

**FINAL
MONITORING REPORT
WILLOWY MONARDELLA (MONARDELLA VIMINEA)
HABITAT ENHANCEMENT 2010
AT
MARINE CORPS AIR STATION MIRAMAR, SAN DIEGO, CALIFORNIA**

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EXECUTIVE SUMMARY

Willow monardella (*Monardella viminea*) is a federally endangered plant species found along stream courses in three relatively protected west facing canyons of the Marine Corps Air Station Miramar (Station). The goal of this project is to test the effect of various controls on exotic species, especially exotic grasses, on the vigor and recruitment of willow monardella. This report describes the site conditions at five sites in West Sycamore, Spring, and San Clemente Canyons, and reports on willow monardella status at the treatment sites in June 2010 following two years of treatment activity. It defines monitoring activities during 2010 of the four sites established previously, as well as conditions at one additional site, which was set up in 2010 with treatment and control blocks identical to those at the other four sites.

Data was collected through the use of 20-meter transects placed in each treatment area, including controls, which were evaluated with a point intercept method as well as with quadrats placed along the transect. Selected plants were also measured for height and lateral dimension, and were scored for vigor and for impacts of herbivory and disturbance. The data were subjected to statistical analysis.

The monitoring shows that the plants grew by about 15 percent between 2009 and 2010. There was no statistically significant relationship between growth and treatment, although the plants were slightly larger in the treatment plots. Presence of *M. viminea* is significantly correlated with lower cover of non-native grass, indicating that reduced cover of non-native grasses may present favorable conditions for establishment of the plant. Non-native grass cover was significantly lower in the treated plots. The data suggest that herbivory and erosion may be important variables in determining population health. Herbivory is significantly and negatively correlated with plant vigor, and may affect plant mortality. Erosion within the cobbled channels where *M. viminea* commonly establishes is probably also a factor in mortality.

Suggestions for further action to enhance habitat include the creation and seeding of occasional new "seedbeds" with low competition managed with weeding; and control of natural herbivory by management of deer and rabbits.

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ACRONYMS AND ABBREVIATIONS

AMEC	AMEC Earth & Environmental, Inc.
C	Control treatment
GPS	Global Positioning System
Station	Marine Corps Air Station Miramar
W	Weed and herbicide treatment
W/T	Weed and thatch treatment
WMEA	Willow monardella enhancement area

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1.0 INTRODUCTION

Willow monardella (*Monardella viminea*) is a perennial herb in the mint family restricted to coastal canyons of San Diego County. Populations of this federally endangered plant species were studied at localized sites along stream courses in three relatively protected west facing canyons of the Marine Corps Air Station Miramar (Station).

The recovery of the Miramar willow monardella populations following a devastating wildfire in 2003 has possibly been affected by the expansion of exotic annual grasses and other impacts. Monitoring results in 2005-2006 appeared to indicate a significant and rapid decline in numbers within the known Miramar occurrences (Tierra Data 2005 and AMEC Earth & Environmental, Inc. [AMEC] 2007).

The *Endangered Willow Monardella (Monardella viminea) Habitat Enhancement Project* (AMEC 2007) was performed to test the effect of interventions involving herbicide treatment and removal of exotic species, especially exotic grasses, on the vigor and recruitment of willow monardella. Three treatments are being tested, and are compared to each other and to a Control (C):

1. Removal of live competing grasses through herbicide application (Weed, or W),
2. Herbicide application combined with the removal of grass thatch (Weed/Thatch, or W/T),
3. Placement of rock cobble around monardella to provide rock mulch (Cobble).

A controlled treatment block design was developed and implemented to test the interventions at four sites within the known population area. The first season of monitoring (2009) suggested that although variation in plant height and canopy volume was randomly distributed among the four canyon sites, exotic grasses had been suppressed in treatment areas, and the plants in some of the treated areas were larger than in untreated areas based on canopy volume. Herbivory, including seed predation, had been noted as a possibly important factor in plant health. Recruitment of new plants was minimal.

This report describes the site conditions and willow monardella status at the treatment sites in June 2010 following two years of treatment activity. It reports on monitoring activities for the project during 2010, as well as the addition of one additional site, which was set up with treatment and control blocks identical to those at the other four sites. The report includes a presentation of the data collected at all five sites, and summarizes other activities and observations made from the site in 2010. It concludes with recommendations for future activities and data interpretation.

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2.0 PURPOSE

The purpose of the June 2010 field effort was to document population trends and treatment conditions within the identified treatment blocks, and to include one additional site for treatment and control observations. Additionally, the June 2010 data collection represents a record of site and plant conditions during the first post-treatment season. The 2009 data established the level of normal variation in measured variables and described the homogeneity of variance among treatment blocks. These evaluations determined the adequacy of the data collection for statistical interpretation. The 2010 data allows for more detailed interpretation of the effect of the treatments compared to natural variability among sites.

2.1 Description of Enhancement Sites and Treatment Histories

A total of five willow monardella enhancement areas (WMEAs) were studied for habitat enhancement activities (Figure 1). There were four sites established in previous years, and the fifth site was added in 2010. In order for each WMEA to be readily located during enhancement and monitoring activities, the boundary of each WMEA was delineated in the field by four metal fence posts and recorded using a Trimble GeoXT submeter global positioning system (GPS) device.

Initial treatments and site conditions were described in the February 2010 annual report (AMEC 2010). In February 2010, herbicide and thatch treatments (W and W/T) were repeated at the four original sites, and were implemented for the first time at the new WMEA Site 5. Treatment consisted of hand weeding where necessary around existing willow monardella plants, and then applying herbicide to both treatment plots at the site (W treatment). Biomass removal was also performed in the weed and thatch (W/T) treatment plot.

The five sites are briefly described below. Maps and photographs of the sites are contained in Appendix A, with figure numbers referenced as a number preceded by an "A".

WMEA Site 1

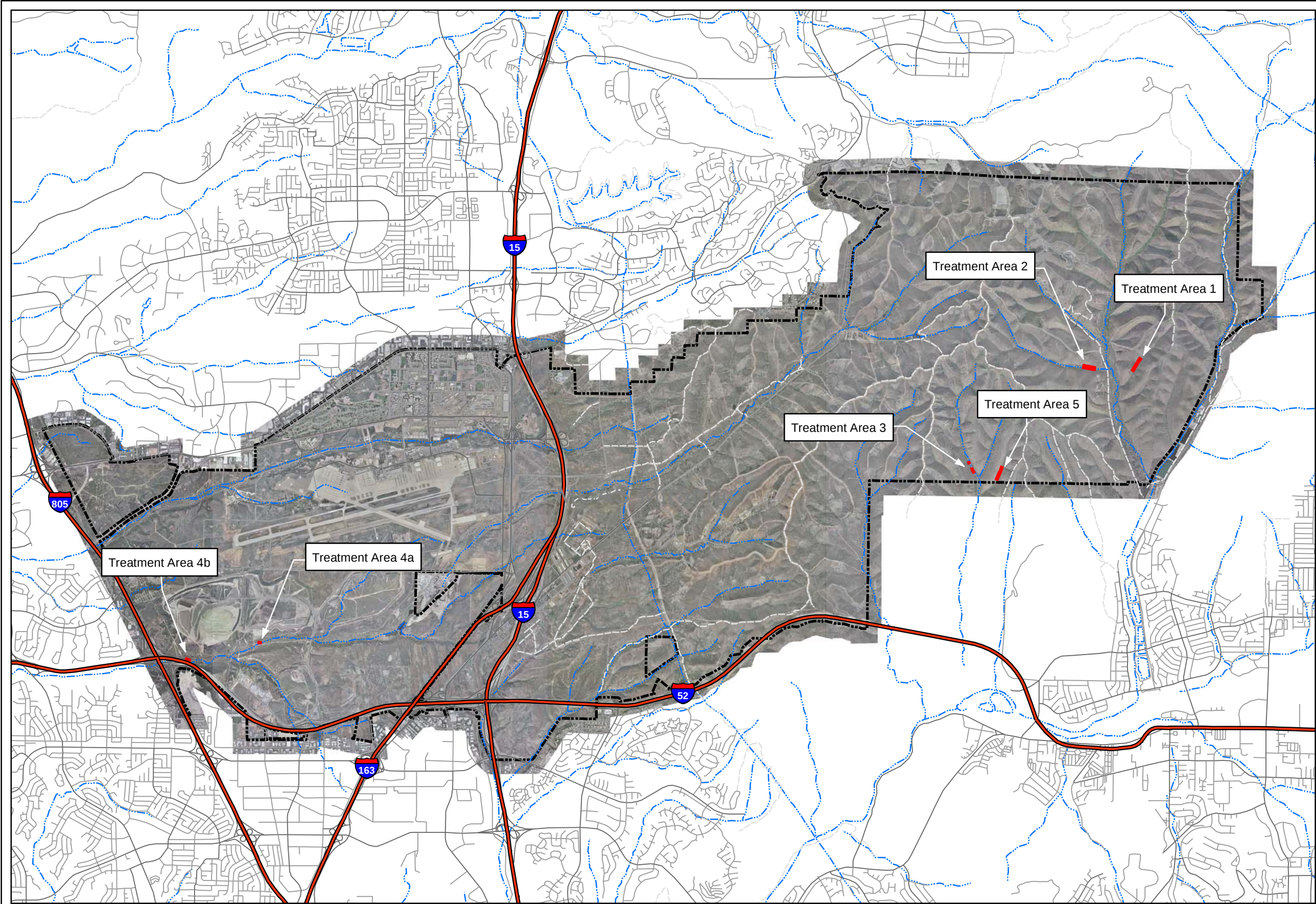
WMEA 1 is located in the middle east branch of West Sycamore Canyon (Figure A1). WMEA 1 is broken into four sections; one area for treatment W, one area for treatment W/T, and two C sections, placed up and down stream. Cobble treatments were placed around selected willow monardella plants within each treatment area. Figure A2 shows the site and its habitat.

WMEA Site 2

WMEA 2 is located along the middle west branch of West Sycamore Canyon (Figure A3). WMEA 2 is broken into three sections; one area for treatment W, one area for treatment W/T, and one C section. Cobbles were placed around selected willow monardella plants in each treatment area.

Two willow monardella seedlings had been found at this location on 16 April 2009. Both seedlings were in the Weed/Thatch treatment area. Additional seedlings were found at the same site in February 2010.

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Legend

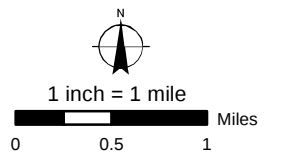
- Treatment Area
- Miramar Boundary
- Major Drainages
- Roads
 - Paved
 - Unimproved
 - Dirt
 - Freeways

Map Notes

Data Source:
MCAS Miramar- Air Station Boundary,
2004 3-band Color Image
Roads on Base
AMEC - Treatment Areas

SANDAG - Freeways
Roads off Base
Major Drainages

Projection: Stateplane, California 406
NAD 83, Feet
Date: 1/5/2011



Path: W:\sd06\Biology\Willow Monardella MMR\mxd\2011\fig1_treatment_areas.mxd

Figure A4 shows the habitat of the site, and the W/T treatment area at the time of the February 2010 treatment.

WMEA Site 3

WMEA 3 is located along the west branch of Spring Canyon (Figure A5). WMEA 3 is broken into three sections; one area for treatment W, one area for treatment W/T, and one C section with no treatments. Cobble was placed around selected willow monardella plants within each treatment area.

Figure A6 shows the habitat at this site, and the weed-thatch treatment area in June 2010.

WMEA Site 4

WMEA 4 is alluvial bench habitat adjacent to sycamore alluvial woodland in the relatively wide flood plain of San Clemente Canyon. There are just two treatment sites in WMEA Site 4, and they are separated from each other. WMEA Site 4a is the C site, and WMEA Site 4b is the treatment site (Figure A7). At the treatment site, the W and W/T treatments were combined. This site was hand-weeded with some spot spraying and did not require large scale dethatching. Figure A8 show the sites at the time of the February 2010 treatments.

WMEA Site 5

WMEA is located in the East Fork of Spring Canyon. This WMEA has experienced a decrease in willow monardella individuals since 2002. The plants in this WMEA growing nearest the stream bottom do not appear immediately threatened, however, the bench habitat appears highly threatened by non-native grasses. A recreational (mountain bike) trail runs through the center of the population surrounded by tall, relatively dense non-native grasses.

WMEA 5 is broken into three segments; one that is designated for W treatment, containing 13 plants; one that is designated for W/T treatment, containing 14 plants; and a C site with no treatments, containing 15 plants (Figure A9).

Prior to treatment, the treatment and control areas were covered in dense non-native grasses ranging from 60 to 80 percent cover overall. Following herbicide applications there was a mat of thatch approximately 3 to 4 inches thick throughout the treatment areas. Some of the most cobbled areas within the stream channels had less non-native growth and resulting thatch, but still had approximately 1 inch of thatch cover.

Initial treatment was conducted at this site in February 2010. A second treatment was conducted in June 2010 to assure that sufficient weed and thatch removal had been performed to produce a difference in growth condition between the treatments and the control sites.

Figures A10 and A11 show WMEA 5 at the time of second treatment in June 2010.

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3.0 MONITORING METHODS

Data was collected through the use of 20-meter transects placed in each treatment area, including controls, in a diagonal, or 45-degree angle to the general trend of the stream. This orientation was selected in order to increase the probability that the landscape heterogeneity was properly sampled, and to help capture enough points for increased power and precision in the data interpretation. For Sites 1, 2, 3, and 4, transects had been established in 2009, and were re-sampled in 2010. For Site 5, transects were established in 2010.

The transects at all sites were monitored on June 1, 2, and 4, 2010 for cover and surface characteristics as well as for species richness for both native and non-native plant species. Monitoring of the willow monardella plants themselves was conducted July 12-13 and 19-20 for plant dimensions and condition. All sites and all treatments were monitored. In addition, a plant species list for each enhancement area was updated with species observed at the site and within the belt transects. Three treatment types were evaluated at each WMEA: C, W, and W/T. Exceptions were that only one treatment (W/T) was implemented at Site 4, and there are two C plots at Site 1. Therefore, there are a total of 15 individual treatment plots.

Two methods of data collection were utilized along each transect. The first method for collecting data was the point-intercept method. Data was collected by using a narrow metal pin (approximately 1/8 inch in diameter) placed every 0.5 meter (totaling 40 points evaluated on each transect). Data was recorded for each species intersected by the pin in both the herb and the shrub layer and the vegetation recorded was also coded as "live" or "dead." Data regarding ground cover was additionally collected and classified into three categories: Rock, Bare (only dirt is present), and Litter (any material that is not rock, dirt or live plant). Duplicate coding (i.e., Rock+Litter) was permitted and was common.

