# Coastal Prairie Restoration Research
# 2003-2004 Progress Report

Prepared For:
Elkhorn Slough Foundation

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## INTRODUCTION

During the 2003-2004 growing season, the Elkhorn Slough Foundation provided financial support for ongoing research at the Porter Ranch on the effects of varying disturbance regimes on the coastal prairie plant community and the Santa Cruz tarplant. This report summarizes the work accomplished and the resulting data for that time period.

## METHODS

We continued the sixth year of our disturbance treatments at the research site, which is one of three sites where the experiment is being conducted. The other two sites are located at UC Santa Cruz and the Swanton Pacific Ranch (in northern Santa Cruz County). The treatments are summarized in Table 1; there were three replicates of each treatment at each site. Because the soil disturbance treatment is costly and has shown no effects to date, beginning in this sixth year, we maintained these plots merely with clipping and vegetation removal. A map of treatments is included in Appendix 1 and a map of the layout of individual plots is included in Appendix 2.

A full discussion of the methodology of the experiment is included in a copy of Grey Hayes' dissertation, which has been provided to the Elkhorn Slough Foundation.

## RESULTS

### *Vegetation Community*

We continued to document trends noted in previous years, and, for the second year in a row, documented the trend of declining native perennial grass abundance in untreated plots. Native perennial grasses are nearly gone from these plots at this point. As with previous years, there were no effects of the secondary treatment of litter accumulation on any plant guild.

In prior years, we noted that more frequent clipping decreased exotic grass abundance while increasing exotic forb abundance. This trend continued in 2004 at Elkhorn (Figs. 1a and b). The Porter Ranch site had the most abundant native grasses at the outset of the experiment; this abundance decreased with time in the untreated plots until, for two years in a row, there was a statistically significant difference between this and all other treatments (Fig. 2).

As with prior years, the litter removal treatment did not increase the amount of bare soil or affect the vegetation community (Fig. 3).

### *Santa Cruz Sunflower*

Although some seedlings recruited from prior years' planted Santa Cruz sunflower (*Holocarpha macradenia*) seedlings, none of these recruits made it to the flowering stage.

This is a major change from the first 4 years' results and continues the results from the previous year.

## DISCUSSION

### *Vegetation Community*

Our results continue to demonstrate that frequent mowing (every other month or every month) can reduce the abundance of exotic grasses. This is significant as competition with these species is often cited as a major factor in the decline of native grassland flora. Interestingly, the grazing treatment is not as efficacious at reducing exotic grasses, probably because of the patchiness of grazing and/or the addition of nitrogen from animal manure and urine.

Conversely, more frequent clipping increased exotic forb abundance. The exotic forbs at the Porter Ranch site are mostly short-statured species that may thereby avoid damage from clipping and benefit from increased light levels in the clipped treatments. None of the exotic forb species at the site have been documented as important competitors with impacts on native plant species.

Although there was a trend of decreasing abundance of native grasses in untreated plots in prior years, this and last year's results suggest that native grasses may disappear without canopy-reducing disturbance. This result confirms anecdotal accounts that native grasses decline in the absence of management in the region's coastal prairies as well as prior research showing that the dominant perennial grass (California oatgrass, *Danthonia californica*) at the site benefits from grazing. California oatgrass is a low-statured perennial grass that may be less competitive in the taller canopied community that results when an area is not grazed or mowed. This species, however, is known to be highly long lived, so we do not know whether the species is dying or just reducing its cover in the untreated plots; it may also maintain a viable population in the seed bank for some time in these plots.

### *Santa Cruz Sunflower*

The causes of lack of recruitment of Santa Cruz sunflower (*Holocarpha macradenia*) remain a mystery. Natural populations of the species had an average or above average year of adult plant numbers. Early observations at the Porter Ranch site located a few seedlings in numerous plots, but these plants were not able to flower and set seed.

### *Management Recommendations*

The results of this research indicate the importance of clipping or grazing for the continued maintenance of native grasses at the Porter Ranch site. Cessation of such disturbances may result in the decline of abundance of native perennial grasses and an increase in exotic grasses.

