



# Correlation Between Weed Control Techniques, Cost and Habitat Restoration Success: Two Case Studies

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The majority of undeveloped open space left in Southern California contains degraded habitat that is commonly dominated by non-native vegetation. The primary goal of habitat restoration is to contain and eventually diminish the weed population, providing resources required to establish native habitat. In addressing this goal, various methods of weed control can be utilized during the restoration process. These techniques differ on many levels; equipment, cost of labor, methodology, and managerial oversight are all components that require attention in the development of restoration projects and budget plans. Two independent restoration projects, implemented by the Palos Verdes Peninsula Land Conservancy, consisting of coastal sage scrub and riparian habitats, will be analyzed. A comparison of weed control techniques, cost of implementation, and success of habitat restoration will be conducted for two sample areas within each habitat type.



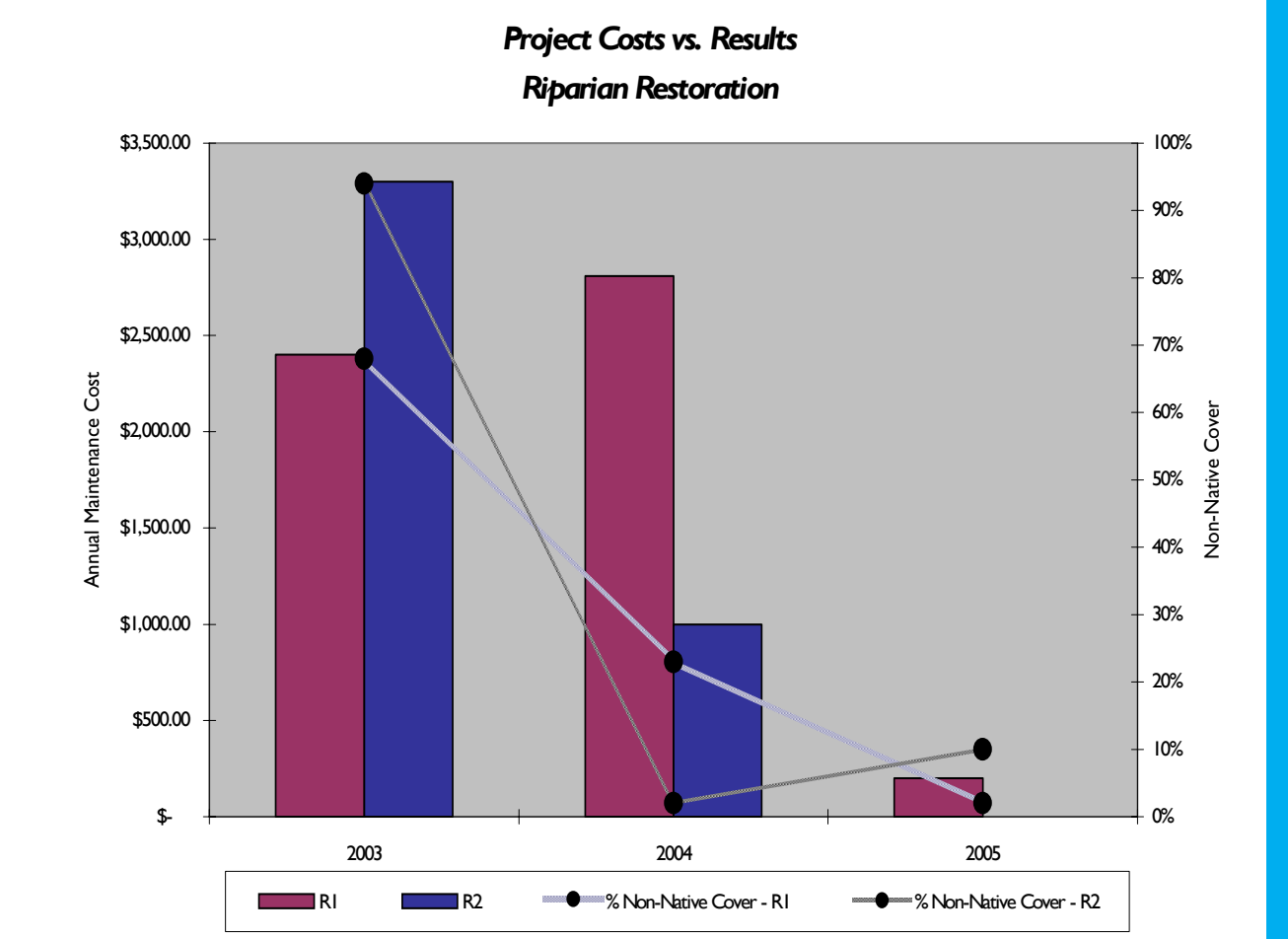
## Riparian Habitat

Beginning in August 2003, two areas of approximately .25 acres in the Forrestal Nature Preserve were managed for weed control and revegetated with riparian and upland plant species. The two areas were dominated by palm trees (*Washingtonia robusta*), myoporum trees (*Myoporum laetum*), and pampas grass (*Cortaderia jubata*). Both areas, identified as R1 and R2, were initially cleared with chain saws and weed trimmers. The two areas were planted in December 2003. R1 was manually cleared three times in 2004 while R2 was chemically treated between the planted shrubs and trees two times in the same period. In 2005, area R1 was weeded two times by hand while R2 did not necessitate further treatment.



R1 (.25 acre) Mechanical		Cost	R2 (.25 acre) Chemical		Cost
2003	Site Cleared (labor, equipment)	\$2,000	2003	Site Cleared (labor, equipment)	\$2,500