The second method for collecting data along each transect was through the use 20 quadrats (50 cm x 50 cm or 0.25 m²) which were placed every meter along each transect. The placement of the quadrat was alternated from one side to the other along the transect line. The quadrat was divided into nine equal sections to facilitate counting and cover estimates. Non-native and native plant species were counted in each quadrat, and the cover within the quadrat was visually estimated and recorded.

Within each WMEA treatment plot, all live willow monardella plants were identified, tagged with a metal marker indicating the site location, the treatment area, and the plant number. Locations were recorded by a sub-meter accuracy GPS device. A subsample of individual plants within each treatment area was measured for the parameters discussed below. An exception was in WMEA Site 4 Control, where a random subsample of 12 plants, a similar number to those sampled plants in other plots, was measured. The measured plants were the first 12 plants encountered in each treatment area when the area was surveyed moving in an upstream direction.

Parameters measured for each of the willow monardella plants sampled were:

- height (measured from the ground to the highest living material on the plant)

- long diameter (longest axis of the plant's canopy measured parallel to the ground)
- perpendicular diameter (measurement of plant canopy taken perpendicular to the long diameter)

From the height and the two diameter measures, "elliptical cover" and "hemispherical volume" can be calculated. Elliptical cover is defined as the elliptical surface area calculated using the mean of the long and perpendicular axis radii, and is a calculation of the projected cover of the plant. Hemispherical volume is the product of the height, longest axis, and perpendicular axis, and is the volume of the canopy, or the plant "size". The data for the hemispheric volume measurement has been reduced to cubic decimeter units for simplicity of statistical comparisons, and further transformed using a base 10 log of the calculated value for statistical evaluation. The log transformation produces a normal distribution of otherwise strongly skewed dimension data, and permits normal means testing of the dataset.

These calculations provide a measure of the plant condition, and allow us to state quantifiably how "big" the plant is. The elliptical cover shows how much space it takes up as an element of the vegetation cover, and the hemispherical volume shows how much space the plant occupies three-dimensionally.

In addition, a 5-class vigor estimate and a 3-class herbivory estimate were made for each measured plant. The vigor codes are in Table 1, and the herbivory codes are in Table 2.

Table 1. Vigor Codes for Willowy Monardella Used in 2010

Scale	Condition
4 = Excellent	• Plant robust • Many leaves • Strong robust stems • Many, large flower heads • A "spectacular" plant
3 = Good	• Growth good but not exceedingly good • Multiple leaves on each or most stems • Stems appear normal • Multiple flower heads • An "average" plant
2 = Fair	• Growth stable but not remarkable • Few leaves • Thin or "spindly" stems • Few, small flower heads
1 = Marginal	• Very few or no flower heads • Plant is not thriving • Evidence of decline in past season
0 = Dead	• Plant dead • Dried or no leaves • Brittle stems (snap test) • No flower heads

Table 2. Herbivory Codes for Willowy Monardella Used in 2010

Code	Condition
S = Severe herbivory	• Extensive pruning of stems (s) and/or • Extensive boring or consumption of leaves (l) and/or • Extensive pruning of flower heads (f) and/or • Extensive insect damage to flower heads (i)
M = Minor herbivory	• Stems pruned somewhat (s) and/or • Some leaves bored or eaten (l) and/or • Some flower heads eaten off (f) and/or • Some damage (insect boring) to flower heads (i)
N= None visible	• No pruning of stems (s) • No visible leaf boring or signs of animal bites (l) • No visible pruning of flower heads (f) • No visible damage (insect boring) to flower heads (i)

Other data noted included cobble treatment condition, shrub associates, disturbance, and approximate flowering effort. These notes were not quantitative, but are anecdotal in nature. There were also extensive notes made of seed predation by insects and of “pruning” by herbivores.

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4.0 RESULTS

4.1 Demographic Data Summary

Plant counts were made during the monitoring activities of 2010. There were 362 recorded willow monardella plants in 15 treatment blocks at 5 sites (Table 3), with the new Site 5 contributing 56 new plants. In San Clemente Canyon, the control site is quite large, and was densely populated with willow monardella plants, and a complete census of all plants within the area was not practical.

Table 3. Total Recorded *M. viminea* at WMEAs in 2010

	WMEA 1 West Sycamore East	WMEA 2 West Sycamore West	WMEA 3 Spring West	WMEA 4 San Clemente*	WMEA 5 Spring East	Total
Site Number	1	2	3	4	5	
Control	93	11	3	40	21	168
Weed	43 (1 new)	13	5		17	78
Weed/Thatch	44	23	10	12	27	116
Site Total	180	47	18	52	56	362

* Counts in San Clemente Canyon populations were limited to those plants measured, as described in the text.

Evaluation of the data from the measured plants in the 2009 investigation indicated that the number of plants measured represented an adequate statistical subsample of the plants in the population for height and width dimensions (AMEC 2010). Plants selected for measurement were the same individuals sampled in 2009 from Sites 1-4, providing a repeated measures sample. A total of 166 plants were measured in 2010 (Table 4).

Table 4. Number of *M. viminea* Plants Measured at WMEAs in 2010

	WMEA 1 West Sycamore East	WMEA 2 West Sycamore West	WMEA 3 West Spring	WMEA 4 San Clemente	WMEA 5 East Spring	Total
Site Number	1	2	3	4	5	
Control	23	7	3	12	15	60
Weed	15	12	5		13	45
Weed/Thatch	14	14	8	11	14	61
Site Total	52	33	16	23	42	166

A summary of numbers of measured plants for 2009 and 2010 (Table 5) shows that there were 42 new plants added for measurement at WMEA 5 in 2010. An additional 9 new plants were added in 2010 for measurement from the previous sites in an effort to expand the sampling to increase statistical vigor, and 2 new plants were added to the numbers measured by recruitment. There were also 16 plants that had been measured in 2009 that were not in the 2010 sample. These plants were either dead, had gone missing through erosion or herbivory, or could otherwise not be located for reasons that could not be determined. In all then, 183 separate individuals, have been measured in either 2009 or 2010 (Table 5). The data in Table 5 are grouped by WMEA and canyon, and separated by treatment.

Table 5. Summary of *M. viminea* Plants Measured in 2009-2010

Number	Category
114	Sampled both years
42	added from new Site 5
9	new plants added for measurement in expanded sampling within old blocks
2	newly discovered or new recruitment
16	plants sampled in 2009 but not in 2010 (missing, dead, or 2009 individuals merged into a clump and treated as a single plant in 2010)
183	Total database individuals

During 2010, there was one fewer plant measured at Site 1 C; four fewer at Site 2 C, but one new plant at the WT area for Site 2; Site 3 has one fewer plant in both the W and WT; and one fewer plant in the WT area of Site 4.

4.2 Dimension Data Summary

Mean measures of the physical dimensions (height, longest axis, and perpendicular axis), and the calculated cover (area) and volume (hemisphere) show some variation among the WMEAs, canyons and treatments. Tables 6, 7, and 8 show mean plant height, mean plant projected cover area, and mean hemispherical volume in the four WMEAs and the three treatments.

Plants were significantly larger in 2010 than in 2009 ($p < 0.001$) when area and hemispheric volume were compared. Plant height was also significantly greater ($p < 0.0001$) in 2010, but there were no significant differences in heights among surface treatments, although plants in treatment areas grew slightly more. Cobble treatment did not appear to have any effect on plant height.

Plant dimension was correlated between the two years with a moderate regression coefficient, ($r^2 = 0.87$) and a linear regression slope indicating that growth between the two years was about 15% in cover area dimension (Figure 2, referencing data from 2009 [AMEC 2010]).

Table 6. 2010 Survey: Mean Height *M. viminea* Plants

	WMEA 1 West Sycamore East	WMEA 2 West Sycamore West	WMEA 3 Spring West	WMEA 4 San Clemente	WMEA 5 Spring East	
Site Number	1	2	3	4	5	Treatment Mean
Control	52.2 (16.7)	69.3 (10.5)	55.0 (21.0)	52.8 (9.1)	58.1 (10.3)	55.9 (14.2)
Weed	47.7 (11.6)	68.9 (15.1)	55.4 (13.5)		58.3 (7.2)	57.3 (14.1)
Weed/Thatch	60.7 (13.3)	51.3 (23.8)	63.3 (13.2)	46.3 (20.4)	58.1 (9.4)	55.7 (17.5)
Site Mean	53.2 (15.1)	61.5 (20.2)	59.3 (14.4)	49.3 (15.5)	58.1 (8.9)	56.2 (15.4)

units are cm; standard deviation in (parentheses)

Table 7. 2010 Survey: Mean Projected Cover *M. viminea* Plants

	WMEA 1 West Sycamore West	WMEA 2 West Sycamore East	WMEA 3 Spring West	WMEA 4 San Clemente	WMEA 5 Spring East	
Site Number	1	2	3	4	5	Treatment Mean
Control	0.694 (0.85)	1.618 (1.16)	0.366 (0.25)	0.8579 (0.82)	1.437 (0.90)	0.999 (0.94)
Weed	0.615 (0.83)	0.702 (0.39)	1.079 (0.46)		1.427 (1.03)	0.924 (0.83)
Weed/Thatch	0.826 (0.38)	0.326 (0.38)	1.026 (0.60)	0.453 (0.37)	1.628 (0.99)	0.854 (0.76)
Site Mean	0.706 (0.74)	0.737 (0.77)	0.919 (0.56)	0.664 (0.67)	1.498 (0.95)	0.926 (0.85)

units are m²; standard deviation in (parentheses)

Table 8. 2010 Survey: Mean Volume *M. viminea* Plants

	WMEA 1 West Sycamore West	WMEA 2 West Sycamore East	WMEA 3 Spring West	WMEA 4 San Clemente	WMEA 5 Spring East	
Site Number	1	2	3	4	5	Treatment Mean
Control	4.91 (4.0)	9.95 (4.6)	4.05 (2.6)	5.41 (3.2)	8.08 (3.7)	6.32 (4.1)
Weed	4.12 (3.4)	6.73 (2.8)	6.92 (2.9)		7.88 (3.5)	6.21 (3.5)
Weed/Thatch	6.47 (2.6)	3.60 (3.0)	7.55 (3.6)	3.67 (2.8)	8.55 (3.5)	5.93 (3.6)
Site Mean	5.10 (3.6)	6.09 (4.0)	6.70 (3.3)	4.58 (3.1)	8.17 (3.5)	6.15 (3.8)

units are dm³; standard deviation in (parentheses)

Monardella viminea 2010 Area vs. 2009 Area

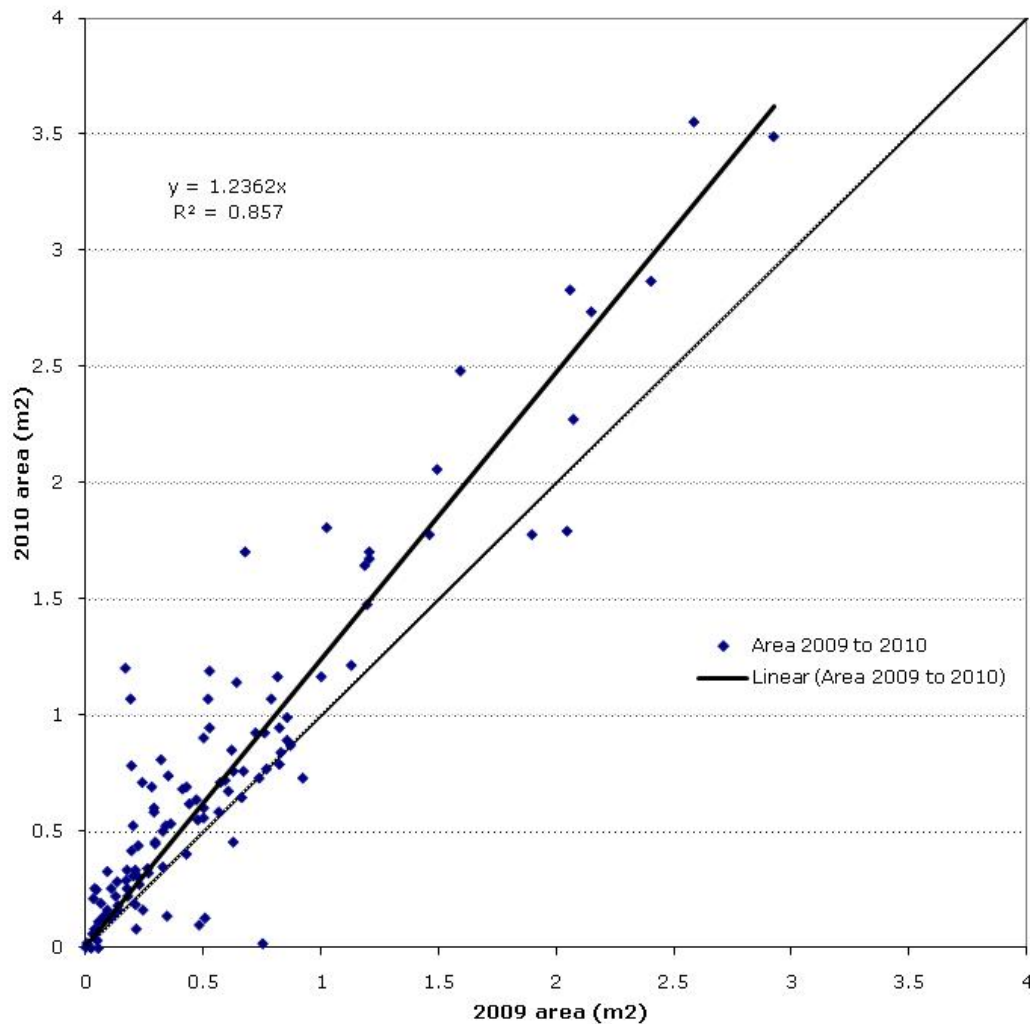


Figure 2. Regression Line for Elliptical Area of *M. viminea* Between 2009 and 2010

Uncontrolled for other variables, the various sites showed significantly different ($p < 0.001$) base dimension in 2010 when sites were compared as a population. Plants at sites 1 and 4 were smaller in dimension and plants at the new Site 5 were larger (Figure 3).