The only recommendation that we can make based on the results with our work with the Santa Cruz sunflower in this past season is that further work is needed to predict translocation areas or methodologies for the species.

## FUTURE RESEARCH

We plan to continue the treatments and vegetation monitoring for at least two more years with funding from the Elkhorn Slough Foundation. In the near future, Dr. Holl and a graduate student at UCSC will do further analyses of the Holocarpha data to try to determine the cause of low numbers of Holocarpha seedlings recruiting from year to year.

Table 1: Experimental disturbance regimes utilized at the Porter Ranch research site.

| Primary Disturbance Regime | Secondary Disturbance Regimes | | |
|---|---|---|---|
| Vegetation Clipping | Litter | Rake | Soil Disturbance |
| 2x/year: April/September | + | + | + |
| 3x/growing season | + | + | + |
| 6x/growing season | + | + | + |
| Control | + | | |

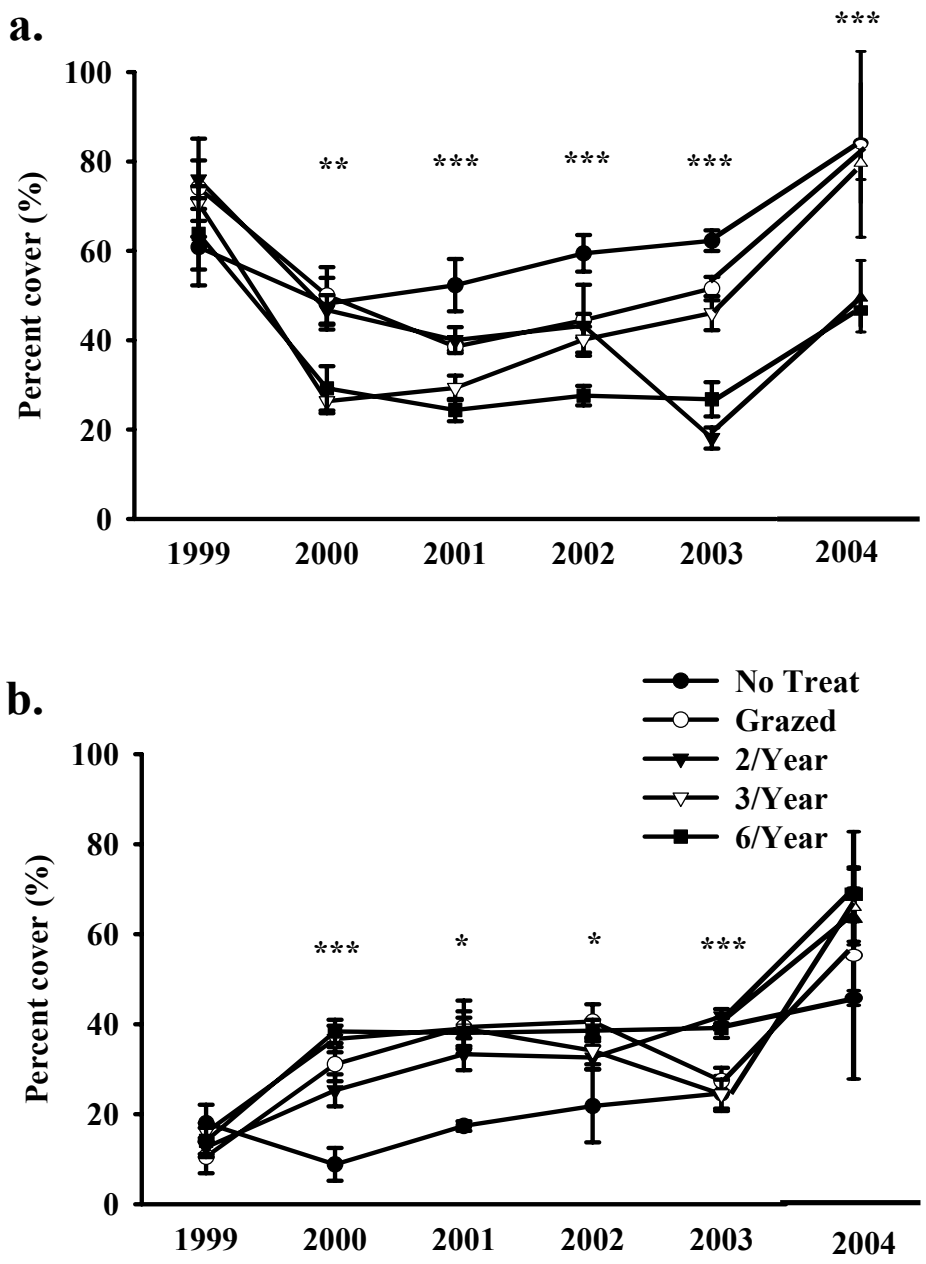



Figure 1: Relative percent cover of a) exotic grasses and b) exotic forbs over time at the Porter Ranch site. Error bars indicate 1 se; n = 3 for no disturbance and grazed plots, n = 9 for other treatments. * = $p<0.05$, ** = $p<0.01$, *** = $p<0.001$ based on ANOVA.

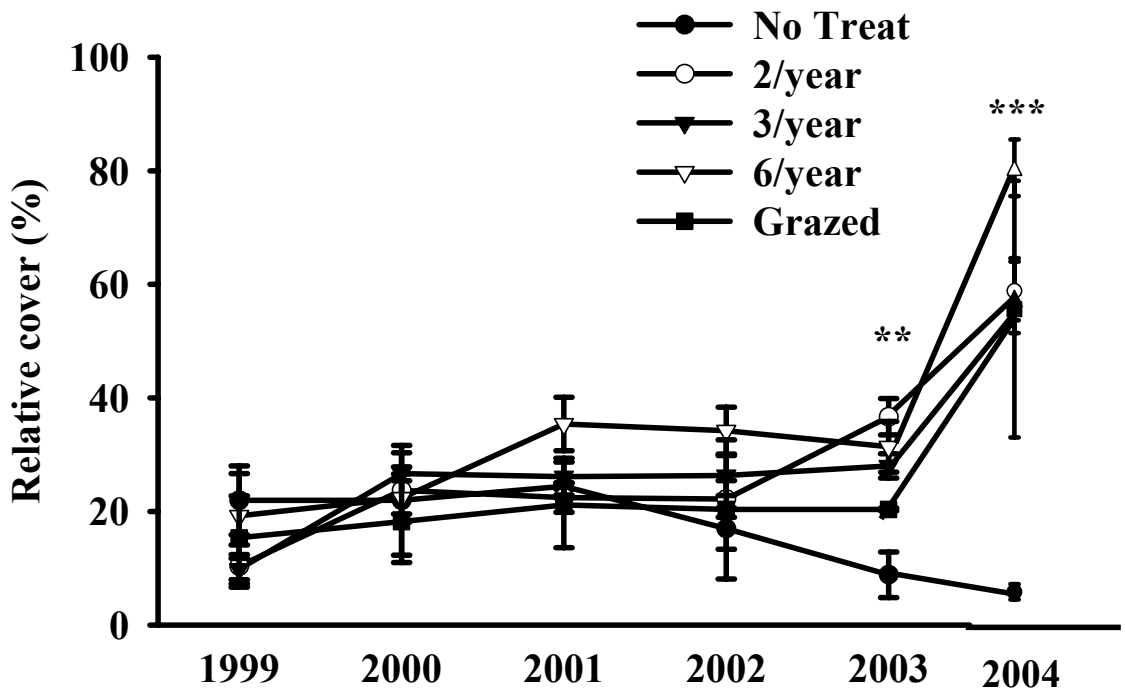



Figure 2: Relative percent cover of native grasses at the Porter Ranch site. Error bars indicate 1 se; n = 3 for no disturbance and grazed plots, n = 9 for other treatments. ** = $p<0.01$ based on ANOVA.

