

# Management and Restoration of California's Coastal Prairie

## A Case Study in Coastal Prairie Restoration Woods Cove Development, Graham Hill Road Santa Cruz, California

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## Coastal Prairie Conservation Easement Management (1998 through 2003)

### Project Location and Description

- The Woods Cove Development (previously known as Graham Hill Showgrounds) includes a 20-acre conservation easement for the enhancement and preservation of coastal terrace prairie. Much of the easement is visible from Graham Hill Road. The easement is located in the County of Santa Cruz along Graham Hill, extending northward from Mosswood Avenue to near Sims Road.
- 60 residential lots have been developed in forest habitat and about one acre of coastal prairie. Mitigation includes managing a Coastal Prairie Conservation Easement and implementing a habitat mitigation plan.

## Habitat Mitigation Plan

Prepared by The Habitat Restoration Group June, 1995

### Mitigation Measures:

- 1) **Mowing Program**
- 2) **Control of Invasive Non-native Plants**
- 3) **Revegetation** of 0.9-acre non-native grassland with plant species representative of coastal terrace prairie.  
Performance Criterion Established for Revegetation Area  
55% vegetative cover of native plant species by the Spring Year 5.
- 4) **Monitoring**  
Short-term monitoring for 5 years and long-term monitoring Year 6 through Year 15. 2004 represents Year 7.
- 5) Annual photographs in spring and summer from established photo stations.
- 6) **Reporting**  
Annual reports Years 1 through 5, then every other year during Years 7 through 15

## Invasive, Non-Native Plants Being Controlled

Black Acacia	<i>Acacia melanoxylon</i>
Bull Thistle	<i>Cirsium vulgare</i>
Cat's Ear	<i>Hypochaeris</i> spp.
Cotoneaster	<i>Cotoneaster</i>
English Ivy	<i>Hedera helix</i>
French Broom	<i>Genista monspessulana</i>
German Ivy (Cape Ivy)	<i>Senecio mikanioides</i>
Himalaya Berry	<i>Rubus discolor</i>
Kikuyu Grass	<i>Pennisetum clandestinum</i>
Mediterranean Clover	<i>Trifolium angustifolium</i>
Poison Hemlock	<i>Conium maculatum</i>
Radish	<i>Raphanus sativus</i>
Rattle Snake Grass	<i>Briza maxima</i>
Ripgut Brome	<i>Bromus diandrus</i>
Slender-flowered Thistle	<i>Carduus tenuiflorus</i>
Velvet Grass	<i>Holcus lanatus</i>
Yellow Dock	<i>Rumex crispus</i>

## French Broom Removal Initial Large-scale Effort 1998

- 19 crew days with NREP – average of 5-man crew.
- Hand-pulling and weed wrenches.
- Burn permit obtained to burn removed material.
- Follow-up patrols and removal still continue.
- Winter and early Spring best time for controlling broom and many other exotics. When soil is wet and before the flowers have set seed.



French broom infestation before removal efforts  
1998

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Same area after 2 years of removal efforts  
2002

## Field Testing

### Tractor Scraping in 1999

- Approximately 0.25 acre of the Revegetation Area was scraped in Fall 1999. This area was observed to be composed primarily of ryegrass (*Lolium* spp.). A Kubota 4-wheel drive tractor, Model L3250 with a mounted scraper box was dragged along the grassland surface until the soil surface was exposed. The surface was scraped to skim off the thatch, vegetation and about one inch of top soil.
- **Treatment after Scraping.** The area was hand seeded in Fall 1999 with a site-collected seed mix. The seed mix was stomped into the ground to improve seed to soil contact. In subsequent years, the area has also been planted with container stock.
- **Scraping Results:** Lower cover of ryegrass, and an increase in native vegetation.



Tractor scraping in portion of revegetation area  
Fall 1999



Ground surface after scraping

## Field Testing (continued)

### Thatch Removal Plots in Santa Cruz Tarplant Population Areas

- Repeated thatch removal in the same plots (50 feet by 50 feet) was conducted in Fall 2001, Fall 2002, and Fall 2003. Thatch rakes with special curved tines were used to remove grass thatch in the Santa Cruz tarplant population areas (both current and historical). Thatch was removed until the grass layer was thin, partially exposing the soil surface.
- Preliminary data and observations support the idea that thatch removal has a positive effect on population size of Santa Cruz Tarplant, and also has increased the proportion of native plant species.
- Santa Cruz Tarplant has still not been observed in the two historical population areas south of Deer Path Road.



Close-up of thatch removal plot

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## Burning – Prescribed and Accidental

- **French Broom Piles 1998.** Large piles of pulled French broom were burned in April 1998 adjacent to the Santa Cruz tarplant population northwest of Deer Path Road. A firebreak made with MacClouds scalped the surface soil around the burn pile. In late Spring 1998, tarplant seedlings were observed growing in the scalped areas of the firebreak.
- **San Francisco Popcorn flower** – A new population area was observed in Spring 2000 in an area, where a French broom pile was burned in 1998. Note two year time delay.
- **Accidental Fire September 2002.** The ground fire area included the Santa Cruz Tarplant population area near Deer Path Road.



