Vegetative analysis of native versus non-native plant species in the salt marsh-upland transition zones within the Los Cerritos Wetlands Complex

Environmental Science & Policy 400
Biology Team 2008

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Abstract

Tidal salt marshes are important for providing unique habitat for flora and fauna communities. Plant species such as *Isocoma menziesii* (goldenbush), *Lycium californicum* (sea lavender), and *Spergularia marina* (Sandspurry) are unique to salt-marsh transition zones (Zedler, 2001). The transition zone hosts important endangered species including: wandering skippers, tiger beetles, Belding Savannah Sparrows, and California least terns. The degradation of the Los Cerritos Wetlands causes concern for the local ecosystem, especially the lack of healthy transition zones. In degraded areas, non-native plant species are encroaching upon native species. In the transition zones, we expect to find a higher abundance of non-native plant species in comparison to native plant species; a greater average percent cover of non-native plant species versus native plant species due to the degradation of the Los Cerritos Wetlands Complex. Vegetation surveying was conducted at four sites within the Los Cerritos Wetlands (Zedler Marsh, Campgrounds, Steamshovel Slough, and the Hellman Property). At each site, ten, one meter-squared quadrats, were placed randomly along four transects. There was no significant difference in percent cover between non-native and native plant species (ANOVA, $p \geq 0.05$). Non-native species richness was also found to be greater than native plant species at each site. Non-native species are encroaching upon native plant species in the transition zones. The data generated is helpful for future restoration projects within the Los Cerritos Wetlands Complex.

Introduction

Wetlands are areas where lands saturate with water creating unique soil conditions for floral and faunal communities. Tidal salt marshes are extraordinary wetland habitats, which are influenced by daily oceanic tides, seasonal freshwater impulses as well as urban and agricultural runoff. Tidal circulation is an integral part of a functioning salt marsh as it flushes harmful pollutants out of wetlands. It also creates variations in abiotic factors that help support the conditions that sustain salt marshes. These salt marshes have unique salinity and moisture regimes that provide habitat for salt tolerant vegetation, which support the food chains leading to fish, shellfish and birds (Zedler, 2001). Southern California has a coastal topography and Mediterranean climate making its tidal salt marshes unique compared to the rest of the world. The climate allows for consistently dry conditions, with seasonal freshwater influx, which explains why tidal salt marshes belong to a limited biogeographic region between Santa Barbara and Baja California (Zedler, 2001). Southern California has 30 tidal salt marshes including the Los Cerritos Wetlands.

The Los Cerritos Wetlands Complex is situated in the Los Angeles and Orange Counties along the lower reach of the San Gabriel River. Over the past century, the channelization of the San Gabriel has limited the water flow across the coastal plains and has lead to the developments of what are now the cities of Seal Beach and Long Beach. The wetlands once consisted of more than 24,000 acres, but have now diminished to close to 50 acres of functioning wetlands (Los Cerritos Wetlands Authority 2006; Coastal

Conservancy, 2007). The wetlands consist of mitigation sites, freshwater, saltwater and brackish marshes, with either full tidal influence, limited tidal influence, or no tidal influence. The Complex is divided between several title-holders: Dean, Bryant, Hellman, Department of Water & Power, Los Cerritos Wetlands Authority, and the State of California. Each of the various title-holders use the land for different purposes and has degraded the Complex extensively with pollution, drainage, dredging, filling, oil drilling, power plants and urbanization (Los Cerritos Wetlands Authority, 2006). The Los Cerritos Wetlands Authority is the only title-holder who strives to preserve the wetlands and recognizes the rare opportunity to restore tidal salt marshes that provide valuable habitat for a number of bird species including Cooper's hawk, Northern harrier, and Osprey (Coastal Conservancy, 2007).