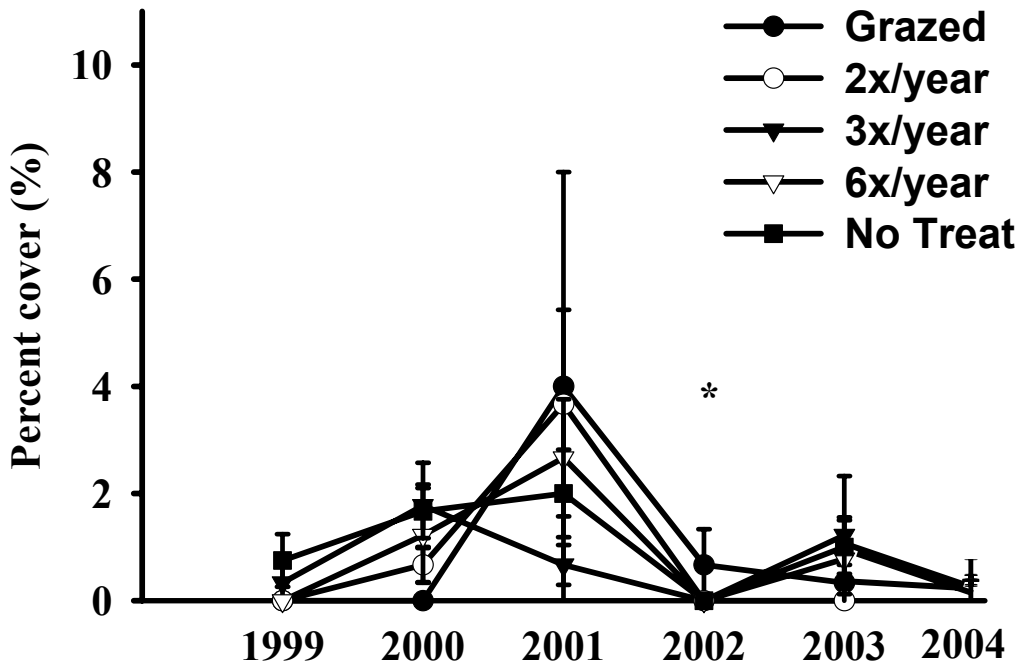



Figure 3: Percent cover of bare ground at the Porter Ranch site. Error bars indicate 1 se; n = 3 for no disturbance and grazed plots, n = 9 for other treatments.
* = $p<0.05$ based on ANOVA.

**APPENDIX 1: Experimental plot layout: Porter Ranch site**

CL1: Clipped April/September CL2: Clipped Jan/March/May CL3: Clipped Jan-June
LL: clipped vegetation remains RE: clipped vegetation removed SD: clipped vegetation removed, soil disturbed with artificial hooves (@ 8 stomps/$m^2$)

Extra plots mowed with mower, vegetation removed as needed
"Cont" plots no disturbance since September 1998
There are 3 grazed plots outside of fence, @ 15 meters distance as noted:
GRAZED 1: below CL3 RE3; GR. 2: left of EXTRA 5; GR. 3: left of CL3 SD 2