French broom pile with fire break  
1998



Burning of broom piles  
Crew had backpack sprayers with water  
1998



Accidental fire near Deer Path Road in Santa Cruz tarplant area  
September 2002

## Mowing Program

- **Mowing is conducted twice in spring (May & June) and then again the following fall.** According to the Habitat Management Plan prepared by the Habitat Restoration Group in 1995, no mowing is allowed in summer so that the native plants may set seed. The tractor mounted mower leaves approximately 6 to 8 inches of standing material after mowing, which lessens damage to native perennials.
- **A Kubota 4-wheel drive tractor, Model L3250** was used to perform each mowing event.
- The mowing program has helped to reduce competition between the native coastal prairie native plants and non-native plant species.

## Revegetation Techniques- 0.9 Acre Revegetation Area

### Plant Salvage And Transplant

- A portion of the native plants for the revegetation area were salvaged from prairie lost to development such as the prairie by the entrance road. Salvaged species include the following perennials: soap plant, California oatgrass, suncups, grindelia, blue-eyed grass, Gairdner's yampah, and purple needlegrass.
- **Propagule Collection:** seed, cuttings, plant divisions (California oatgrass), blackberry cuttings.
- Planting native container stock.
- Pest control (gophers and slugs).

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Plant salvage area where entrance road to be developed

## Clearing Of Planting Areas/Patches

- Purpose of clearing was to reduce competition between the non-native vegetation and the native plantings.
- 5-6 foot diameter patches in the non-native vegetation were cleared for planting native container stock.
- On-going weeding concentrated near planting areas, including velvet grass, rippgut brome, sheep sorrel, Mediterranean clover, ryegrass, wild oat, English plantain, rattlesnake grass, and cat's ear.



Revegetation area with cleared patches of native plantings



Gopher damage in revegetation area

## Monitoring Methods for the Revegetation Area

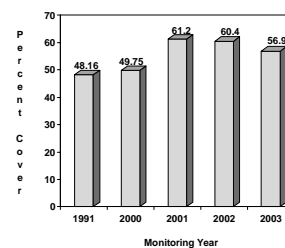
### Stratified Random Design of Belt Transects:

- Eight line transects 75 feet apart (strata) had 20 Belt transects randomly placed along them.
- Twenty belt transects were established in Spring 1999.
- Belt Transect Size 20 feet by 10 feet.
- Sample size about 10% (4,000 square feet of the approx. 0.9 acre). Data were collected and analyzed in 1999, 2000, 2001, 2002, and 2003.
- Visual estimates of vegetative cover according to plant species.
- Average vegetative cover of all native species for all 20 belt transects was determined for each sampling year.

### Results of Vegetation Sampling

- Cover of native plants compared to desired performance criterion.
- Criterion of 55% native cover was met in 2001, 2002, and 2003.

## Average Vegetative Cover Native Species Belts 1 to 20



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## Santa Cruz Tarplant Census Data and Trends 1998 through 2003

Overall, there has been an increasing trend in population size in the population area northwest of Deer Path Road in part due to thatch removal and burning.

### Approximate Number of Individuals

Census Year	Population SW of Sims Road	Population NW of Deer Path Road
1998	450 to 500 plants	250 to 300 plants (burn 4-98)
1999	175 to 225 plants	210 to 270 plants
2000	125 to 150 plants	350 to 400 plants
2001	175 to 200 plants	350 to 400 plants
2002	125 to 150 plants	400 to 450 plants
2003	325 to 350 plants	550 to 600 plants (burn 9-02)



Soap plant (*Chlorogalum pomeridianum*) and Johnny jump-up (*Viola pedunculata*)



San Francisco popcorn flower (*Plagiobothrys diffusus*)



Gumplant (*Grindelia* sp.)



Shooting star (*Dodecatheon clevlandii*)



Narrow-leaved mule ears (*Wyethia angustifolia*) and Coast trefoil (*Lotus formosissimus*)

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Suncup (*Camissonia ovata*)

## Conclusion

### Important Components of a Habitat Mitigation Plan

1. Realistic Performance Criteria based on research of desired habitat.
2. Provide monitoring specifications that document habitat changes annually, such as repeat photos from fixed photostations and vegetation sampling design.  
  
The design should include a random component for areas sampled. Sample size should be large enough to reflect site conditions.
3. Include provisions for adaptive management, such as extending the length of long-term monitoring, if performance criteria have not been met.
4. Revegetation techniques should require use of site-collected propagules (seeds, cuttings, etc.) in order not to dilute/contaminate the local gene pool.
5. If sensitive plant species (special status species and listed species) occur at the mitigation site, they should be censused annually.