients in the applied solutions

HERBICIDE (ACTIVE INGREDIENT, AI)	FORMULATION[1]	RATE
Telar® (chlorsulfuron)	75% AI	.282 ounces/gallon
Rodeo®[2] (glyphosate)	53.8% AI	38.1%
Roundup®[2] (glyphosate)	41% AI	50%
Transline® (clopyralid)	40.9% AI	25%

[1] There are many brands of herbicides that contain glyphosate, and the formulations may vary from those listed in this column. If the brand of herbicide being used has a different formulation than that listed in the table, adjust your rate accordingly.

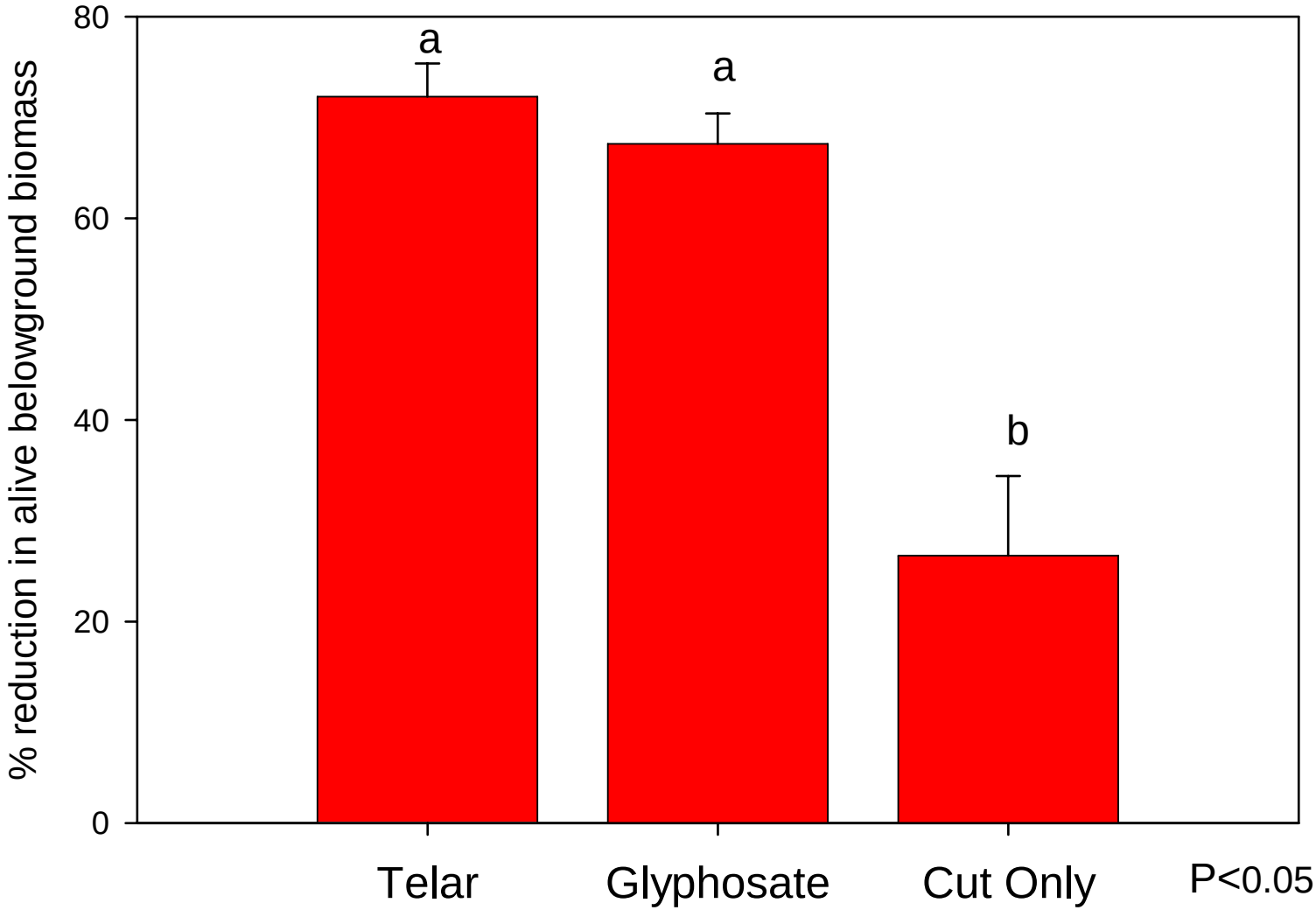
[2] Rodeo is an aquatically labeled brand of the herbicide glyphosate that may be used in or near water according to label directions. Roundup is a terrestrially labeled brand of glyphosate that may not be used adjacent to or in water. Other brands of glyphosate will work as effectively as the two examples provided. Check the label to verify that the formulation and brand is licensed for the location being treated.