	Donated Waste Receptacles	\$400		Donated Waste Receptacles	\$800
2004	Plant Materials	\$400	2004	Plant Materials	\$150
	Volunteer Labor @ \$15/hr. (planting)	\$1,800		Volunteer Labor @ \$15/hr. (planting)	\$600
	Volunteer Labor @ \$15/hr. (weeding)	\$450		Staff Labor @ \$20/hr. (treatment)	\$100
	Staff Labor @ \$20/hr. (weeded)	\$80		Herbicide/Surfactant Cost	\$25
	Staff Labor @ \$20/hr. (weeded)	\$80		Staff Labor @ \$20/hr. (treatment)	\$100
				Herbicide/Surfactant Cost	\$25
2005	Staff Labor @ \$20/hr. (weeded)	\$120			
	Staff Labor @ \$20/hr. (weeded)	\$80			
		<b>\$5,410</b>			<b>\$4,300</b>

Area	Year Monitored	% Native Cover	% Non-Native Cover
R1	2003	3	68
	2004	23	23
	2005	72	2
R2	2003	0	94
	2004	18	2
	2005	62	10



## Materials and Methods



### Coastal Sage Scrub Habitat

Two areas of approximately one acre each in the White Point Nature Preserve were managed for weed control and revegetated with coastal sage scrub plants. Before the weed treatment began, both areas were dominated by non-native black mustard (*Brassica nigra*) and annual grasses. The area identified as C2 was initially sprayed with glyphosate before planting, while the area identified as C5 was mowed before planting. Both areas were planted in April 2003. In Spring 2004, C2 was sprayed with glyphosate between the planted shrubs, while area C5 was cleared using a weed trimmer between the planted shrubs. In winter 2004-2005, area C2 was again selectively sprayed with glyphosate between the planted shrubs, and C5 was minimally hand-weeded.



### Mechanical Treatment

The majority of weed removal after the initial clearing was done by hand although additional mechanical treatments in R1 were conducted with an Echo 350SM weed trimmer. Volunteers supplied the majority of the post-planting labor.

### Chemical Treatment

Rodeo (glyphosphate) was used at a 2% rate or the equivalent of 8 oz. per three gallons of water. Surfactant was also used.