Elev. 63' (~19M) 36 degrees 52' 4.3"N 121 degrees 44' 23.8"W

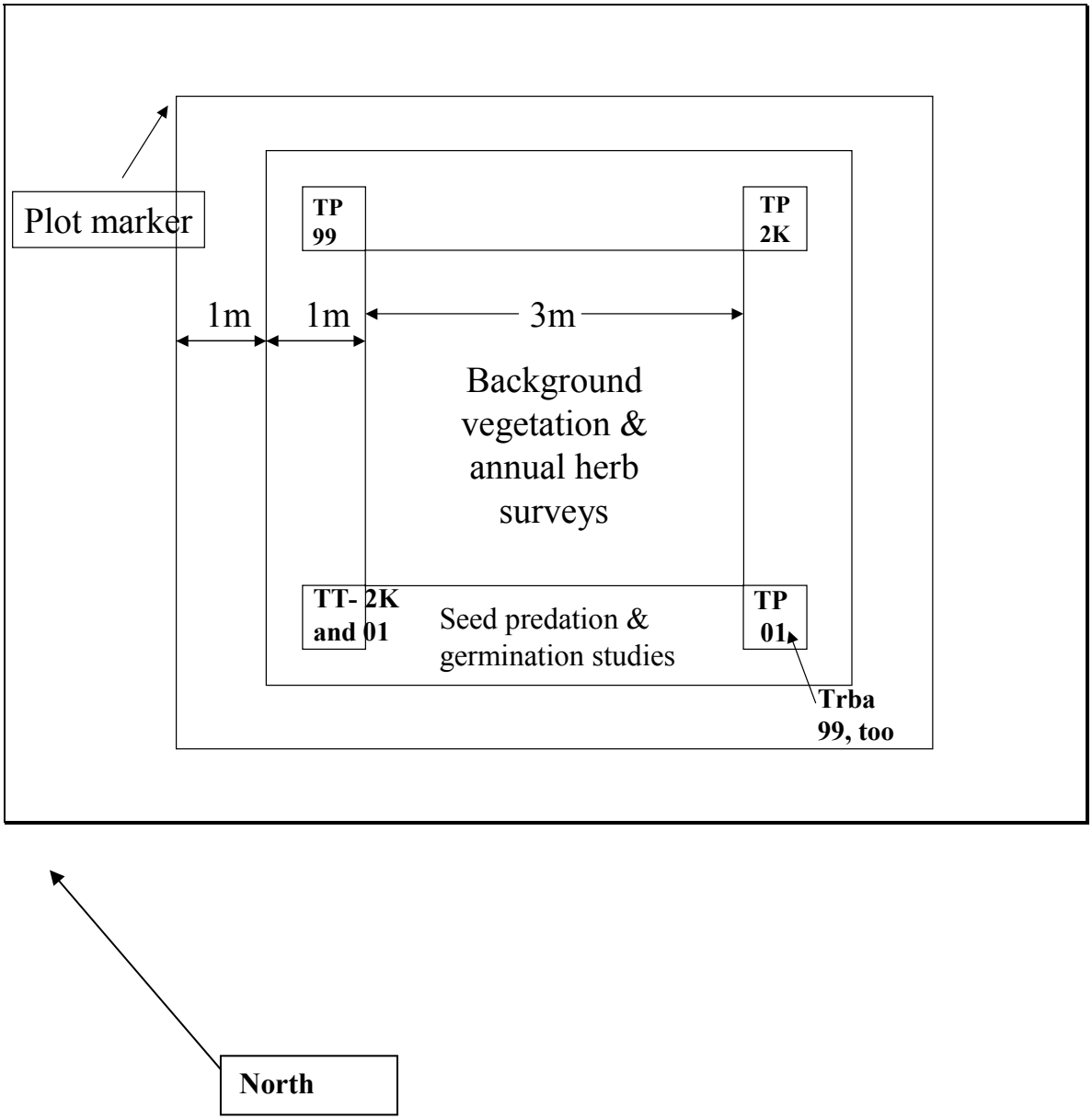
| | | | | | |
|---|---|---|---|---|---|
| EXTRA 1 | CL2 RE 1 | CL3 SD 1 | EXTRA 2 | CONT 1 | CL1 SD 1 |
| CL3 SD 2 | EXTRA 3 | CL1 RE 1 | CL1 LL 1 | CL3 SD 3 | CONT 2 |
| CL3 RE 1 | CL3 RE 2 | EXTRA 4 | CL1 RE 2 | CL2 SD 1 | CL3 LL 1 |
| CL2 SD 2 | CL3 LL 2 | CL2 LL 1 | CL1 RE 3 | CL2 LL 2 | CONT 3 |
| CL2 LL 3 | CL1 SD 2 | CL2 RE 2 | CL3 LL 3 | CL1 SD 3 | CL2 RE 3 |
| EXTRA 5 | CL3 RE 3 | CL1 LL 2 | CL1 LL 3 | EXTRA 6 | CL2 SD 3 |

DOOR

North

**APPENDIX 2**: Plot layout of research plots at the Porter Ranch site.

Plots are 7m x 7m each. "TP" stands for Santa Cruz Tarplant (*Holocarpha macradenia*). "TT" stands for Tidy Tips (*Layia platyglossa*). "Trba" stands for bearded clover (*Trifolium barbigerum*). Where these species' abbreviations are indicated in a box (or an arrow to a box), we planted 25 seedlings in the year indicated. We have data on all but the Trba for each year following. The TP has recruited in nearly every plot in every year following.



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