Greenhouse study: Perennial pepperweed

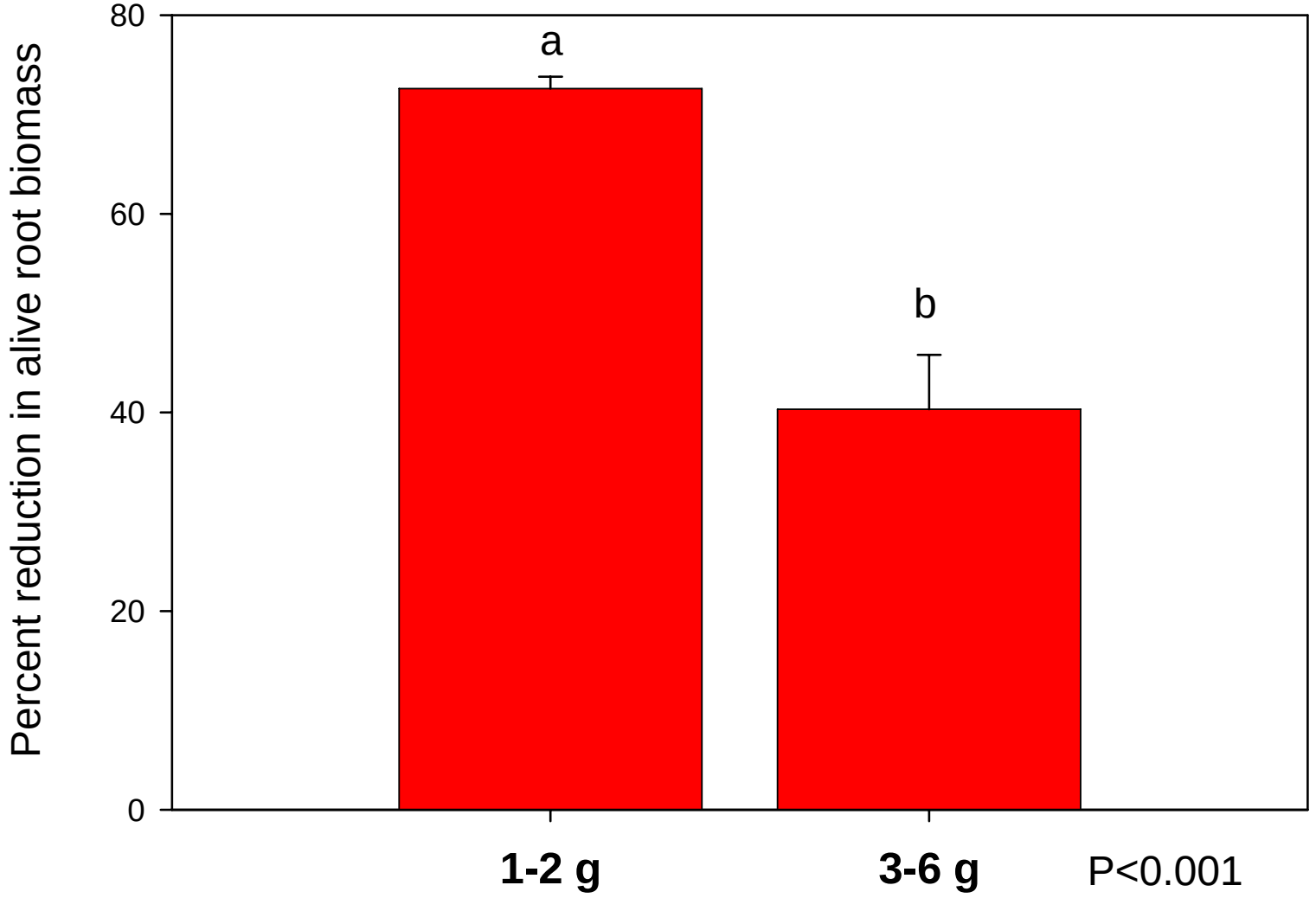
- Methods:
  - Dropper
  - Dipped clipper
- Stage of plant:
  - Flower bud
  - Flowering
- Size of root fragment:
  - 1-2 grams
  - 3-6 grams
- Treatments used:
  - Telar
  - Glyphosate
  - Cut only
  - Untreated control

Results of greenhouse study

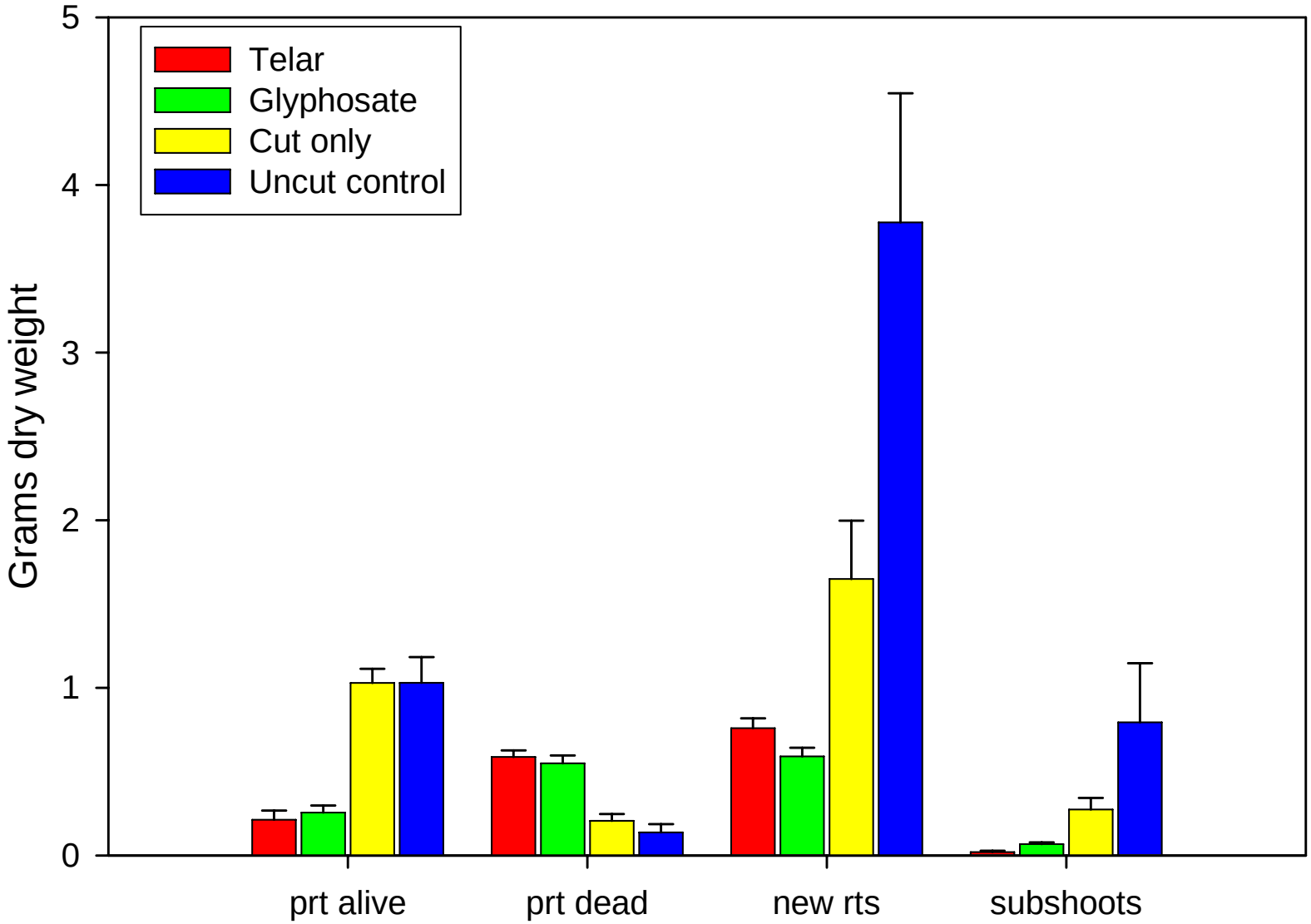
Percent reduction in perennial pepperweed alive belowground biomass
45 days after treatment