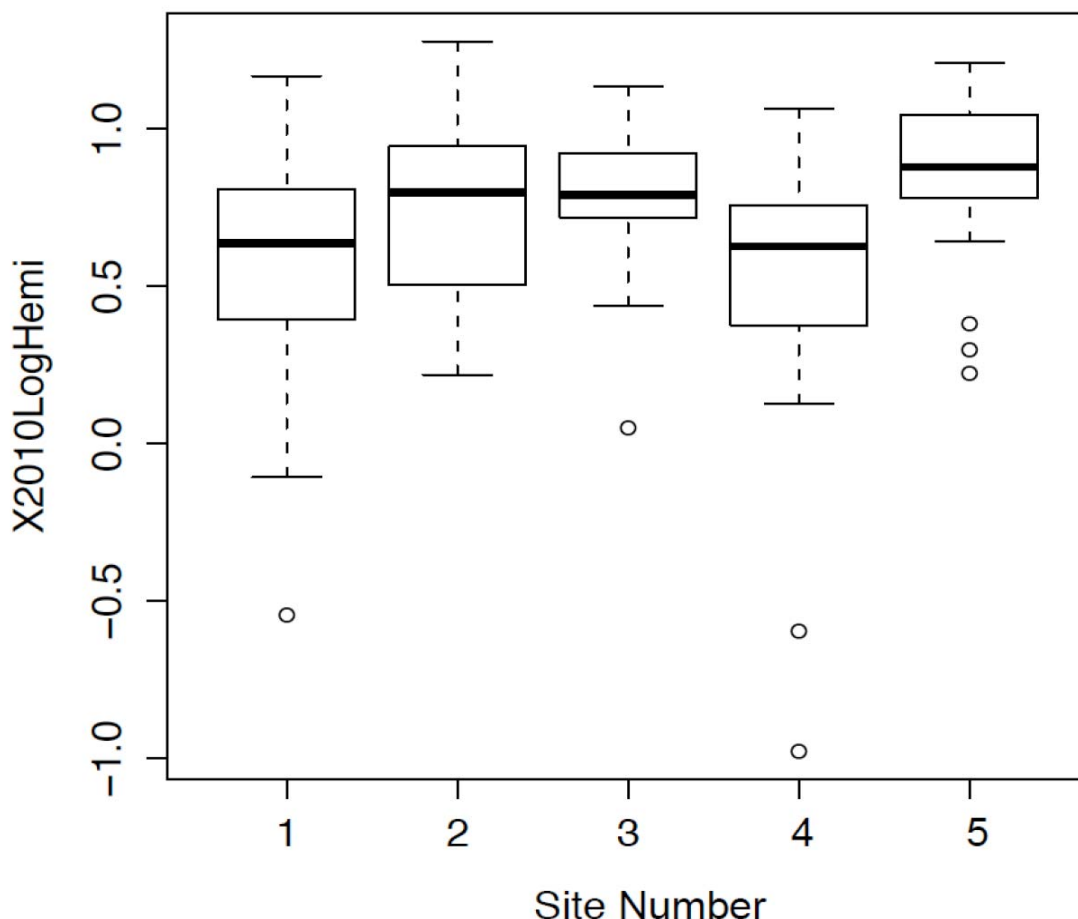


Figure 3. Hemispheric Volume of *M. viminea* at 5 Sites in 2010

Dimension data is presented in a Tukey Boxplot (Tukey 1977). These plots are also known as “box and whisker” plots. The box represents the 1st and 3rd interquartile range, which is the 25% and 75% distribution limit of the dataset. The belt line is the data median, or 50th percentile. The whiskers (vertical dashed lines) represent the maximum value, exclusive of outliers. The open circles are outlier data (greater than 1.5 times the inter-quartile median in the 1st and 4th quartile). Tukey boxplots are used here and in subsequent charts because they present in very compact form information the central tendency, the 50% distribution, and the skew and kurtosis (peakedness) in the data set, as well as highlighting outlier data.

The data were also evaluated for differences among the three treatments. Figure 4 summarizes those data, and shows that uncontrolled for any other variables, no significant difference existed among the base dimension for the three block treatments, and no significant difference was present among the treatments for mean change in dimension between 2009 and 2010. That is, there is no evidence that the treatments affected the

measured dimensions in 2010, and no evidence that the treatments affected the growth rate of the plants between 2009 and 2010.

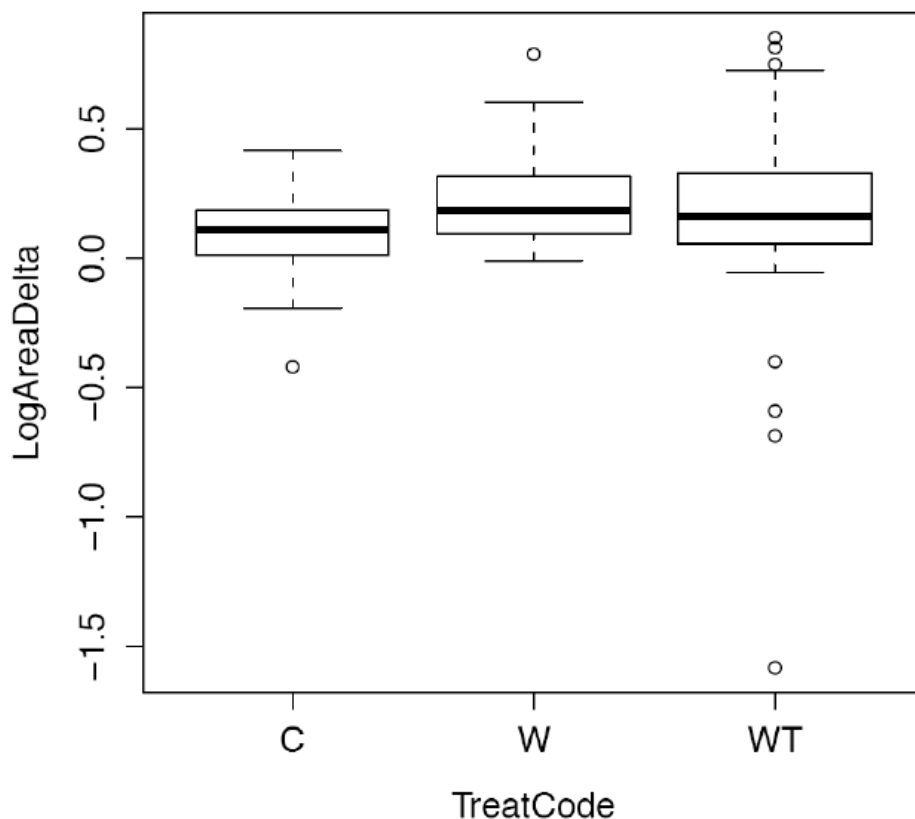


Figure 4. Change in *M. viminea* Dimension Year-to-Year of Log-Transformed Cover Area (Log Delta) vs. Treatment Regime

Year-to-year mortality appears to have moderated compared to previous years (AMEC 2010), and no significant shifts in vigor classification tally (discussed in Section 5.5) as evaluated with the Fisher exact test ($p > 0.8$) between 2009 and 2010 were observed. Three dead plants were recorded and 16 plants were missing between 2009 and 2010. The fate of the missing plants is not explicitly known. If all missing plants are assigned to dead, mortality is 19/132 or 13% year-to-year. Field observations, however, suggest that at least some of the missing plants were removed from the site by erosion, as they were located adjacent to active channels (see Section 4.9). Recruitment was negligible with two new individuals added to the database.

4.3 Cobble Effect

Also evaluated was the effect of cobble treatment (Table 9). Uncontrolled for other variables, there is no significant difference in dimension or change in dimension between the two years for cobbled vs. uncobbled plants. The total number of cobble-treated plants is too low to add other factors to the cobble analysis and still produce a statistically meaningful result. Cobbled plants were slightly smaller (at non-significant levels) than non-cobbled plants. Cobbled plants were not significantly different in herbivory ranking than non-cobbled plants. (at $p > 0.4$). Cobbled plants show virtually no difference in two-year growth vs. non-cobbled plants.

Table 9. Elliptical Area (m²) of Cobble-Treated *M. viminea* Plants

Cobble Code	Mean	SD	N
No Cobble	0.93	0.89	140
Cobble	0.78	0.61	31

4.4 Herbivory

Plants given an herbivory class of Severe were significantly smaller than plants classified as Class Minor) ($p < 0.001$) (Figure 5). Plants given high herbivory classification were also more likely to be coded as vigor class 1 (low herbivory impact condition) (Table 10). The association has a significance of $p < 0.001$.

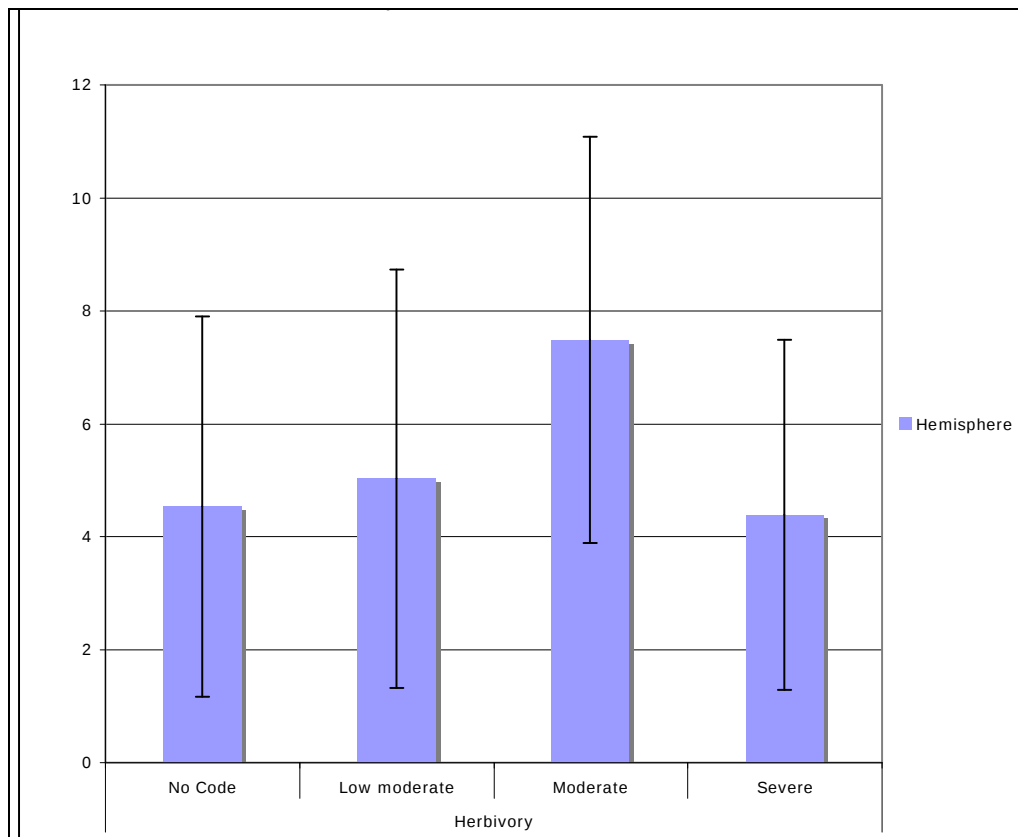


Figure 5. Plant Volume (dm3) vs. Qualitative Herbivory Ranking for *M. viminea*

Table 10. Tally of Vigor of *M. viminea* by Herbivory Code

Herbivory	0 (Dead)	1 (Poor)	2(Fair)	3(Good)	4 (Excel.)
Not Recorded	2	5	13	1	3
Moderate	0	9	32	45	10
Severe	1	14	23	4	0

Herbivory differed in intensity among sites and treatment groups (Table 11). Herbivory was most severe at WMEA 1 in the east fork of West Sycamore Canyon; field observations indicate that deer were probably responsible for most of the herbivory. Herbivory was least severe at WMEA 4 in San Clemente Canyon. There is no obvious difference in herbivory in different treatment types.

Table 11. Herbivory Shown by Site and Severity

Site	WMEA 1 E Sycamore West	WMEA 2 W Sycamore East	WMEA 3 Spring West	WMEA 4 San Clemente	WMEA 5 Spring East		
Control						TOTAL	Percent
Severe	14	0	0	0	2	16	35%
Moderate	10	5	1	0	13	29	63%
None	0	1	0	0	0	1	2%
TOTAL	24	6	1	0	15	46	
Weed							
Severe	11	1	0	0	1	13	26%
Moderate	3	10	4	4	12	33	66%
None	1	1	1	1	0	4	8%
TOTAL	15	12	5	5	13	50	
Weed/Thatch							
Severe	7	3	2	0	1	13	22%
Moderate	7	6	6	6	13	38	64%
None	0	3	0	5	0	8	14%
TOTAL	14	12	8	11	14	59	

4.5 Vigor

A slight trend toward higher qualitative vigor class is observable in plants in the W/T treatment than in the C and W plots (Table 12). A Chi-square probability for the 3 x 4 tally is $p=0.029$.

Table 12. Tally of *M. viminea* plants in Vigor Class by Treatment

	0 (Dead)	1 (Poor)	2(Fair)	3(Good)	4 (Excel.)
Control	1 (2%)	14 (23%)	26 (43%)	12 (20%)	8 (13%)
Weed	0	6 (10%)	24 (39%)	11 (18%)	4 (7%)
Weed + Thatch	2 (3%)	8 (13%)	21 (34%)	28 (46%)	2 (3%)

However, vigor is strongly sorted by site as well (Table 13), indicating that an unmeasured ecological effect is likely a much larger influence on plant condition.

Table 13. Tally of Vigor class by Survey Area

Site	0 (Dead)	1 (Poor)	2(Fair)	3(Good)	4 (Excel.)
Syc. East	1 (2%)	12 (23%)	24 (45%)	16 (30%)	0
Syc. West	2 (6%)	3 (10%)	7 (21%)	9 (27%)	12 (36%)
San Clemente	0	5 (22%)	14 (61%)	4 (17%)	0
Spring West	0	5 (31%)	5 (31%)	5 (31%)	1 (7%)
Spring East	0	3 (8%)	21 (50%)	17 (40%)	1 (2%)

4.6 Species Diversity Data

Total species diversity at all sites is shown in Appendix A. Numbers of species cumulatively observed between 2008 and 2010 at each site is shown in Table 14. For WMEA 5, the species noted are only for 2010, as this was a new site this year. The lower species diversity in WMEA 4 reflects the dominance of shrubs at that site.

Table 14. Species Diversity (Native and Non-Native) Observed in the Years 2008 – 2010 at WMEAs

Type	WMEA 1 West Sycamore East	WMEA 2 West Sycamore West	WMEA 3 Spring West	WMEA 4 San Clemente	WMEA 5 Spring East
Native	82	85	73	85	35
Sensitive	2	2	2	2	1
Non-native	19	19	20	26	22
Invasive	6	6	5	6	9
Total	101	104	93	57	111

Shrub cover was lowest this year in Spring Canyon, with San Clemente Canyon having the highest overall shrub cover, especially at the treatment site. (Table 15).

