

Comparing management techniques for controlling Italian thistle

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"Rise Early, Stay Late, and Take Care of the Land"



Figure 1. Coyote Hills East Preserve in Fullerton, CA. Inset is a regional map of the location of the Preserve.

Introduction

The Center for Natural Lands Management is a nonprofit organization that manages over 50,000 acres distributed across 60 preserves in California for conservation purposes in perpetuity. This study is focused on one of those preserves.

The 125 acre Coyote Hills East Preserve (Preserve) was established in 2004 as mitigation for loss of habitat for the federally threatened and state species of concern, the California gnatcatcher (*Poliotia californica*), and the state species of concern, the cactus wren (*Campylorhynchus brunneicapillus*).

During the first year of managing the Preserve, we determined that the extent of distribution and patchy dominance of the non-native Italian thistle (*Carduus pycnocephalus* L.) was a threat to the long-term conservation of coastal sage scrub (CSS). We estimate that Italian thistle covers a total of 5 acres of the preserve.

Negative impacts on various native plant communities in California have been recorded for the Italian thistle and as Italian thistle's impacts (and control) may be closely related to community type, we decided to test a number of management techniques to control it on our Preserve.

Our management goal is to restore the native plant community (i.e. *Artemisia californica*) in areas that have been invaded by Italian thistle and other non-natives.

Objective: To compare several mechanical and chemical methods for their efficacy in reducing seed production of Italian thistle, impact on native vegetation, and costs.

Methods

Study site

- Preserve located in Fullerton, Orange County, CA (Fig 1).
- Selected two sites within the Preserve for their dominance of Italian thistle and other non-natives.

Experimental design

- Each site was divided into 36, 1 m² quadrats.

On half of quadrats, all dead biomass from the previous year's growth was removed prior to the growing season, in January 2006 (Fig. 2).

Tested five mechanical and chemical treatments on control of Italian thistle and effect on other non-native and native plant species.

Within each 18-quadrat block, five treatments and a control were replicated three times.

Treatments consisted of 2% Roundup Pro® applied to basal rosettes, hand-pulling basal rosettes, mowing with 1% thistles flowering, mowing with 5% thistles flowering, mowing with 10% thistles flowering, and no treatment as a control

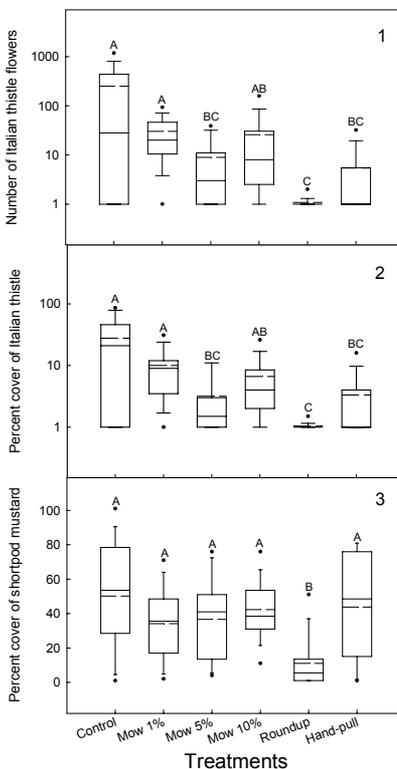


Figure 4. Response of Italian thistle flowers (panel 1), percent cover of Italian thistle (panel 2), and percent cover of shortpod mustard (panel 3) to five mechanical and chemical treatments and an untreated control. Site and biomass removal did not significantly affect treatment outcomes, therefore sites and biomass removal blocks were grouped for this graph. Different letters above each box denote differences among treatments ($\alpha = 0.05$). The boundary of boxes indicate the 25th and 75th percentiles, the solid line within the box marks the median, and the dashed line indicates the mean. Whiskers above and below the box indicate the 90th and 10th percentiles; outlying points are also graphed.



Figure 2. Photographs of a biomass removal plot (down slope) next to a non-biomass removal plot (up slope). Note presence of dense layer of dead thistle stems in non-biomass removal plot in A: January 19, 2006; B: April 27, 2006.



Figure 3. Comparison of treatments on April 6, 2006 (A), the day that hand-pull and herbicide quadrats were treated, and April 27, 2006 (B).

- Herbicide and hand-pulling treatments that needed to be applied to basal rosettes were treated on April 6, 2006, while mowing treatments were applied as conditions required (Fig 3).

Data collection

- Percent cover of all species that occurred in the plots, native or non-native, was measured before treatments were applied to quadrats on April 3, 2006, to ensure there were no differences among treatments present before the treatments were applied. Percent cover of all species and the number of Italian thistle flowers was also measured approximately two weeks after the last mow treatment was applied, on June 14, 2006.

Results

- All treatments decreased the number of flowers and percent cover of Italian thistle compared to the control by at least 66% (Fig 4.1 and 4.2).

- Removing past year's biomass did not improve the efficacy of our treatments, although it did significantly increase the number of quadrats with *Artemisia californica* seedlings (exact binomial test of goodness-of-fit, $\alpha < 0.05$).

- Herbicide was most effective, with a 99% reduction in the number of thistle flowers, regardless of whether or not biomass had been removed. Mowing when 5% of the thistles were flowering was the second most effective with a 97% decrease in the number of thistle flowers, and hand-pulling ranked third in effectiveness, decreasing the number of thistle flowers by 88% (Fig 4.1).

- Percent cover of Italian thistles responded to treatments the same way as the number of thistle flowers (Fig 4.2).

- Shortpod mustard (*Brassica geniculata*) was the only other non-native plant affected by our treatments (Fig 4.3). Application of herbicide decreased the percent cover of mustard by 80%.

- Not only was application of herbicide significantly more effective in reducing thistle flowers and percent cover, it was also less expensive than hand-pulling. Hand-pulling took an average of 4.16 min/m² to treat, while applying herbicide only took 0.83 min/m². At a cost of \$15/hr for labor, plus the cost of herbicide, one would save \$0.33/m², or \$332/hectare, by treating with herbicide.

Management Implications

- After one year of treatment, we will be expanding this study to larger plots and will implement the three most effective treatments in this follow-up study (mow at 5% flowering, 2% Roundup Pro®, and hand-pulling). This year was a dry year and we estimate that the population of Italian thistle at Coyote Hills East Preserve was about half of what it was in the extremely wet year of 2005. A second year of study is needed because our results likely do not reflect how Italian thistle populations would respond after treatment in a wet year.

- In non-study areas, we will be treating Italian thistle with herbicide to prevent further degradation of the sensitive sage scrub habitat. Furthermore, we will be removing dead biomass from areas that we treat to promote natural recovery by native species such as *A. californica*.