Percent reduction in perennial pepperweed biomass
45 Days after treatment



Results of management methods on biomass allocation 45 days after treatment



Field sites

2 perennial pepperweed

Field sites

1 diffuse knapweed

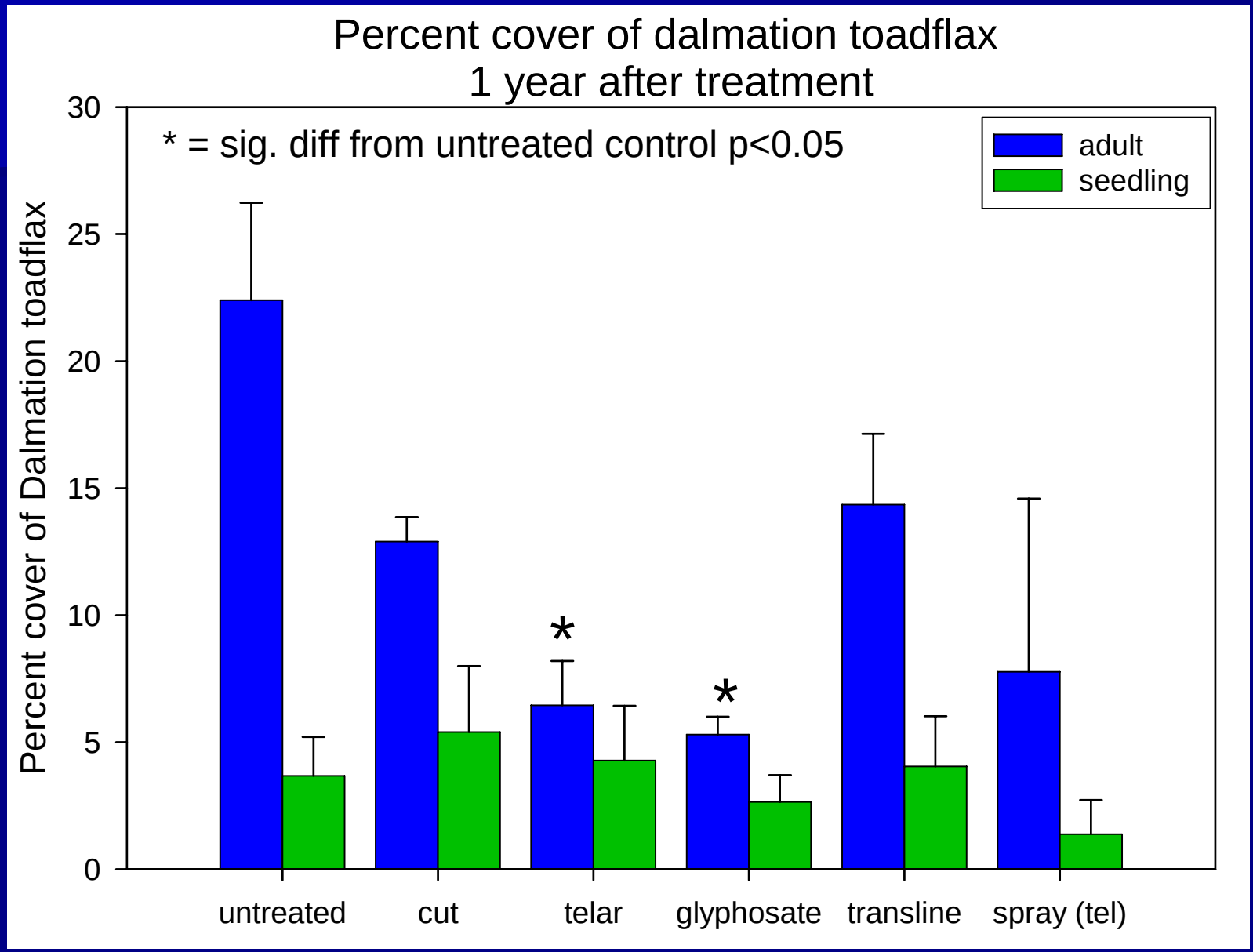
1 Dalmatian toadflax

Data collection

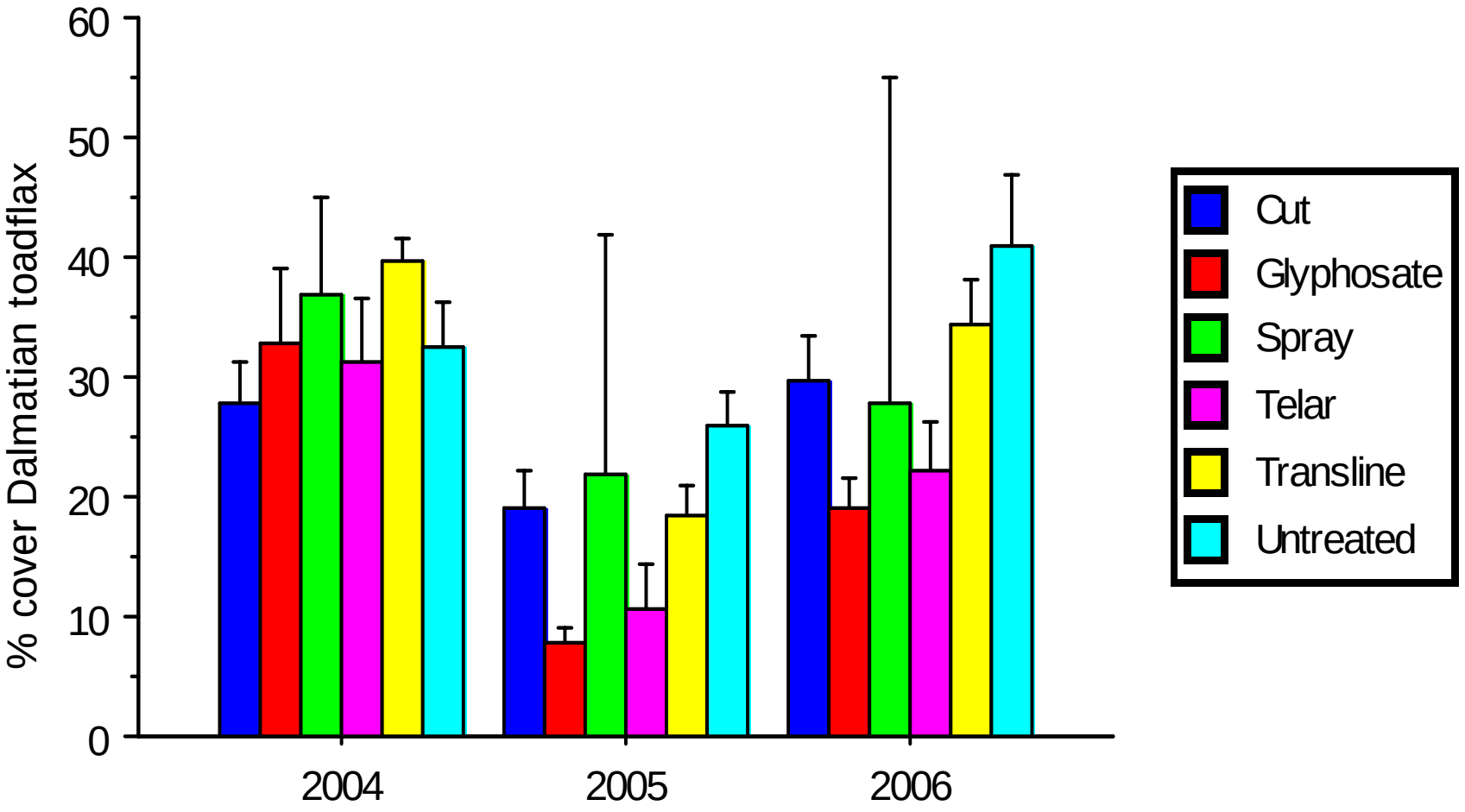
- 5 Replicates/treatment
  - Untreated control
  - Cut only