Table 15. Proportion of Point-hit Data in Life-form Category in 2010

	San Clemente Canyon		Spring Canyon		Sycamore Canyon	
	Control	Treatment	Control	Treatment	Control	Treatment
Empty	50%	23%	6%	50%	25%	56%
Any Herb + Low Perennial	35%	48%	70%	37%	59%	34%
Any Shrub	20%	38%	10%	21%	31%	13%
Dead	0%	0%	0%	0%	0%	0%

4.7 Cover Data

4.7.1 Total Plant Cover

Total plant cover was estimated by point-intercept proportion (n=40 in each of 12 transects) and additionally by quadrats sampled in each treatment (n=20 in each of 12 treatment plots). In an analysis of the 2009 data (AMEC 2009), the two independent measures of total cover show significant correlation and some consistent variation between canyons. For the interpretation of cover that can be seen as an “actual” value, quadrat data are generally more repeatable and are reported in Table 16.

Table 16. Total Plant Cover of Treatment Blocks Measured by Quadrat Estimates

	WMEA 1 West Sycamore East	WMEA 2 West Sycamore West	WMEA 3 Spring West	WMEA 4 San Clemente	WMEA 5 Spring East	Mean
Quadrat Data						
Control	32%	15%	50%	17%	45%	32%
Weed	8%	14%	31%		23%	19%
Weed/Thatch	14%	8%	17%	32%	17%	18%
Site Overall	18%	12%	33%	24%	29%	23%

A cross tabulation of cover by treatment and site shows large inter-canyon variation. Differences are significant at the $p < 0.001$ level, but are un-interpretable because the trend of variation is not consistent across treatment groups. Nevertheless, it can be seen that cover in Sycamore Canyon (sites 1 and 2) is generally lower than in Spring Canyon (sites 3 and 5), with San Clemente overall cover intermediate.

Qualitatively, a difference may exist between Site 4 (San Clemente) and the other sites. A higher proportion of plot cover in San Clemente canyon site is represented by native perennial shrubs (especially *Eriogonum fasciculatum*), rather than non-native grass species. Associated with this difference in dominant species mix is the observation that the willowy monardella plants are smaller on average in the San Clemente populations than other sites. No plants were lost from the San Clemente population.

4.7.2 Relationships of Cover to Plant Dimensions

The relationship between the canopy volume of individual willowy monardella plants and plot cover was also examined. Over all plots sampled, there is no significant correlation of plant dimensions with total mean plot cover (Figure 6).

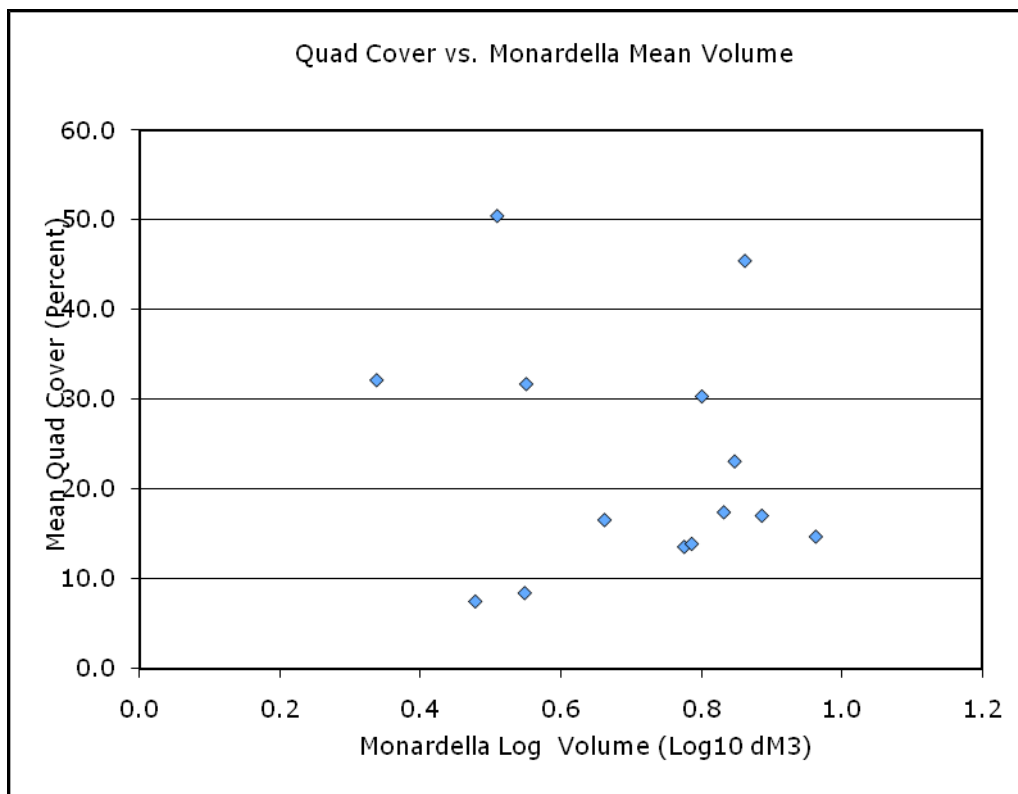


Figure 6. Scatter Plot of *M. viminea* Plant Volume vs. Plot Cover

Units of volume are $\text{Log}^{10}(\text{volume})$ in dm^3

4.8 Influence of Exotic Grasses

The data show that total plant cover (measured with point intercept) and the non-native grass cover (as measured with a quadrat estimate) are much lower in treatment blocks

than in control blocks (Table 17). This finding indicates that the prescribed treatment is being carried out successfully.

Table 17. Total Non-Native Grass Cover Quads 2010

Treatment	Mean	SD	N
Control	19%	24.45	125
Weed	4.04%	5.91	85
Weed/Thatch	3.7%	5.71	105

A highly significant ($p < 0.001$) inverse relationship exists between non-native plant cover and the recorded presence of *M. viminea* in control quadrats (Table 18). The relationship is not present in treatment quadrats, but the grass cover in control quadrats with *M. viminea* recorded ($n=10$) is similar to the grass cover reported in treatment quadrats. This suggests that a naturally occurring low plant cover condition may be favorable for establishment and growth of willow monardella.

Table 18. Non-native Grass Cover (Percent) Stratified by Presence or Absence of *M. viminea* in 2010

Treatment	<i>M. viminea</i> Not present	<i>M. viminea</i> Present	N for Not Present	N for Present
Control	20.37	3.4	114	10
Weed	3.75	7.8	79	6
Weed/Thatch	3.78	2.57	98	7

A cross tabulation of cover by treatment and site (Table 19) shows large inter-canyon variation. Differences are significant at the $p < 0.001$ level, but are un-interpretable because the trend of variation is not consistent across treatment groups.

Table 19. Cover (percent) of Non-native Grass Cross Tabulated by Site and Treatment. 2010

Treatment	WMEA 1 West Sycamore East	WMEA 2 West Sycamore West	WMEA 3 Spring West	WMEA 4 San Clemente	WMEA 5 Spring East
Control	10.52	8.61	39.71	5.3	38.5
Weed	1.68	0.94	4.61	NA	9.09
Weed/Thatch	1.38	1.57	5.5	4.52	5.52

This cross-tabulation of sites and treatments for non-native grass cover shows that the prescribed treatment is effective in meeting the management goal of suppression of non-native grasses, and that the second year treatment areas (Sites 1-4) have better control than Site 5 with a single year of treatment

4.9 Disturbance

Twenty-three plants were given disturbance ranking in 2010. Eleven had erosion noted as a factor, and 12 had debris impacts noted. Debris coded plants showed significantly larger dimensions, but this effect is auto-correlated with the new Spring Canyon site where plants were significantly larger than at other sites. Vigor class and disturbance rank were unrelated.

We examined the data for plants that had been present in 2009 but not found in 2010. During the 2010 survey, plants recorded had been coded as to their location in a streambed, so the data could be examined for this locational criterion. We found that at Site 1 in West Sycamore East Fork, 4 out of 5 plants coded as being in a streambed were gone in 2010; and at Site 2 West Sycamore West fork, 7 out of 11 plants within the streambed were gone. For Site 3 in Spring Canyon West, none of the 6 plants in the streambed were gone. No plants were recorded as in the streambed in San Clemente Sites 4.

Figure 7 shows a photo of a willow monardella plant on the edge of a streambed with the soil around its roots eroded. This is possibly a mechanism by which mature plants are removed from the population.



Figure 7. *M. viminea* plant (Cobbled Treatment) Near Stream Channel at Site 3 (Spring Canyon West), with Root Zone Eroded

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5.0 MORTALITY

Natural levels of herbivory are likely cyclic to periods of fire and drought. However, the natural level of herbivore pressure has likely been distorted by the loss of the predator equilibrium through factors related to urbanization. Shrub growth and canopy closure in succession post-fire will impact willow monardella by providing cover to rabbits and other herbivores, reducing available open seedbed for recruitment, and increasing summer and late-season competition for soil water. The negative association between severity of herbivory and level of vigor was not a surprising finding, as herbivory and vigor are likely to be correlated. It may indicate that the primary determinant of plant condition is the severity of herbivory experienced.

Year-over-year mortality in the sampled populations is about 18 losses out of a total of 184 sampled plants, or about 10%. Recruitment of two new plants reduced the net loss to 16 or 9%. Of the missing and dead, 9 plants were in the W/T treatment. 3 in W treatment, and 6 in Controls. Within treatment mortality was highest in the W/T treatment 13%, lowest in W at 6% and intermediate for Control at 9%. There is no significant treatment trend in disappearances due to random effects in the small sample size.

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6.0 DISCUSSION

It has been hypothesized that exotic grass cover would negatively influence the vigor and growth of willow monardella. Non-native grass competition has interrupted a key component of the natural meta-population cycle by reducing the likelihood of post-fire establishment. It appears the early establishment phase is impacted by grass competition (*viz.* losses of young plants post-fire). A lack of substantial recruitment detected in 2009 and 2010 surveys indicate populations are likely established in single cohorts with recruitment following major periodic disturbance.

Natural levels of herbivory are likely cyclic to periods of fire and drought. However, the natural level of herbivore pressure has likely been distorted by the loss of the predator equilibrium through factors related to urbanization. Shrub growth and canopy closure in succession post-fire will impact willow monardella by providing cover to rabbits and other herbivores, reducing available open seedbed for recruitment, and increasing summer and late-season competition for soil water. The negative association between severity of herbivory and level of vigor was not a surprising finding, as herbivory and vigor are likely to be correlated. It may indicate that the primary determinant of plant condition is the severity of herbivory experienced.

For a short-lived herbaceous perennial to experience 10% mortality at year 4 post-fire is likely within the normal expected range (Keeley and Johnson 1977). Some of the documented mortality factors such as erosion, shrub overgrowth, and possibly herbivory are not addressed by the experimental treatment. Fortunately, the mortality documented in the immediate post-fire succession has tapered off. Surviving plants are disappearing at a relatively low rate, and some balancing recruitment is occurring. In 2010, surviving willow monardella plants are currently showing more evidence of impact from more chaotic disturbance factors (herbivory, erosion, shrub competition) than from direct annual grass competition.

Causes of mortality may be related to herbivory or to erosion, both of which were noted in the sampling. The impact of the overgrowth of other shrubs is also noted. In addition, willow monardella is naturally present in, and appears to prefer, habitat found in frequently disturbed streambeds. The species likely has adaptations to recover and expand its populations after disturbance events. Similar species exhibit a meta-population strategy, where individual populations are very dynamic, expanding and shrinking in response to rapid successional changes found in their highly unstable habitats.

Monitoring observation has established that stream erosion is leading to the loss of established monardella plants. Herbivory is documented as strongly reducing willow monardella plant fitness, and this factor may remove new recruits as well as established plants. Herbivory is a natural factor that has been perturbed by fire, changes in species composition and land use associated with a military mission. The growth of native shrubs, a natural successional factor, may increase shading, but there is no real evidence that

shading has a negative effect on the growth and vigor of willow monardella. There are additional sources of mortality including direct losses from exotic grass competition, as well as damage from recreational foot and bicycle traffic.

We suggest that sustaining the population would benefit from the following two steps:

- a. Provision for and the creation of occasional new early successional "seedbeds" with low levels of competition. This situation is probably created naturally by the cobble sandbanks developed in stream wash events. As natural cobble sandbanks are likely influenced by heavy storm events that can be exacerbated by the effects of fire and other disturbance, experimental sandbars may need to be created and seeded. Establishment events in such new habitats are likely severely impacted by heavy grass competition, and control of that competition could be targeted in years one and two of a cohort establishment.
- b. Controlling through the regulation or isolation of plants from deer and rabbits.

7.0 SUMMARY OF CONCLUSIONS

No detectable significant difference in survival, plant size, or growth rate of willow monardella exists among the various treatments (W, W/T, and cobble) as compared to control plots in the 2010 dataset. Significant differences between plots are consistent with the same observations made in 2009, indicating that unmeasured ecological effects are influencing plant growth. The measured effect of treatments was neither positive nor negative on growth rate and plant size, but was statistically insignificant. One exception to this generalization is that there was a slight although non-significant trend noted toward larger size and growth rate of willow monardella plants in actively treated plots compared to control blocks.

The data also show that plants treated with herbicide and thatch removal to reduce non-native competition showed a slight trend toward higher qualitative vigor. This finding may indicate that treatment is benefiting plant health. The data clearly show that the treatments are significantly reducing the cover of non-native grasses, but it is less clear that such reduction has a discernable benefit to the willow monardella.

A finding that could have management implications is the relationship between herbivory and vigor. Since herbivory is a factor previously unconsidered in active management planning, this is a significant new correlation. Herbivory was assigned in descriptive notes to "deer", but no formal observations of the responsible herbivores are reported. Field notes report "haystacking" of seed heads, which is characteristic of rodent or lagomorphs.

The data comparing plant size between the two years indicates that overall the willow monardella plants are growing at a rate of approximately 15 percent per year. This was true in all treatment plots. Although the treatments may not be effective at enhancing growth rate, it is encouraging to note that the plants in the five sampled populations as a whole appear to be in good health.