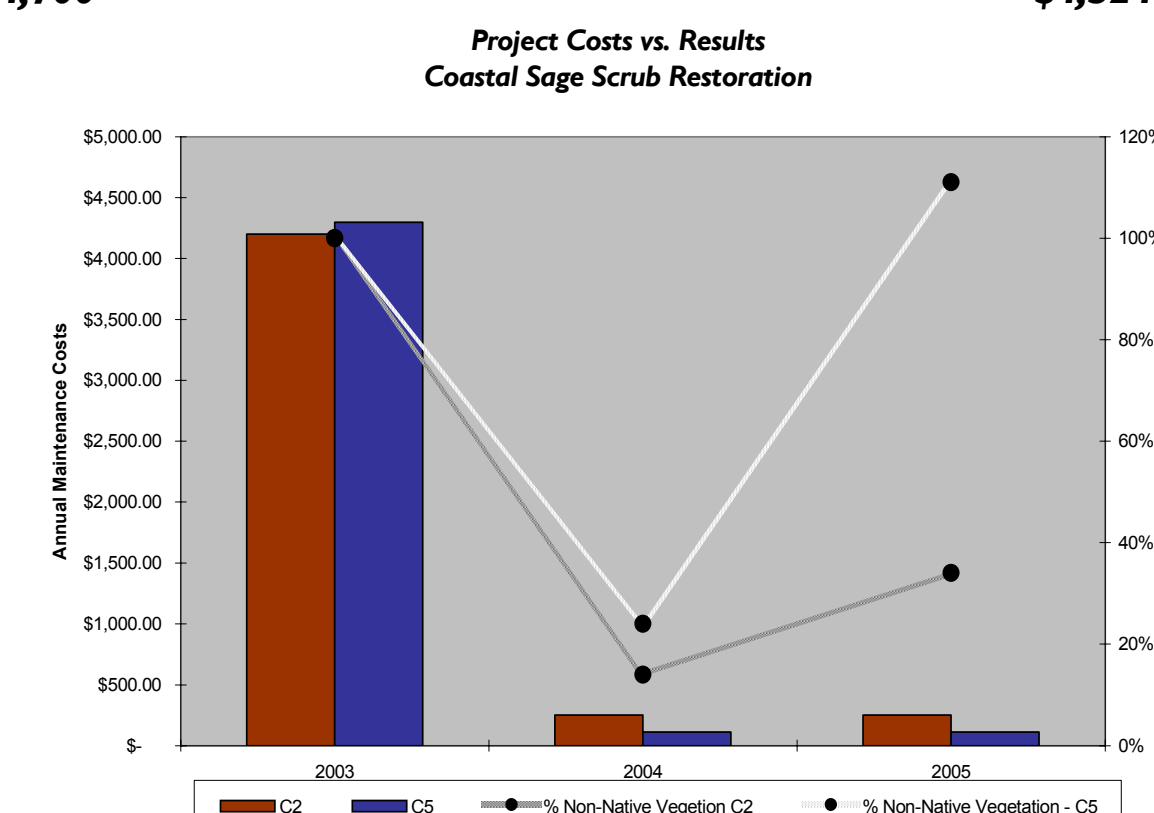
### Vegetation Monitoring Techniques

Point-intercept transects were used at all four sites to gather the vegetation coverage. Protocol identified by the California Native Plant Society was followed in data collection. Transect locations were replicated for the length of the study.

## Cost vs. Weed Control Technique

C5 (1 acre) Mechanical		Cost	C2 (1 acre) Chemical		Cost
2003	Contracted Labor (mowing)	\$150	2003	Staff Labor @ \$20/hr. (chemical treatment)	\$160
	Plant Materials	\$2,350		Herbicide	\$88
	Volunteer Labor @ \$15/hr. (planting)	\$1,200		Plant Materials	\$2,350
	Staff Labor @ \$20/hr. (planting)	\$500		Volunteer Labor @ \$15/hr. (planting)	\$1,200
				Staff Labor @ \$20/hr. (planting)	\$500
2004	Staff Labor @ \$20/hr. (mechanical treatment)	\$250	2004	Staff Labor @ \$20/hr. (chemical treatment)	\$87
				Herbicide	\$26
2005	Staff Labor @ \$20/hr. (mechanical treatment)	\$250	2005	Staff Labor @ \$20/hr. (chemical treatment)	\$87
				Herbicide	\$26
		<b>\$4,700</b>			<b>\$4,524</b>

Area	Year Monitored	% Native Cover	% Non-Native Cover
C2	2003	0	100
	2004	34	14
	2005	47	34
C5	2003	0	100
	2004	30	24
	2005	25	11



### Mechanical Treatment

A tractor with a flail mower attachment was used as the preparation method for C5. Subsequent mechanical treatments in C5 were conducted with an Echo 350SM weed trimmer.

### Chemical Treatment

Roundup Pro (glyphosphate) was used at a 2% rate or the equivalent of 8 oz. per three gallons of water.

## Results

### Coastal Sage Scrub Habitat Restoration

From project inception both areas of CSS restoration experienced an increase in native plant coverage. Non-native plant coverage decreased in the chemically treated area (C2) over the two years. The mechanically treated (C5) area yielded declines in non-native coverage over the first year, but an explosion of *Brachypodium distachyon* coupled with heavy annual rainfall resulted in high percent coverage of non-natives in 2005. Overall, there is no significant difference between the treatment effects and the cost of implementation. However, the results suggest that the use of herbicides may be more effective and slightly more cost efficient.



### Riparian Habitat Restoration

Both areas of the riparian restoration demonstrated a considerable decline in the presence of non-native species and an increase in native species. The two sites have comparable results in native coverage and implementation costs. Although the mechanically cleared site (R1) cost approximately 20% more than the chemically treated site (R2), volunteer efforts subsidized the labor required. In summation, the results suggest that the use of herbicides may be more cost-effective than the use of mechanical means in a riparian restoration project.