  - Dip and clip (telar, glyphosate, transline)
  - Backpack spray
- Percent cover of all species in four $1m^2$ quadrats/replicate
- Data collected pre-treatment & 1 yr post-treatment

Dalmatian toadflax

Dalmatian toadflax results



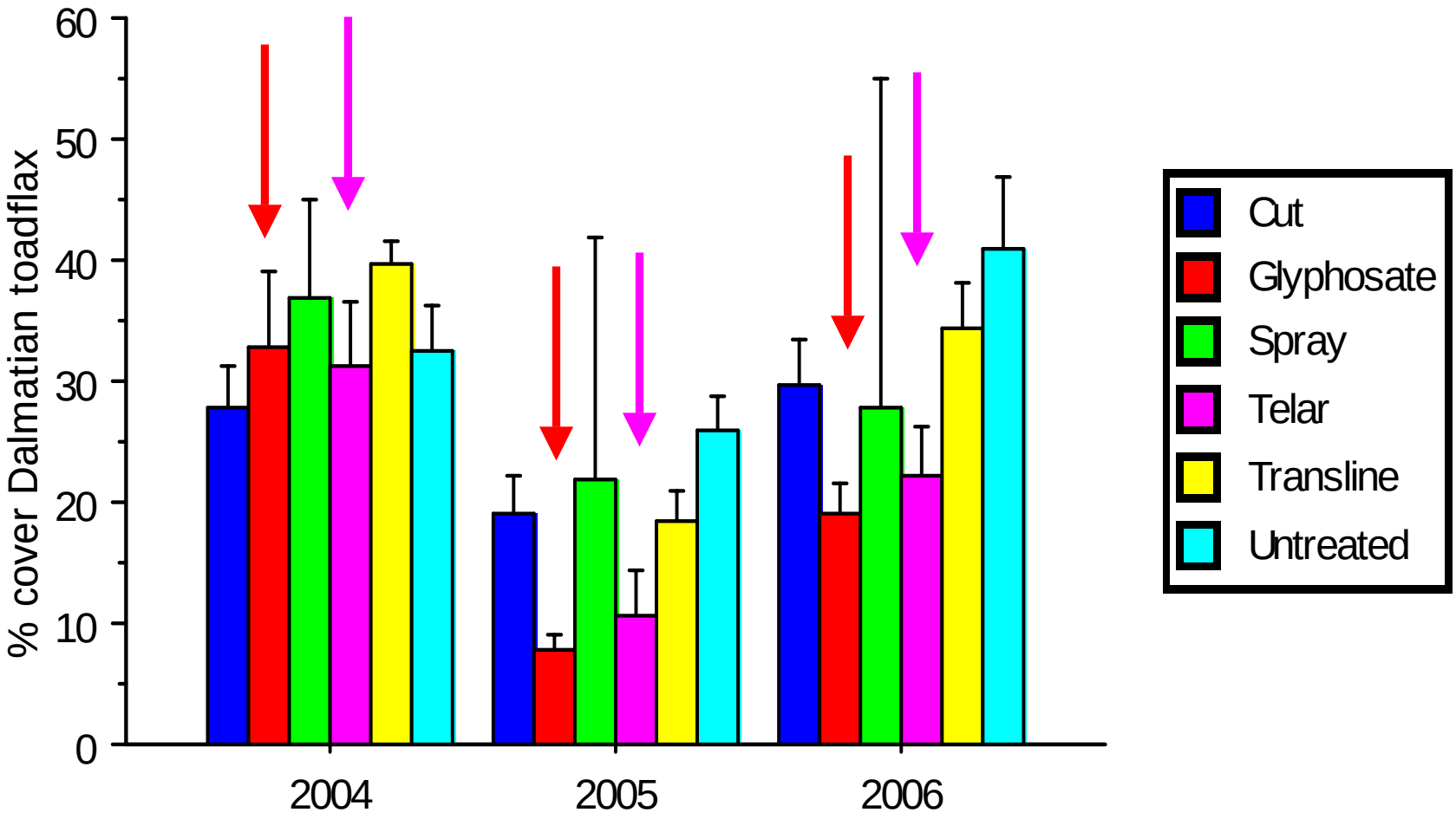
Changes in cover of Dalmatian toadflax over time



Year effect significant ($p<0.001$).

Year*treatment effect barely significant ($p=0.053$ using repeated-measures ANOVA.