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8.0 REFERENCES

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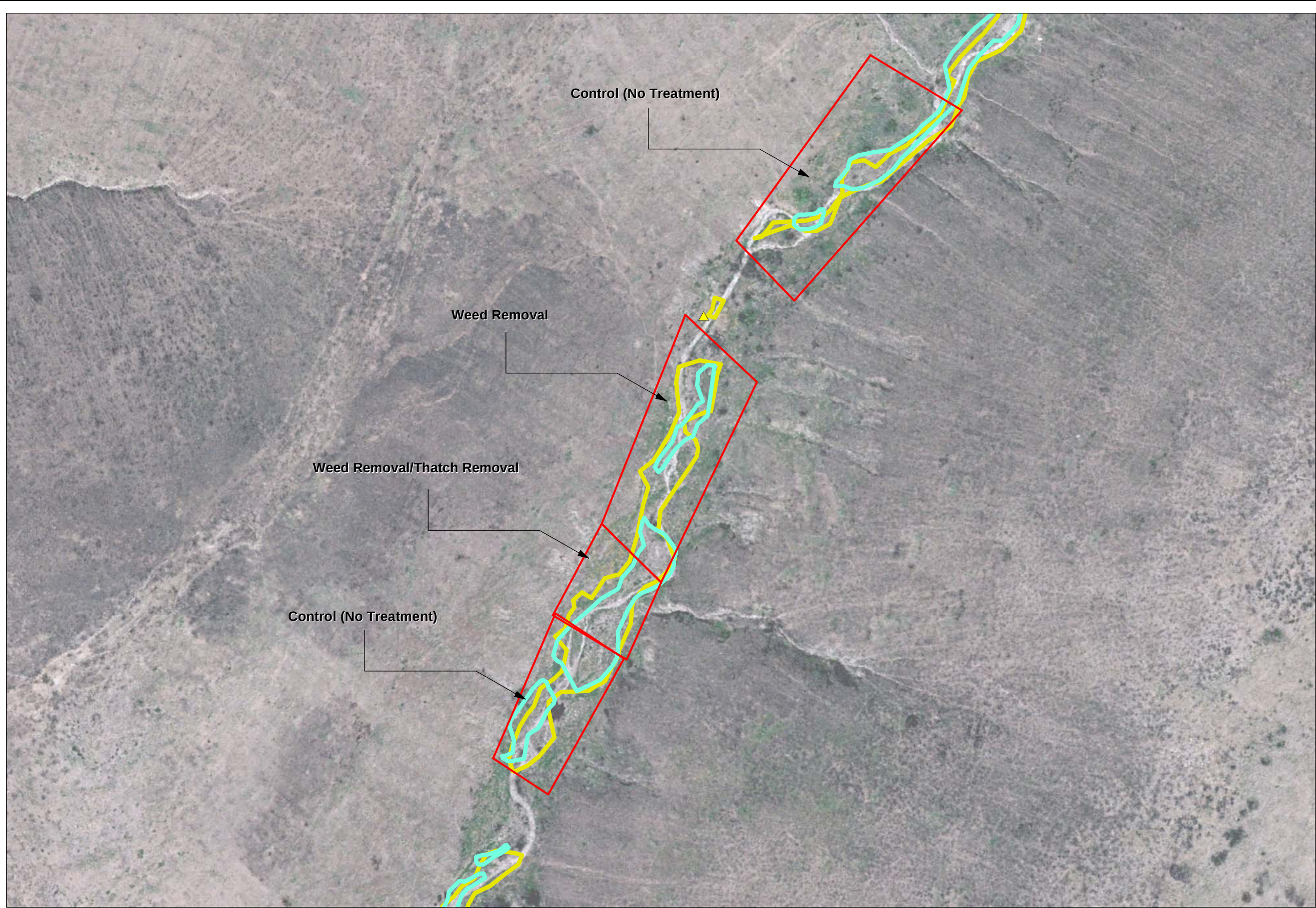
Marine Corps Air Station Miramar
Willow Monardella Habitat Enhancement 2010
Final Monitoring Report
AMEC Project No. 321060133
March 2011

APPENDIX A

**MAPS AND PHOTOS OF WILLOWY MONARDELLA
ENHANCEMENT AREAS**

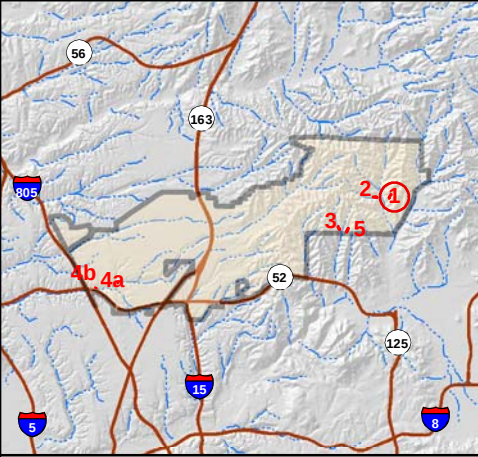
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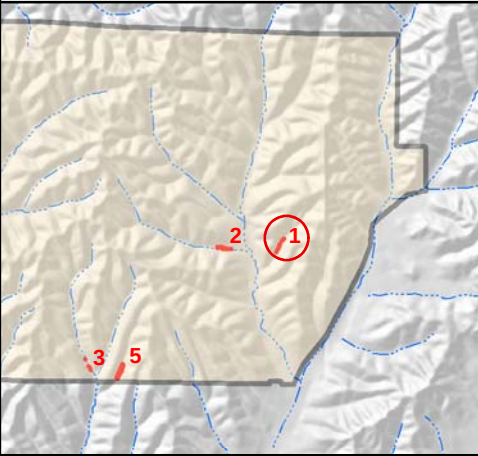


- Legend**
- ▲ Willowy Monardella Points (2002)
 - Willowy Monardella (2006)
 - Willowy Monardella (2002)
 - Treatment Area

Treatment Area Location



Detail Location

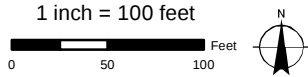


Map Notes

Data Source:
 MCAS Miramar - Air Station Boundary,
 2004 3-band Color Image
 AMEC - Treatment Areas

Projection: Stateplane, California 406
 NAD 83, Feet

Date: 3/28/2011



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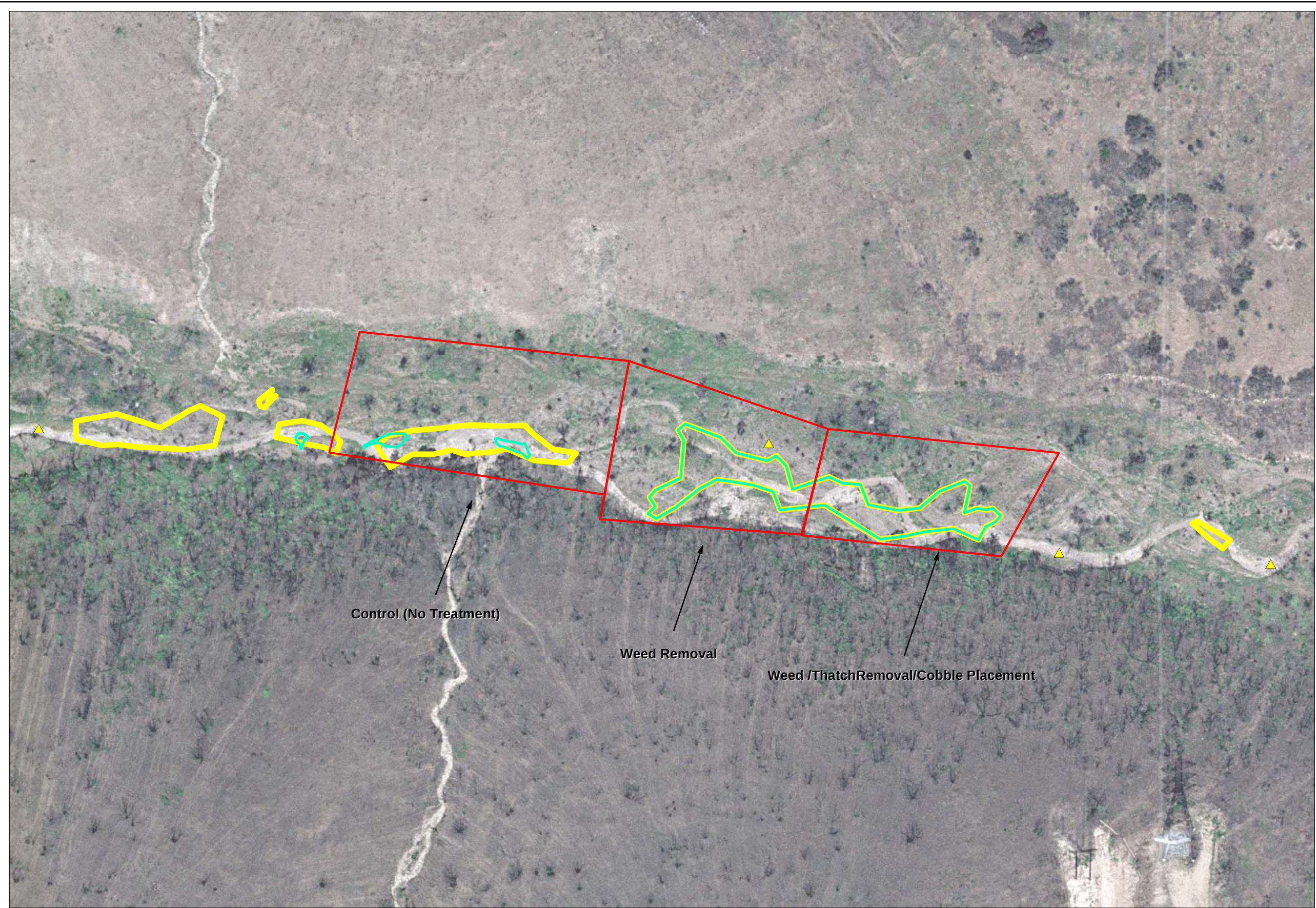
Willow Monardella Enhancement Area 1
 West Sycamore Canyon East
 Marine Corps Air Station Miramar

FIGURE
A-1



Figure A-2. WMEA 1 Site Showing Habitat Characteristics

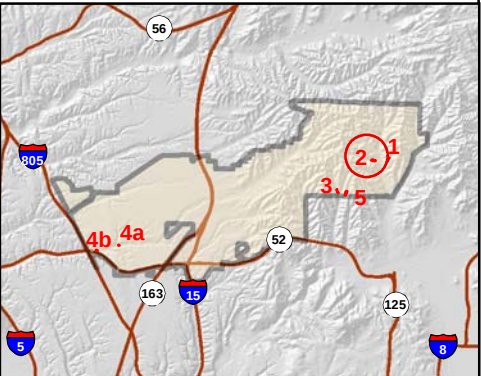
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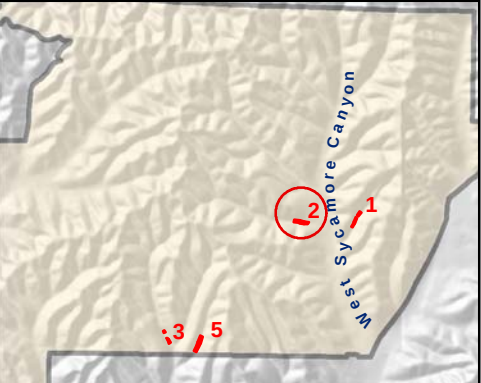
Legend

- Willowy Monardella Points (2002)
- Willowy Monardella (2002)
- Willowy Monardella (2006)
- Willowy Monardella (Extent the same for 2002 & 2006)
- Treatment Area

Treatment Area Location



Detail Location

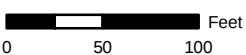


Map Notes

Data Source:
MCAS Miramar - Air Station Boundary,
2004 3-band Color Image
AMEC - Treatment Areas

Projection: Stateplane, California 406
NAD 83, Feet
Date: 3/28/2011

1 inch = 100 feet

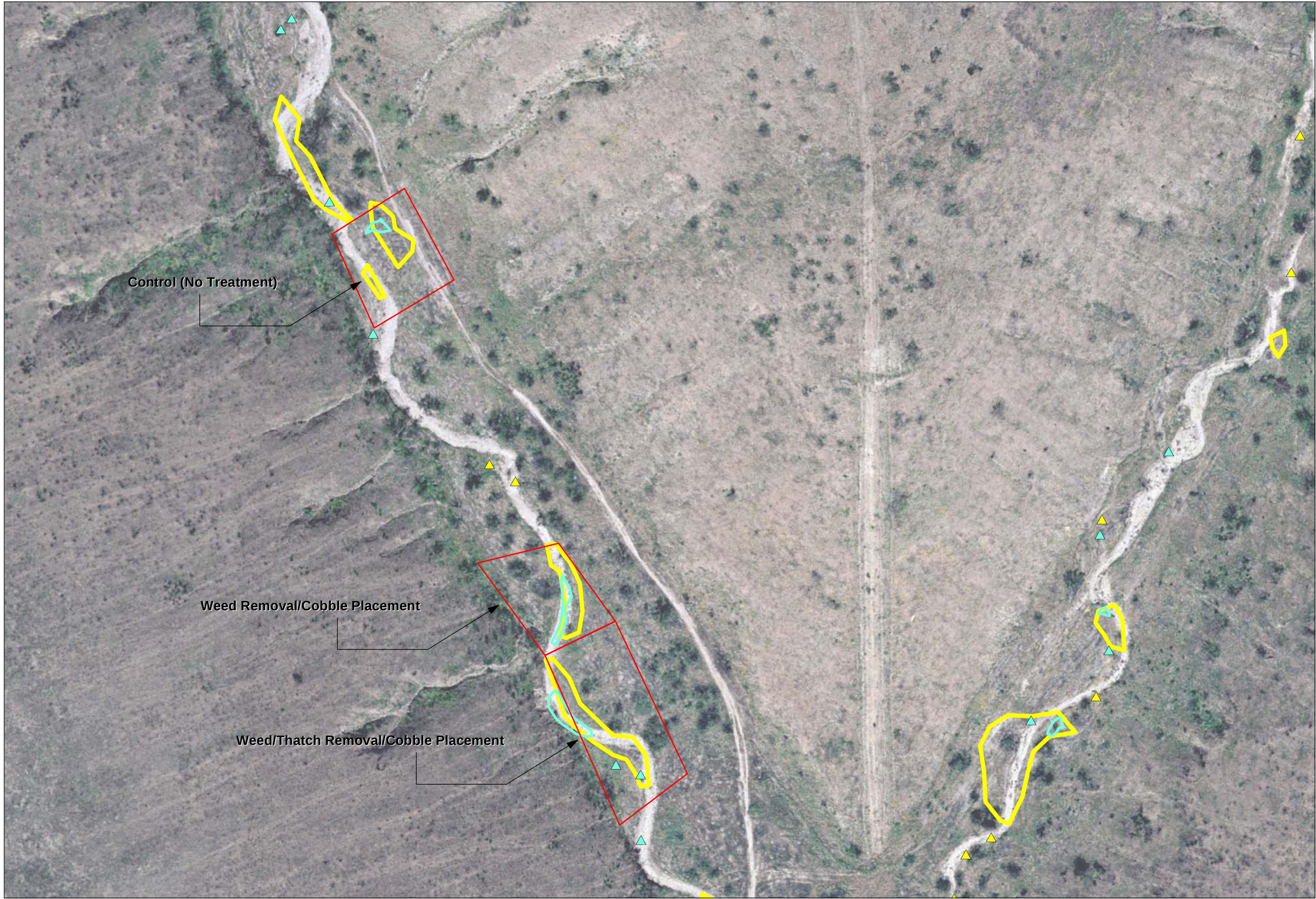


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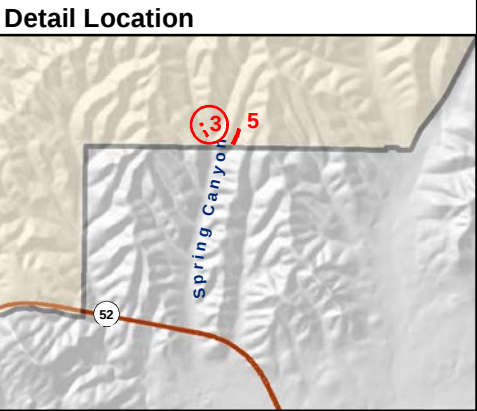
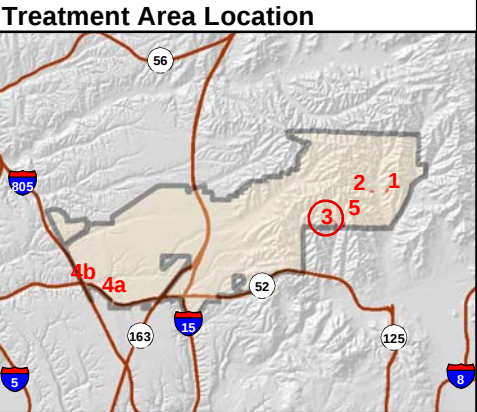