Changes in cover Dalmatian toadflax over time



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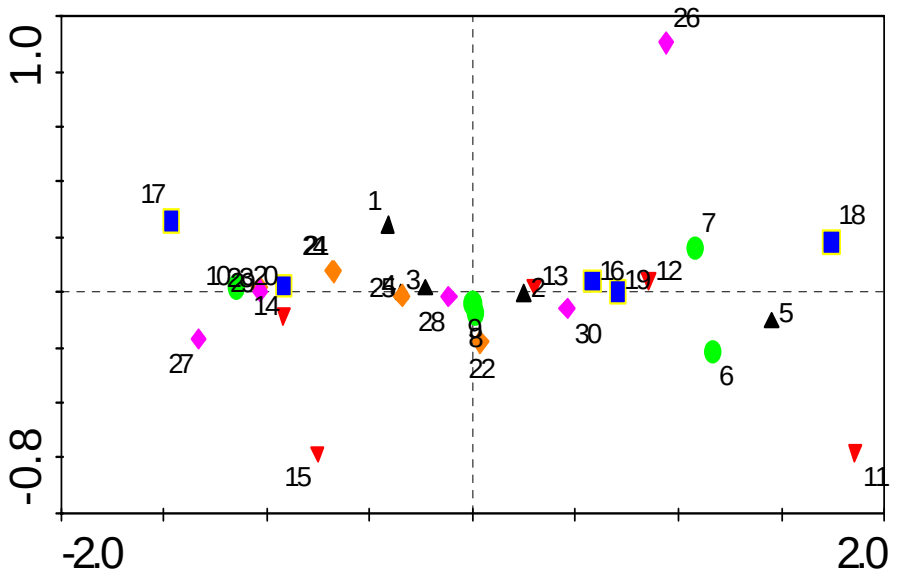
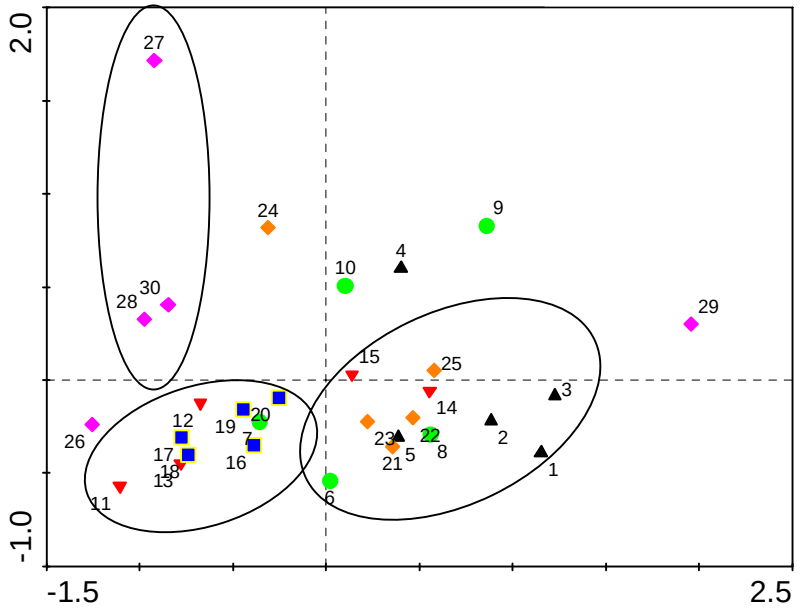
Control with glyphosate & telar