Figure A-4. WMEA 2 Showing Habitat (above) and the W/T Treatment Area in February 2010 (below)

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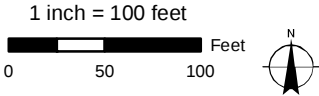


- Legend**
- ▲ Willowy Monardella Points (2006)
 - ▲ Willowy Monardella Points (2002)
 - Willowy Monardella (2006)
 - Willowy Monardella (2002)
 - Treatment Area



Map Notes
 Data Source:
 MCAS Miramar - Air Station Boundary,
 2004 3-band Color Image
 AMEC - Treatment Areas

 Projection: Stateplane, California 406
 NAD 83, Feet
 Date: 3/28/2011



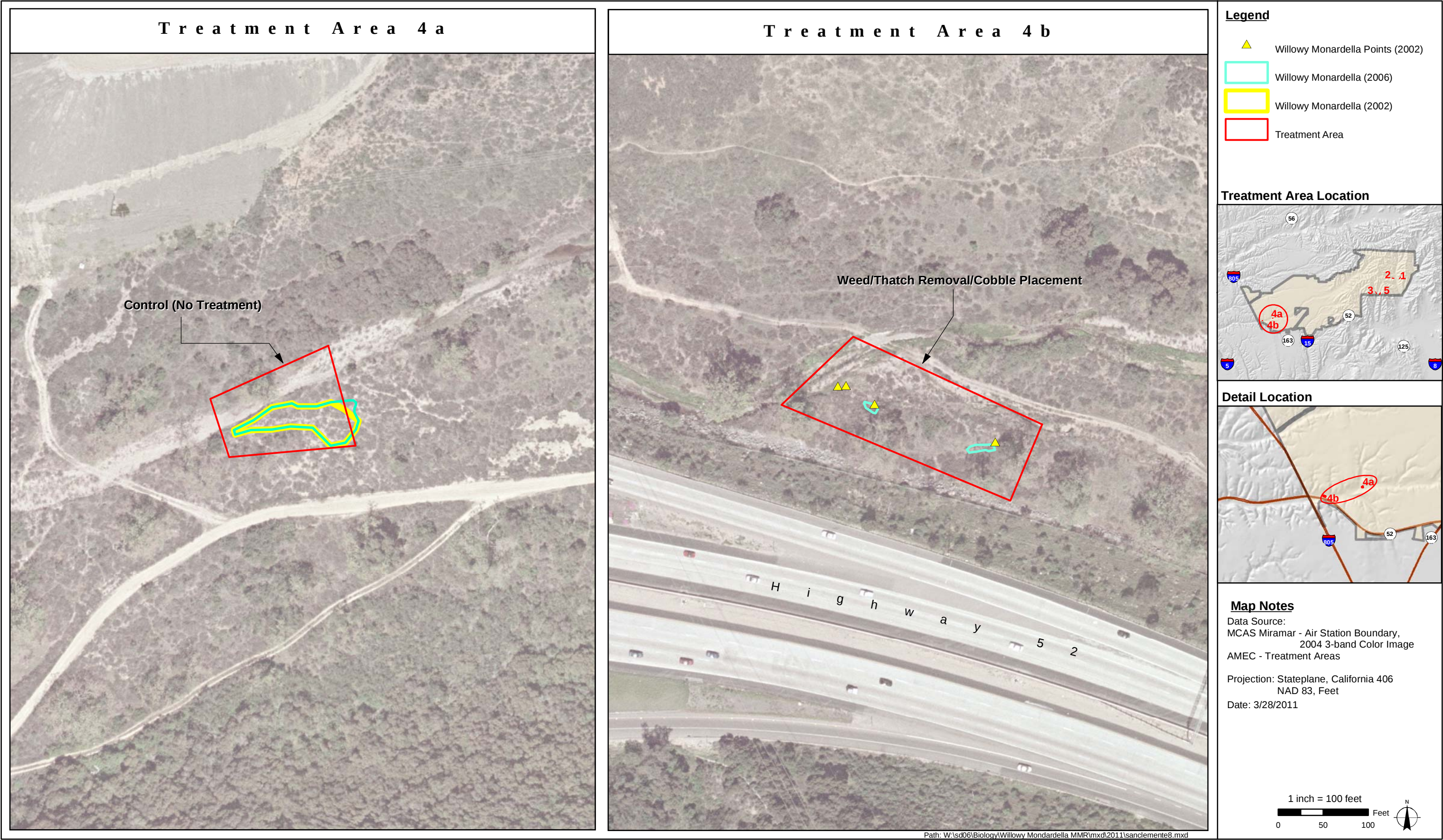
Willowy Monardella Enhancement Area 3
 Spring Canyon West
 Marine Corps Air Station Miramar

FIGURE
 A-5



**Figure A-6. WMEA 3 Habitat (above)
and W/T Treatment Area in June 2010 (below)**

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**Figure A-8. WMEA 4 Control Area (above)
and W/T Treatment Area (below) in May 2010**

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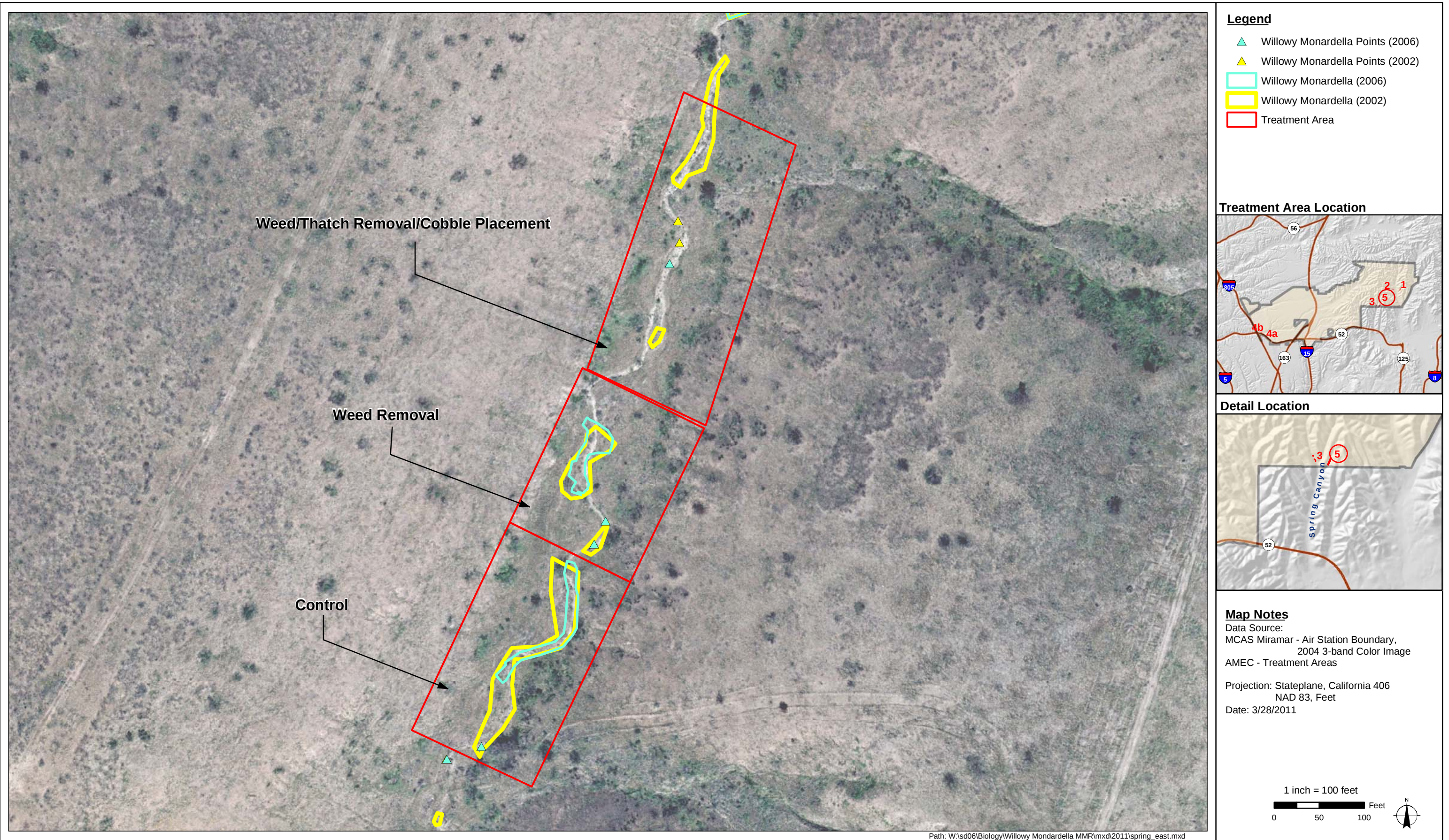




Figure A-10. WMEA 5 Control Area in April (above) and June (below) 2010



Figure A-11. WMEA 5 W Treatment April 2010, W/T Treatment June 2010

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APPENDIX B

SPECIES DIVERSITY IN ALL PLOTS

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Willow Monardella Habitat Enhancement 2010
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March 2011

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Species List - Enhancement Area 1 - West Sycamore Canyon East

Scientific Name	Common Name	Status
Native Species		
<i>Acourtia microcephala</i>	sacapellote	
<i>Amsinckia menziesii</i> var <i>intermedia</i>	rancher's fiddleneck	
<i>Antirrhinum nuttallianum</i>	Nuttall snapdragon	
<i>Artemisia californica</i>	coastal sagebrush	
<i>Baccharis sarothroides</i>	broom baccharis	
<i>Bromus carinatus</i>	California brome	
<i>Calandrinia breweri</i>	brewer calandrinia	
<i>Calandrinia ciliata</i>	red maids	
<i>Calystegia macrostegia</i> ssp <i>tenuifolia</i>	San Diego morning Glory	
<i>Castilleja exerta</i> ssp <i>exerta</i>	owl's clover	
<i>Caulanthus heterophyllus</i>	slender-pod jewel flower	
<i>Ceanothus tomentosus</i>	Ramona lilac	
<i>Cercocarpus minutiflorus</i>	mountain mahogany	
<i>Clarkia purpurea</i> ssp <i>quadrivulnera</i>	wine cups	
<i>Claytonia parviflora</i>	miner's lettuce	
<i>Claytonia perfoliata</i>	miner's lettuce	
<i>Clematis pauciflora</i>	clematis	
<i>Collinsia heterophylla</i>	Chinese houses	
<i>Cordylanthus rigidus</i> ssp. <i>setigerus</i>	dark-tip bird's beak	
<i>Crassula aquatica</i>	common pygmy weed	
<i>Croton setigerus</i> (<i>Eremocarpus setigerus</i>)	dove weed	
<i>Cryptantha intermedia</i>	cryptantha	

Species List - Enhancement Area 1 - West Sycamore Canyon East

Scientific Name	Common Name	Status
<i>Deinandra fasciculata</i>	tarweed	
<i>Delphinium parryi</i> ssp <i>parryi</i>	blue larspur	
<i>Descurania pinnata</i>	tansy mustard	
<i>Dichelostemma capitatum</i> sspp <i>capitatum</i>	blue dicks	
<i>Dodecatheon clevelandii</i>	shotting star	
<i>Emmenanthe penduliflora</i> var <i>penduliflora</i>	whispering bells	
<i>Eriodictyon crassifolium</i> var <i>crassifolium</i>	flat-leaf yerba santa	
<i>Eriogonum fasciculatum</i>	California buckwheat	
<i>Eriophyllum confertiflorum</i> var <i>confertiflorum</i>	golden yarrow	
<i>Eschscholzia californica</i>	California poppy	
<i>Eucryptha chrysanthemifolia</i>	common eucrypta	
<i>Ferocactus viridescens</i> var <i>viridescens</i>	San Diego barrel cactus	CNPS List 2.1
<i>Filago californica</i>	California filago	
<i>Galium nuttallii</i>	San Diego bedstraw	
<i>Helianthemum scoparium</i>	yellow rock-rose	
<i>Hesperoyucca whipplei</i>	chaparral yucca	
<i>Heteromeles arbutifolia</i>	toyon	
<i>Isocoma menziesii</i>	goldenbush	
<i>Jepsonia parryi</i>	coast jepsonia	
<i>Lathyrus vestitus</i>	wild pea	
<i>Lepidium lasiocarpum</i>	peppergrass	
<i>Lepidium nitidum</i>	peppergrass	
<i>Linanthus (Leptosiphon) parviflorus</i>	coast baby star	
<i>Linaria candensis</i>	blue toadflax	
<i>Lonicera subspicata</i>	southern honeysuckle	
<i>Lupinus bicolor</i>	dove lupine	
<i>Lotus scoparius</i>	deer weed	
<i>Leymus condensatus</i>	giant rye grass	
<i>Malacothamnus fasciculatus</i>	bushmallow	