Changes in toadflax community composition after treatment using PCA

2004 **2005**



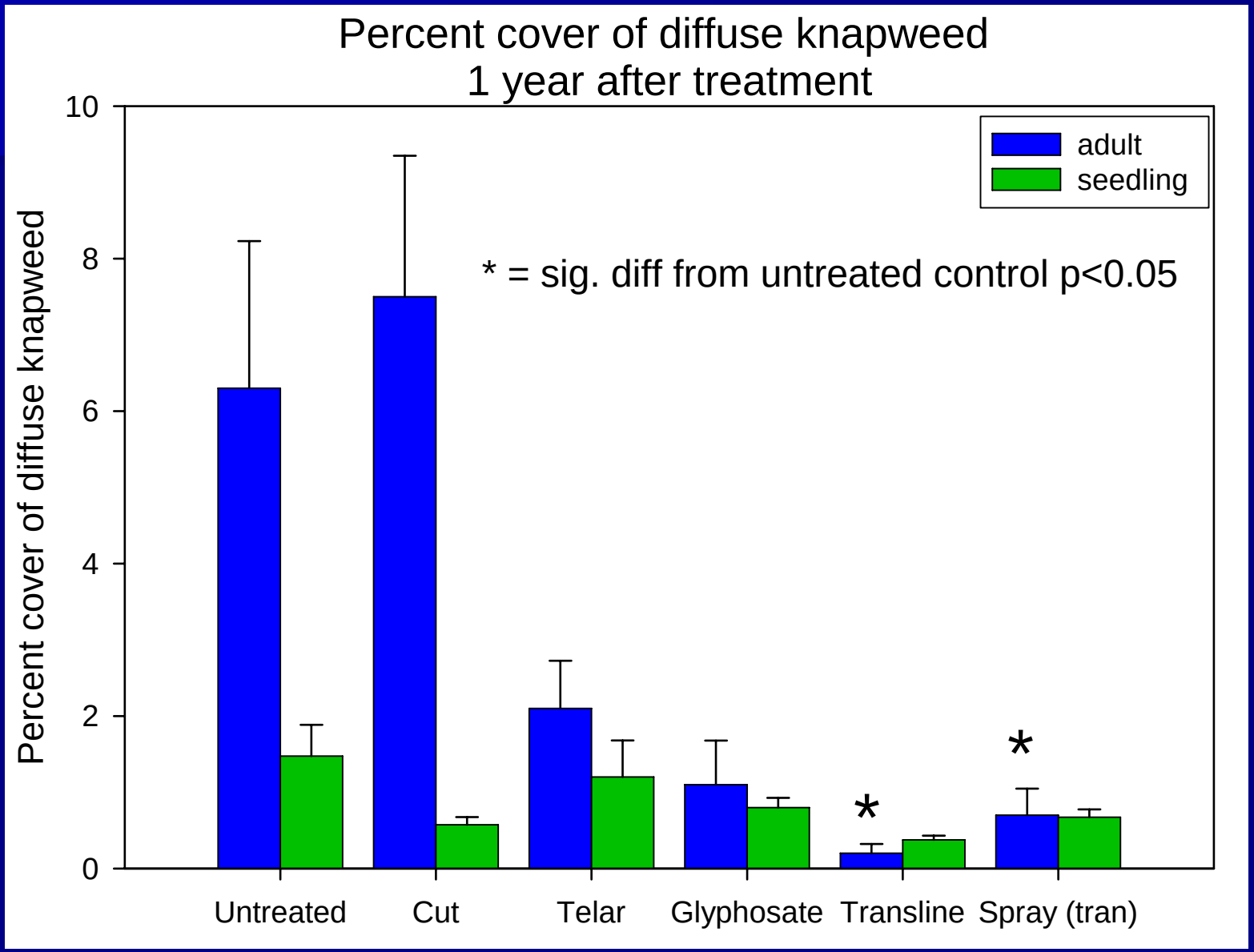


SAMPLES

Untreated Cut Telar Glyphosate Transline Spray

Diffuse knapweed site

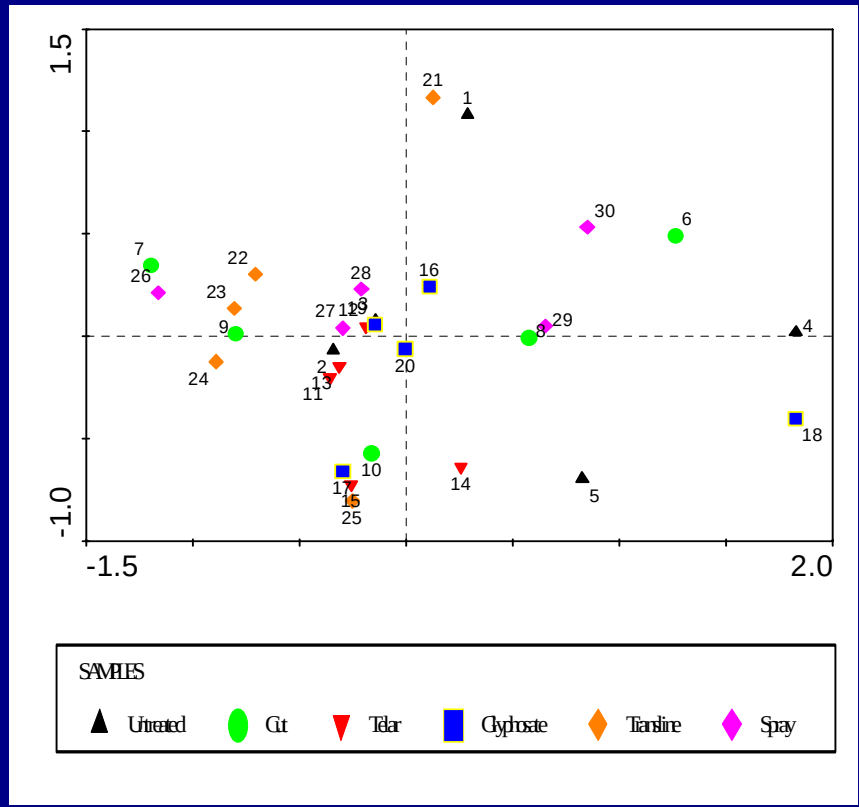
Diffuse knapweed results



Changes in diffuse knapweed community dynamics

- Treatments controlled diffuse knapweed
- Community changes not seen using PCA:
  - Treated plants replaced with bareground and litter
  - Few natives to re-establish