Species List - Enhancement Area 1 - West Sycamore Canyon East

Scientific Name	Common Name	Status
<i>Malosma laurina</i>	laurel sumac	
<i>Marah macrocarpus</i>	wild cucumber	
<i>Melica imperfecta</i>	coast melic	
<i>Micropus californicus</i>	slender cottonweed	
<i>Mimulus aurantiacus</i> var <i>aurantiacus</i>	bush monkeyflower	
<i>Mimulus guttatus</i>	seep monkeyflower	
<i>Mirabilis laevis</i>	wishbone bush	
<i>Monardella viminea</i>	willowy monardella	CNPS List 1B.1; CA State & Federal Listed Endangered
<i>Opuntia littoralis</i>	coast prickly-pear	
<i>Oxalis albicans</i> ssp <i>Californica</i>	California wood sorrel	
<i>Pellaea mucronata</i> var <i>mucronata</i>	bird's foot fern	
<i>Pentagramma viscosa</i>	silverback fern	
<i>Phacelia distans</i>	common phacelia	
<i>Plagiobothrys nothofulvus</i>	popcorn flower	
<i>Pterostegia drymariodes</i>	granny's hairnet	
<i>Prunus ilicifolia</i>	holly-leaf cherry	
<i>Quercus berberidifolia</i>	scrub oak	
<i>Rhamnus crocea</i>	spiny redberry	
<i>Rhus ovata</i>	sugar bush	
<i>Sanicula arguta</i>	sharp-tooth sanicle	
<i>Selaginella bigelovii</i>	spike moss	
<i>Sidalcea malvaeflora</i> ssp <i>sparsiflora</i>	checkerbloom	
<i>Solanum parishii</i>	Parish nightshade	
<i>Salvia apiana</i>	white sage	
<i>Salvia mellifera</i>	black sage	
<i>Stephanomeria exigua</i>	small wreath-plant	
<i>Thysanocarpus laciniatus</i>	fringe-pod	
<i>Toxicodendron diversilobum</i>	poison oak	
<i>Trifolium willdenovii</i>	tomcat clover	

Species List - Enhancement Area 1 - West Sycamore Canyon East

Scientific Name	Common Name	Status
<i>Viola pedunculata</i>	johnny jump-up	
<i>Xylococcus bicolor</i>	mission manzanita	
Non-Native Species		
<i>Avena barbata</i>	wild oat	Cal-IPC moderate
<i>Brassica nigra</i>	black mustard	
<i>Bromus diandrus</i>	ripgut brome	Cal-IPC moderate
<i>Bromus hordeaceus</i>	soft chess	Cal-IPC limited
<i>Bromus madritensis ssp. Rubens</i>	red foxtail brome	Cal-IPC high
<i>Centaurea melitensis</i>	totalote	Cal-IPC moderate
<i>Erodium botrys</i>	long-beaked filaree	
<i>Erodium cicutarium</i>	red stem filaree	Cal-IPC limited
<i>Erodium moschatum</i>	white stem filaree	
<i>Hedypnois cretica</i>	crete weed	
<i>Hirschfeldia incana</i>	short-pod mustard	Cal-IPC moderate
<i>Hypochaeris glabra</i>	cat's ear	Cal-IPC limited
<i>Reseda luteola</i>	wild mignonette	
<i>Silene gallica</i>	windmill pink	
<i>Senecio vulgaris</i>	groundsel	
<i>Stellaria media</i>	common chickweed	
<i>Veronica anagallis-aquatica</i>	water speedwell	
<i>Vulpia myros</i>	rat's tail	Cal-IPC moderate
<i>Vulpia bromoides</i>	six weeks fescue	

*species in black text were added summer 2008

*species in blue text were added spring 2009

*species in red text were added spring 2010

Species List - Enhancement Area 2 - West Sycamore Canyon West

Scientific Name	Common Name	Status
Native Species		
<i>Acourtia microcephala</i>	sacapellote	
<i>Adiantum jordanii</i>	maidenhair Fern	
<i>Allium praecox</i>	red-skinned onion	
<i>Amsinckia menziesii var intermedia</i>	rancher's fiddleneck	
<i>Artemisia californica</i>	coastal Sagebrush	
<i>Baccharis sarothroides</i>	broom Baccharis	
<i>Bloomeria crocea ssp crocea</i>	golden Stars	
<i>Bromus carinatus</i>	California brome	
<i>Calystegia macrostegia ssp tenuifolia</i>	San Diego morning Glory	
<i>Castilleja exerta ssp exerta</i>	owl's clover	
<i>Caulanthus heterophyllus</i>	slender-pod jewel flower	
<i>Cercocarpus minutiflorus</i>	mountain mahogany	
<i>Chenopodium californicum</i>	California goosefoot	
<i>Clarkia epilobiodes</i>	canyon clarkia	
<i>Clarkia purpurea ssp quadrivulnera</i>	wine cups	
<i>Claytonia parviflora</i>	miner's lettuce	
<i>Claytonia perfoliata</i>	miner's lettuce	
<i>Clematis pauciflora</i>	clematis	
<i>Collinsia heterophylla</i>	Chinese houses	
<i>Crassula aquatica</i>	common pygmy weed	
<i>Croton setigerus (Eremocarpus setigerus)</i>	dove weed	
<i>Cryptantha intermedia</i>	cryptantha	

Species List - Enhancement Area 2 - West Sycamore Canyon West

Scientific Name	Common Name	Status
<i>Deinandra fasciculata</i>	tarweed	
<i>Dicentra chrysantha</i>	golden Ear-Drops	
<i>Dichelostemma capitatum</i> spp <i>capitatum</i>	blue dicks	
<i>Epilobium canum</i>	California Fushia	
<i>Eriodictyon crassifolium</i> var <i>crassifolium</i>	flat-leaf yerba santa	
<i>Eriogonum fasciculatum</i>	California Buckwheat	
<i>Eriophyllum confertiflorum</i> var <i>confertiflorum</i>	golden yarrow	
<i>Eschscholzia caespitosa</i>	tufted-gold poppy	
<i>Eschscholzia californica</i>	California poppy	
<i>Eucrypta chrysanthemifolia</i>	common eucrypta	
<i>Ferocactus viridescens</i> var <i>viridescens</i>	San Diego barrel cactus	CNPS List 2.1
<i>Filago californica</i>	California filago	
<i>Galium aparine</i>	common bedstraw	
<i>Galium nuttallii</i>	San Diego bedstraw	
<i>Geranium californicum</i>	California geranium	
<i>Gnaphalium californicum</i>	California everlasting	
<i>Gnaphalium canescens</i> ssp <i>microcephalum</i>	white everlasting	
<i>Gnaphalium stramineum</i>	cotton-batting plant	
<i>Helianthemum scoparium</i>	yellow rock-rose	
<i>Hesperoyucca whipplei</i>	chaparral Yucca	
<i>Heteromeles arbutifolia</i>	toyon	
<i>Lathyrus vestitus</i>	wild pea	
<i>Lepidium lasiocarpum</i>	peppergrass	
<i>Lepidium nitidum</i>	peppergrass	
<i>Linanthus (Leptosiphon) parviflorus</i>	coast baby star	
<i>Linaria candensis</i>	blue toadflax	
<i>Lonicera subspicata</i>	southern Honeysuckle	
<i>Lotus scoparius</i>	deer Weed	

Species List - Enhancement Area 2 - West Sycamore Canyon West

Scientific Name	Common Name	Status
<i>Lupinus bicolor</i>	dove lupine	
<i>Lupinus truncatus</i>	collar lupine	
<i>Malacothamnus fasciculatus</i>	bushmallow	
<i>Malosma laurina</i>	laurel sumac	
<i>Marah macrocarpus</i>	wild cucumber	
<i>Melica imperfecta</i>	coast melic	
<i>Mimulus aurantiacus</i> var <i>aurantiacus</i>	bush monkeyflower	
<i>Mimulus guttatus</i>	seep monkeyflower	
<i>Mirabilis laevis</i>	wishbone bush	
<i>Monardella viminea</i>	willowy monardella	CNPS List 1B.1; CA State & Federal Listed Endangered
<i>Opuntia littoralis</i>	coast prickly-pear	
<i>Oxalis albicans</i> ssp. <i>Californica</i>	California wood sorrel	
<i>Pellaea mucronata</i>	bird's foot fern	
<i>Pentagramma viscosa</i>	silverback fern	
<i>Phacelia distans</i>	common phacelia	
<i>Pholistoma auritum</i> var <i>auritum</i>	fiesta flower	
<i>Plagiobothrys</i> sp	popcorn flower	
<i>Prunus ilicifolia</i>	holly-leaf cherry	
<i>Pterostegia drymariodes</i>	granny's hairnet	
<i>Quercus berberidifolia</i>	scrub oak	
<i>Rhamnus crocea</i>	spiny redberry	
<i>Rhus integrifolia</i>	lemonade berry	
<i>Rumex salicifolius</i>	willow dock	
<i>Salvia apiana</i>	white sage	
<i>Salvia mellifera</i>	black sage	
<i>Selaginella bigelovii</i>	spike moss	
<i>Sidalcea malvaeflora</i> ssp <i>sparsiflora</i>	checkerbloom	
<i>Sisyrinchium bellum</i>	blue-eyed grass	

Species List - Enhancement Area 2 - West Sycamore Canyon West

Scientific Name	Common Name	Status
<i>Solanum parishii</i>	Parish nightshade	
<i>Stephanomeria exigua</i>	small wreath-plant	
<i>Thalictrum fendleri</i>	meadow rue	
<i>Thysanocarpus laciniatus</i>	fringe-pod	
<i>Toxicodendron diversilobum</i>	poison oak	
<i>Trifolium willdenovii</i>	tomcat clover	
<i>Uropappus lindleyi</i>	silver puffs	

Non-Native Species

<i>Avena barbata</i>	wild oat	Cal-IPC moderate
<i>Brassica nigra</i>	black mustard	Cal-IPC moderate
<i>Bromus diandrus</i>	ripgut brome	Cal-IPC moderate
<i>Bromus hordeaceus</i>	soft chess	Cal-IPC limited
<i>Bromus madritensis ssp. Rubens</i>	red foxtail brome	Cal-IPC high
<i>Erodium botrys</i>	long-beaked filaree	
<i>Erodium cicutarium</i>	red stem filaree	Cal-IPC limited
<i>Erodium moschatum</i>	white stem filaree	
<i>Euphorbia peplus</i>	petty spurge	
<i>Hirschfeldia incana</i>	short-pod mustard	Cal-IPC moderate
<i>Hypochaeris glabra</i>	cat's ear	Cal-IPC limited
<i>Lolium multiflorum</i>	Italian ryegrass	
<i>Plantago major</i>	common plantain	
<i>Reseda luteola</i>	wild mignonette	
<i>Senecio vulgaris</i>	groundsel	
<i>Silene gallica</i>	windmill pink	
<i>Stellaria media</i>	common chickweed	

Species List - Enhancement Area 2 - West Sycamore Canyon West

Scientific Name	Common Name	Status
<i>Vulpia myros</i>	<i>rat's tail</i>	Cal-IPC moderate
<i>Vulpia bromoides</i>	six weeks fescue	

*species in black text were added summer 2008

*species in blue text were added spring 2009

*species in red text were added spring 2010

Species List - Enhancement Area 3 - Spring Canyon West

Scientific Name	Common Name	Status
Native Species		
<i>Amsinckia menziesii</i> var <i>intermedia</i>	rancher's fiddleneck	
<i>Adenostoma fasciculatum</i>	chamise	
<i>Ambrosia psilostachya</i>	western ragweed	
<i>Artemisia californica</i>	coastal sagebrush	
<i>Baccharis sarothroides</i>	broom baccharis	
<i>Brickellia californica</i>	California brickelbush	
<i>Bromus carinatus</i>	California brome	
<i>Calandrinia ciliata</i>	red maids	
<i>Calystegia macrostegia</i> ssp. <i>tenuifolia</i>	San Diego morning glory	
<i>Castilleja exerta</i> ssp. <i>exerta</i>	owl's clover	
<i>Ceanothus tomentosus</i>	Ramona lilac	
<i>Cercocarpus minutiflorus</i>	mountain mahogany	
<i>Clarkia epilobioides</i>	canyon clarkia	
<i>Claytonia parviflora</i>	miner's lettuce	
<i>Claytonia perfoliata</i>	miner's lettuce	
<i>Clematis pauciflora</i>	clematis	
<i>Collinsia heterophylla</i>	Chinese houses	
<i>Cordylanthus rigidus</i> ssp. <i>setigerus</i>	dark-tip bird's beak	
<i>Crassula aquatica</i>	common pygmy weed	
<i>Croton setigerus</i> (<i>Eremocarpus setigerus</i>)	dove weed	
<i>Deinandra fasciculata</i>	tarweed	
<i>Dichelostemma capitatum</i> ssp. <i>capitatum</i>	blue dicks	

Species List - Enhancement Area 3 - Spring Canyon West

Scientific Name	Common Name	Status
<i>Erigeron foliosus</i> var. <i>foliosus</i>	fleabane daisy	
<i>Eriogonum fasciculatum</i>	California buckwheat	
<i>Eriophyllum confertiflorum</i> var. <i>confertiflorum</i>	golden yarrow	
<i>Eschscholzia caespitosa</i>	tufted-gold poppy	
<i>Eschscholzia californica</i>	California poppy	
<i>Eucryptha chrysanthemifolia</i>	common eucrypta	
<i>Ferocactus viridescens</i> var. <i>viridescens</i>	San Diego barrel cactus	CNPS List 2.1
<i>Filago californica</i>	California filago	
<i>Galium nuttallii</i>	San Diego bedstraw	
<i>Galium stellatum</i>	star-flowered bedstraw	
<i>Gnaphalium californicum</i>	California everlasting	
<i>Gnaphalium canescens</i> ssp. <i>microcephalum</i>	white everlasting	
<i>Gnaphalium palustre</i>	cudweed	
<i>Hesperoyucca whipplei</i>	chaparral yucca	
<i>Heteromeles arbutifolia</i>	toyon	
<i>Heterotheca grandiflora</i>	telegraph weed	
<i>Juncus bufonius</i>	toad rush	
<i>Lathyrus vestitus</i>	wild pea	
<i>Lepidium lasiocarpum</i>	peppergrass	
<i>Lessingia filaginifolia</i> var. <i>filaginifolia</i>	California aster	
<i>Lonicera subspicata</i>	southern honeysuckle	
<i>Lotus scoparius</i>	deer weed	
<i>Lupinus bicolor</i>	dove lupine	
<i>Lupinus hirsutissimus</i>	stinging lupine	
<i>Lupinus truncatus</i>	collar lupine	
<i>Malacothamnus fasciculatus</i>	bushmallow	
<i>Malosma laurina</i>	laurel sumac	
<i>Marah macrocarpus</i>	wild cucumber	
<i>Melica imperfecta</i>	coast melic	