2005 PCA

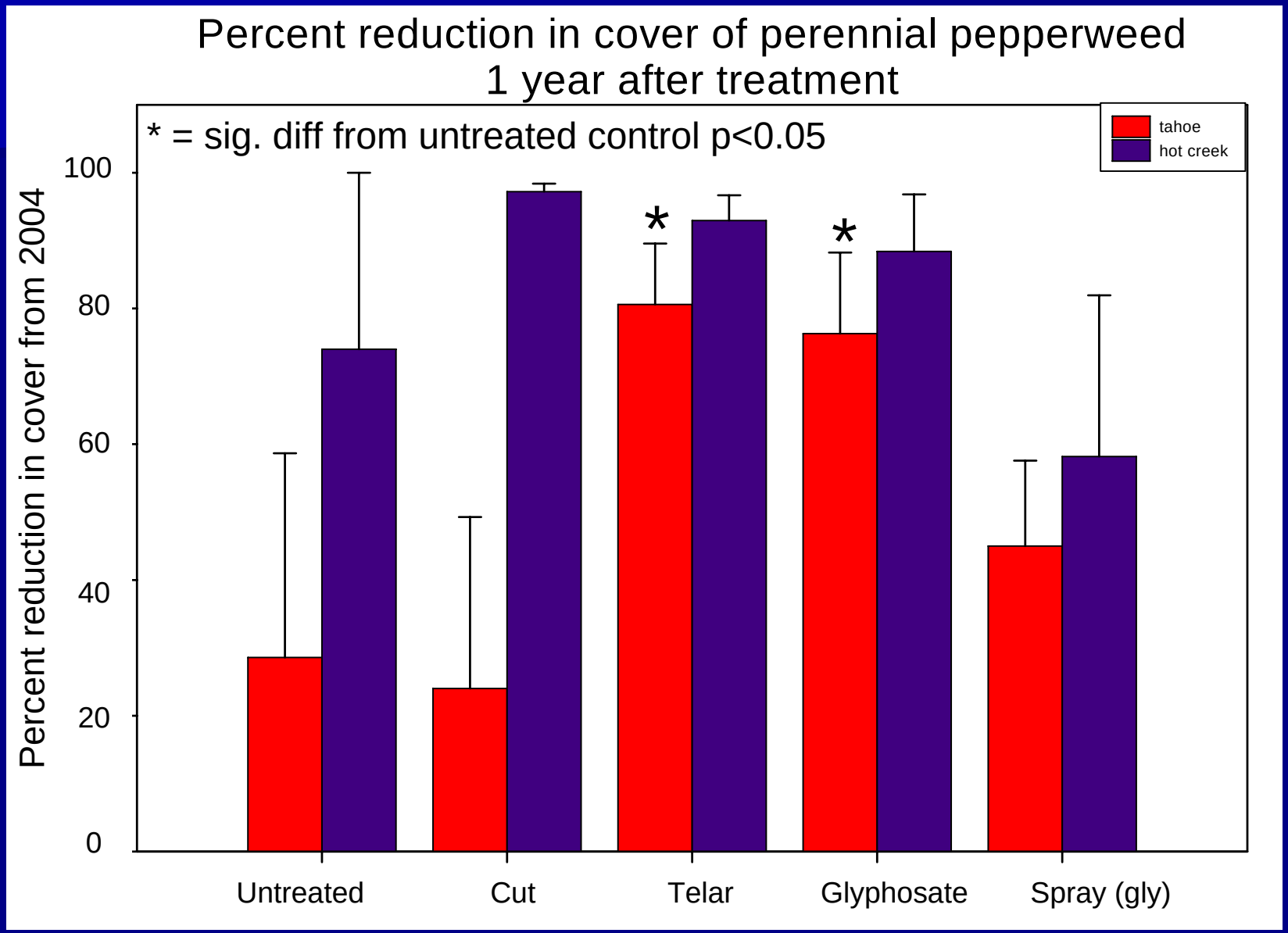


Perennial pepperweed: What happens when it rains?

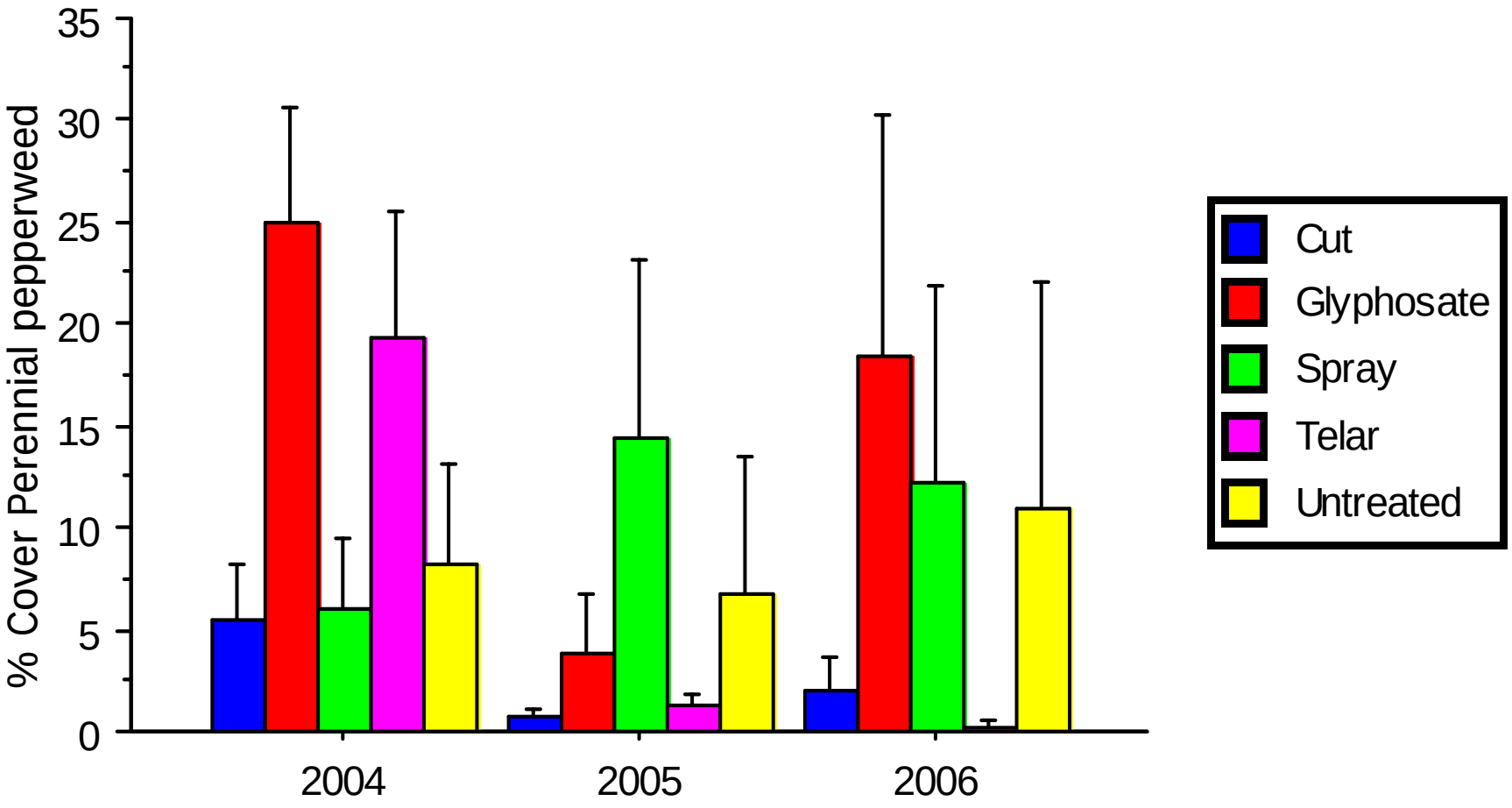
- 2 inches above average rainfall in October 2004 (Carson City, NV)*
- 1.5 inches above average rain/snow in March 2005 (Glenbrook, NV)

* Yearly avg. precipitation in Carson City: 11.8”