Species List - Enhancement Area 3 - Spring Canyon West

Scientific Name	Common Name	Status
<i>Mirabilis laevis</i>	wishbone bush	
<i>Mimulus aurantiacus</i> var <i>aurantiacus</i>	bush monkeyflower	
<i>Monardella viminea</i>	willowy monardella	CNPS List 1B.1; CA State & Federal Listed Endangered
<i>Nassella pulchra</i>	purple needlegrass	
<i>Opuntia littoralis</i>	coast prickly-pear	
<i>Phacelia distans</i>	common phacelia	
<i>Pholistoma auritum</i> var <i>auritum</i>	fiesta flower	
<i>Prunus ilicifolia</i>	holly-leaf cherry	
<i>Quercus berberidifolia</i>	scrub oak	
<i>Rhamnus crocea</i>	spiny redberry	
<i>Ribes speciosum</i>	fuchsia-flower gooseberry	
<i>Rumex salicifolius</i>	willow dock	
<i>Salvia apiana</i>	white sage	
<i>Salvia mellifera</i>	black sage	
<i>Selaginella bigelovii</i>	spike moss	
<i>Sidalcea malvaeflora</i> ssp <i>sparsiflora</i>	checkerbloom	
<i>Solanum parishii</i>	Parish nightshade	
<i>Stephanomeria exigua</i>	small wreath-plant	
<i>Toxicodendron diversilobum</i>	poison oak	
<i>Uropappus lindleyi</i>	silver puffs	
<i>Viola pedunculata</i>	johnny jump-up	
<i>Xylococcus bicolor</i>	mission manzanita	

Non-Native Species

<i>Avena barbata</i>	wild oat	Cal-IPC moderate
<i>Bromus diandrus</i>	ripgut brome	Cal-IPC moderate
<i>Bromus hordeaceus</i>	soft chess	Cal-IPC limited

Species List - Enhancement Area 3 - Spring Canyon West

Scientific Name	Common Name	Status
<i>Bromus madritensis ssp. Rubens</i>	red foxtail brome	Cal-IPC high
<i>Centaurea melitensis</i>	totalote	Cal-IPC moderate
<i>Conyza canadensis</i>	horseweed	
<i>Cynodon dactylon</i>	Bermuda grass	
<i>Erodium botrys</i>	long-beaked filaree	
<i>Erodium cicutarium</i>	red stem filaree	Cal-IPC limited
<i>Erodium moschatum</i>	white stem filaree	
<i>Euphorbia peplus</i>	petty spurge	
<i>Hypochaeris glabra</i>	cat's ear	Cal-IPC limited
<i>Lolium multiflorum</i>	Italian ryegrass	
<i>Reseda luteola</i>	wild mignonette	
<i>Rumex crispus</i>	curly dock	
<i>Silene gallica</i>	windmill pink	
<i>Spergularia bocconii</i>	sand spurrey	
<i>Stellaria media</i>	common chickweed	
<i>Vulpia myros</i>	rat's tail	Cal-IPC moderate
<i>Vulpia bromoides</i>	six weeks fescue	

*species in black text were added summer 2008

*species in blue text were added spring 2009

*species in red text were added spring 2010

Species List - Enhancement Area 4 : San Clemente Canyon

Scientific Name	Common Name	Status
Native Species		
<i>Ambrosia acanthicarpa</i>	bur-sage	
<i>Amsinckia menziesii</i> var <i>intermedia</i>	rancher's fiddleneck	
<i>Artemisia californica</i>	coastal sagebrush	
<i>Artemisia palmeri</i>	Palmer sagewort	
<i>Baccharis pilularis</i>	coyote bush	
<i>Baccharis salicifolia</i>	mule-fat	
<i>Baccharis sarothroides</i>	broom baccharis	
<i>Bromus carinatus</i>	California brome	
<i>Calystegia macrostegia</i> ssp <i>tenuifolia</i>	San Diego morning Glory	
<i>Claytonia perfoliata</i>	miner's lettuce	
<i>Corethrogyne filafinifolia</i>	California aster	
<i>Crassula aquatica</i>	common pygmy weed	
<i>Cuscuta californica</i>	dodder	
<i>Dichelostemma capitatum</i> sspp <i>capitatum</i>	blue dicks	
<i>Eriogonum fasciculatum</i>	California buckwheat	
<i>Eschscholzia californica</i>	California poppy	
<i>Galium angustifolium</i> ssp. <i>angustifolium</i>	narrow-leaved bedstraw	
<i>Galium nuttallii</i>	San Diego bedstraw	
<i>Heteromeles arbutifolia</i>	toyon	
<i>Heterotheca grandiflora</i>	telegraph weed	
<i>Isocoma menziesii</i>	goldenbush	
<i>Lonicera subspicata</i>	southern honeysuckle	
<i>Lotus scoparius</i>	deer weed	
<i>Lupinus bicolor</i>	dove lupine	
<i>Lupinus truncatus</i>	collar lupine	
<i>Monardella viminea</i>	willow monardella	

CNPS List 1B.1; CA State & Federal Listed Endangered

Species List - Enhancement Area 4 : San Clemente Canyon

Scientific Name	Common Name	Status
<i>Opuntia littoralis</i>	coastal prickly pear	
<i>Platanus racemosa</i>	California sycamore	
<i>Prunus ilicifolia</i>	holly-leaf cherry	
<i>Quercus agrifolia</i>	coast live oak	
<i>Salix lasiolepis</i>	arroyo willow	
<i>Salvia apiana</i>	white sage	
<i>Salvia mellifera</i>	black sage	
<i>Solanum parishii</i>	Parish's nightshade	
<i>Toxicodendron diversilobum</i>	poison oak	

Non-Native Species

<i>Asphodelus fistulosus</i>	onion weed	Cal-IPC moderate
<i>Avena barbata</i>	slender wild oat	Cal-IPC
<i>Avena fatua</i>	wild oat	Cal-IPC
<i>Brassica nigra</i>	black mustard	Cal-IPC moderate
<i>Bromus diandrus</i>	ripgut brome	Cal-IPC moderate
<i>Bromus hordeaceus</i>	soft chess	Cal-IPC limited
<i>Bromus madritensis ssp. Rubens</i>	red foxtail brome	Cal-IPC high
<i>Carduus pycnocephalus</i>	Italian thistle	(Cal-IPC moderate and California Department of Food and Ag Noxious weed list C)
<i>Erodium botrys</i>	long-beaked filaree	
<i>Erodium cicutarium</i>	red stem filaree	Cal-IPC limited
<i>Erodium moschatum</i>	white stem filaree	
<i>Foeniculum vulgare</i>	fennel	Cal-IPC high
<i>Hirschfeldia incana</i>	short-pod mustard	Cal-IPC moderate
<i>Latua serriola</i>	prickly lettuce	
<i>Lolium multiflorum</i>	Italian ryegrass	Cal-IPC moderate
<i>Plantago lanceolata</i>	English plantain	Cal-IPC limited
<i>Rumex crispus</i>	dock	Cal-IPC limited
<i>Senecio vulgaris</i>	groundsel	

Species List - Enhancement Area 4 : San Clemente Canyon

Scientific Name	Common Name	Status
<i>Silene gallica</i>	windmill pink	
<i>Trifolium hirtum</i>	rose clover	Cal-IPC moderate
<i>Vulpia myros</i>	rat's tail	Cal-IPC moderate
<i>Vulpia bromoides</i>	six weeks fescue	

*species in blue text were added spring 2009

*species in red text were added spring 2010

Species List - Enhancement Area 5 -Spring Canyon East

Native Species

<i>Acourtia microcephala</i>	sacapellote
<i>Amsinckia menziesii</i> var <i>intermedia</i>	rancher's fiddleneck
<i>Adenostoma fasciculatum</i>	chamise
<i>Artemisia californica</i>	coastal sagebrush
<i>Artemisia palmeri</i>	Palmer's sagewort
<i>Baccharis sarothroides</i>	broom baccharis
<i>Bloomeria crocea</i> ssp <i>crocea</i>	golden Stars
<i>Bromus carinatus</i>	California brome
<i>Calandrinia ciliata</i>	red maids
<i>Calystegia macrostegia</i> ssp <i>tenuifolia</i>	San Diego morning Glory
<i>Castilleja exerta</i> ssp <i>exerta</i>	owl's clover
<i>Cercocarpus minutiflorus</i>	mountain mahogany
<i>Chenopodium californicum</i>	California goosefoot
<i>Clarkia epilobiodes</i>	canyon clarkia
<i>Clarkia purpurea</i> ssp <i>quadrivulnera</i>	wine cups
<i>Claytonia parviflora</i>	miner's lettuce
<i>Claytonia perfoliata</i>	miner's lettuce
<i>Clematis pauciflora</i>	clematis
<i>Collinsia heterophylla</i>	Chinese houses
<i>Crassula aquatica</i>	common pygmy weed
<i>Cuscuta californica</i>	dodder
<i>Deinandra fasciculata</i>	tarweed
<i>Dichelostemma capitatum</i> sspp <i>capitatum</i>	blue dicks
<i>Dodecatheon clevelandii</i>	shotting star
<i>Dudleya pulverulenta</i>	chalk dudleya
<i>Epilobium canum</i>	california fushia
<i>Erigeron foliosus</i> var. <i>foliosus</i>	fleabane daisy

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<i>Eriogonum fasciculatum</i>	California buckwhea	
<i>Eriophyllum confertiflorum</i> var <i>confertiflorum</i>	golden yarrow	
<i>Eschscholzia caespitosa</i>	tufted-gold poppy	
<i>Eschscholzia californica</i>	California poppy	
<i>Eucryptha chrysanthemifolia</i>	common eucrypta	
<i>Ferocactus viridescens</i> var <i>viridescens</i>	San Diego barrel cactus	CNPS List 2.1
<i>Filago californica</i>	California filago	
<i>Galium angustifolium</i> ssp. <i>angustifolium</i>	narrow-leaved bedstraw	
<i>Galium nuttallii</i>	San Diego bedstraw	
<i>Geranium californicum</i>	California geranium	
<i>Gnaphalium canescens</i> ssp <i>microcephalum</i>	white everlasting	
<i>Hesperoyucca whipplei</i>	chaparral yucca	
<i>Heteromeles arbutifolia</i>	toyon	
<i>Isocoma menziesii</i>	goldenbush	
<i>Lathyrus vestitus</i>	wild pea	
<i>Lepidium lasiocarpum</i>	peppergrass	
<i>Lessingia filaginifolia</i> var <i>filaginifolia</i>	California aster	
<i>Linaria candensis</i>	blue toadflax	
<i>Lonicera subspicata</i>	southern honeysuckle	
<i>Lotus scoparius</i>	deer weed	
<i>Lupinus bicolor</i>	dove lupine	
<i>Lupinus hirsutissimus</i>	stinging lupine	
<i>Malacothamnus fasciculatus</i>	bushmallow	
<i>Malosma laurina</i>	laurel sumac	
<i>Marah macrocarpus</i>	wild cucumber	
<i>Melica imperfecta</i>	coast melic	
<i>Mimulus aurantiacus</i> var <i>aurantiacus</i>	bush monkeyflower	
<i>Mirabilis laevis</i>	wishbone bush	
<i>Monardella viminea</i>	willowy monardella	CNPS List 1B.1; CA State & Federal Listed Endangered
<i>Opuntia ficus -indica</i>	mission cactus	

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<i>Opuntia littoralis</i>	coast prickly-pear
<i>Oxalis albicans</i> ssp. <i>Californica</i>	California wood sorrel
<i>Pellaea mucronata</i> var <i>mucronata</i>	bird's foot fern
<i>Pentagramma viscosa</i>	silverback fern
<i>Phacelia distans</i>	common phacelia
<i>Pholistoma auritum</i> var <i>auritum</i>	fiesta flower
<i>Plagiobothrys nothofulvus</i>	popcorn flower
<i>Platystemon californicus</i>	cream cups
<i>Pterostegia drymariodes</i>	granny's hairnet
<i>Prunus ilicifolia</i>	holly-leaf cherry
<i>Quercus berberidifolia</i>	scrub oak
<i>Rhamnus crocea</i>	redberry
<i>Ribes indecorum</i>	white-flower currant
<i>Ribes speciosum</i>	fushia-flower gooseberry
<i>Salvia apiana</i>	white sage
<i>Salvia columbariae</i>	chia
<i>Sambucus mexicana</i>	blue elderberry
<i>Sanicula arguta</i>	sharp-tooth sanicle
<i>Selaginella bigelovii</i>	spike moss
<i>Sidalcea malvaeflora</i> ssp <i>sparsiflora</i>	checkerbloom
<i>Solanum parishii</i>	Parish nightshade
<i>Silene laciniata</i>	indian pink
<i>Thysanocarpus laciniatus</i>	fringe-pod
<i>Toxicodendron diversilobum</i>	poison oak
<i>Trifolium willdenovii</i>	tomcat clover
<i>Uropappus lindleyi</i>	silver puffs
<i>Viola pedunculata</i>	johnny jump-up
<i>Xylococcus bicolor</i>	mission manzanita

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Non-Native Species

<i>Anagallis arvensis</i>	scarlet pimpernel	Cal-IPC moderate
<i>Avena barbata</i>	wild oat	Cal-IPC moderate
<i>Brassica nigra</i>	black mustard	
<i>Bromus diandrus</i>	ripgut brome	Cal-IPC moderate
<i>Bromus hordeaceus</i>	soft chess	Cal-IPC limited
<i>Bromus madritensis ssp. Rubens</i>	red foxtail brome	Cal-IPC high
<i>Centaurea melitensis</i>	tocalote	Cal-IPC moderate
<i>Conyza canadensis</i>	horseweed	
<i>Erodium botrys</i>	long-beaked filaree	
<i>Erodium cicutarium</i>	red stem filaree	Cal-IPC limited
<i>Erodium moschatum</i>	white stem filaree	
<i>Latuca serriola</i>	prickly lettuce	
<i>Lolium multiflorum</i>	Italian ryegrass	
<i>Lythrum hyssopifolium</i>	grass poly	
<i>Medicago polymorpha</i>	California burclover	
<i>Melilotus alba</i>	white sweetclover	
<i>Oxalis pes-caprae</i>	Bermuda buttercup	
<i>Polypogon monspeliensis</i>	annual beard grass	
<i>Raphanus sativus</i>	wild radish	
<i>Reseda luteola</i>	wild mignonette	
<i>Senecio vulgaris</i>	groundsel	
<i>Silene gallica</i>	windmill pink	
<i>Stellaria media</i>	common chickweed	
<i>Trifolium hirtum</i>	rose clover	
<i>Vulpia myros</i>	rat's tail	Cal-IPC moderate
<i>Vulpia bromoides</i>	six weeks fescue	