Perennial pepperweed results



Changes in cover of perennial pepperweed over time



No significant year or year*treatment effect using repeated-measures ANOVA

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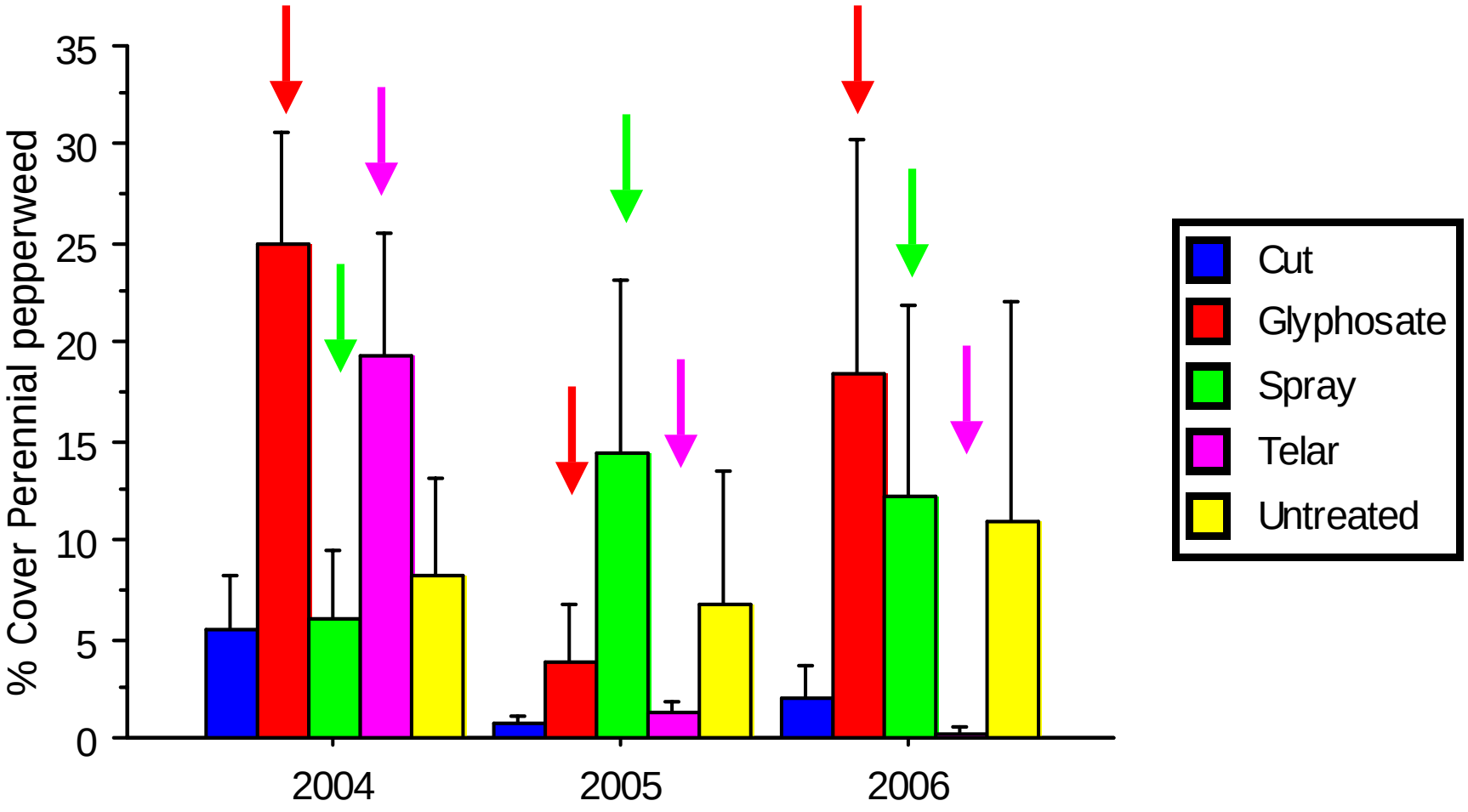

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Sometimes spraying herbicide might help the target species.....

Treatment effects on perennial pepperweed community dynamics

- No changes in plant community dynamics with the treatment of perennial pepperweed in sprayed or dip and clip plots
  - Other factors (rainfall, flooding) outweighed effects of treatment

Conclusion data after one year of treatment…

Table 2. Percent reduction in plant cover one year after treatment

TREATMENT	DIFFUSE KNAPWEED	DALMATIAN TOADFLAX	PERENNIAL PEPPERWEED
Telar® (chlorsulfuron)	91%	81%	80%
Rodeo®[1] (glyphosate)	95%	81%	76%
Transline® (clopyralid)	99%	63%	(not applied)
Spot spray	97%	82%	45%
Cut only	53%	56%	24%

[1] While these are examples of formulated versions of glyphosate, many others are available and work as well as the mentioned brands.

Conclusions

- Treatment **reduces** but does not eliminate future years growth
  - Future management needed for seedlings/resprouts
- Both methods effective
  - If drop falls off reduced control
- Changes in plant community dynamics seen in toadflax site with the dip and clip method. Other sites/species have the potential for similar results.
- Rainfall plays significant role in establishment of plants.

For more information on our study please see University of Nevada Cooperative Extension

Special Publication-06-09

University of Nevada Cooperative Extension

A Precision Method for the Control of Perennial Herbaceous Species in Sensitive Locations

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Susan Donaldson, University of Nevada Cooperative Extension

Introduction

Many of our most challenging invasive and noxious weeds are aggressive herbaceous species that are deeply rooted and highly competitive with native plants (Cal-IPC 1999). They generally tolerate a wide range of stresses, including drought, grazing, burning, and mowing. They frequently invade and establish in areas where management is difficult and effective options are limited. These areas can include sensitive locations such as wetlands, areas along bodies of water, and plant communities with rare or endangered species.

Despite the limited control options available, it is important not to refrain from controlling invasive weeds in these areas, as these areas often provide critical habitat for wildlife and serve as effective buffers to protect water quality. They are often directly linked to waterways or other vectors that aid in subsequent dispersal of weeds.

In many cases, no affordable, effective management methods exist for these herbaceous perennial weeds. As a result, infestations are often left unmanaged, and small infestations increase in size and continue to reproduce, spreading into nearby areas.

The most effective and economical management strategies for these herbaceous perennial weeds typically involve the use of herbicides. Unfortunately, the selection of herbicides registered for use in these sensitive locations is limited.

Applying herbicides directly to freshly cut stems of trees and large shrubs has been a common practice for decades (Kossuth et al. 1978, Malefyt and Macks 1985). Using this method on small, woody species and herbaceous perennials is a recently introduced management tool (Wahlers et al. 1997b). This publication describes a modified version of the cut-and-treat technique that can be used to effectively control certain perennial herbaceous species in sensitive habitats while minimizing impacts to native and desirable plant species and protecting water quality.

A variation of the cut-and-treat method, referred to as the "dip-and-clip" method, was tested on a number of infestations of diffuse knapweed (*Centaurea diffusa*), Dalmatian toadflax (*Linaria genistifolia* spp. *dalmatica*, Figure 1) and perennial pepperweed (*Lepidium latifolium*, Figure 2) in Douglas County, Nevada, and in the Lake Tahoe Basin. The method may be effective on other herbaceous invasive weed species, but no information is currently available to determine potential success.

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http://www.unce.unr.edu/publications/files/nr/2006/SP0609.pdf

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