Tidal salt marshes are composed of several sub-habitats including salt pannes, mud flats, lower marsh, upper marsh, upland and ecotones within. Ecotones are transition zones that provide a boundary between different ecological communities, creating a more diverse habitat (Zedler, 2001). The wetland-upland transition zones of the Los Cerritos Wetlands provide great buffers between wetlands and urban areas helping to reduce the edge effect of human and domestic intrusion into sensitive vegetation. Such vegetation include the Pickleweed habitat of the Belding Savannah Sparrow, an endangered species, and the foraging marsh plains of many other special status species like California least tern, American coot, and the California brown pelican (Garcia et al., 2007). These ecotones are also habitat to a variety of animals such as the Pacific tree frog, southern alligator lizard, western fence lizard, and gopher snake among many other animal species (CWIS, 1998). These reptiles and amphibians are important indicator species to the health of wetlands because they are some of the first species to die off when pollutants reach high levels. The unique habitat of the wetland-upland transition zones of the Los Cerritos Wetlands have suffered extensive losses associated with urban development and should be protected as an extension of the wetlands (Zedler et al., 1992). Transition zones undergo heavy foot and vehicle traffic for recreational and commercial purposes due their proximity to marshes and accessibility. These excessive uses destroy specialized transitional plants, and allows for encroachment of non-native plant species in disturbed areas as they invade and compete with native plant species (Zedler, 1982).

The purpose of the 2008 Biology Team project is to analyze the health of the wetland-upland vegetative transition zones of the Los Cerritos Wetlands Complex (LCW). Our findings will enable us to determine the amount of native versus non-native plant species by identifying the percent cover of plant species located within the transition zones in Zedler Marsh, Steamshovel Slough, Campgrounds, and the Hellman property. In a healthy Southern California salt-marsh transition zone, the Biology Team would expect to find the following native plant species, *Frankenia palmerii, Lycium californicum, Isocoma menziesii,* and *Lasthenia glabrata coulteri* (Zedler et al., 1992). However, due to the degradation of the Complex, these native species may not be abundant. Instead, the Biology Team expects to find a higher abundance of non-native plant species such as, *Atriplex semibaccata, Bassia hyssopifolia, Lolium multiflorum, Mesembryanthemem nodiflorum, Mesembryanthemem crystallinum, Parapholis incurva,* and *Sonchus oleraceus* (Zedler et al., 1992). Our prediction is there will be a greater

average percent cover of non-native plant species versus native plant species in the transition zones, due to the degradation of the Los Cerritos Wetlands Complex. The degradation occurring in the Los Cerritos Complex is attributed to pollution, dredging, filling, oil drilling, and urbanization; each of which has played a role in the varying amount of tidal influence into the wetlands. Native transition plant species have evolved to adapt to the conditions associated with tidal salt marshes such as the variability of salinity correlating to tides. Non-native species cannot tolerate the variations and level of salinity associated with greater tidal flux (Zedler, 1982).

Biological factors as well as hydrological and chemical factors are important in determining the health of transition zones since transitional plant species adapt to specific soil conditions depending on salinity and pH levels. Data of the soil contents from the 2008 Hydrology-Chemistry Team (Hydro-Chem Team) analysis of the Hellman property and the 2007 Hydrology-Chemistry Team analysis of Steamshovel Slough are used to compare the impact of tides on the transition zones of the Hellman property (limited tidal influence) and Steamshovel Slough (full tidal influence). The integration of economics, law and policy is also essential in the preservation, protection and expansion of the Los Cerritos Wetlands and its transition zones. In Southern California, wetland protection typically extends only to the elevation of the average highest predicted tide under the Clean Water Act (USACE, 1987). The ecotone is rarely flooded and lacks regulation except where 100 feet habitat buffers are required (California Coastal Commission, 2008). According to the California Coastal Commission, buffers reduce the impact of humans on wetlands (2008). Wetland-upland transition zones of LCW are important to protect the lower marsh and mudflats for many species including the endangered species, Belding's Savannah Sparrow. In addition, maintaining the health of the transition zones will enhance the aesthetic value and increase the biodiversity of LCW. Data collected and analyzed generate valuable information for future research and restoration projects. Recommendations are provided on how the transition zones of Jack Dunster can be improved as well as how they should be implemented into the restoration plans of the Colorado Lagoon.

Methods

Surveying was conducted on April 09th, 14th, 16th, and 28th, 2008. Surveying consisted of six study sites in order to assess the health of the transition zones within the Los Cerritos Wetlands. The sites included Zedler Marsh, Campgrounds, Steamshovel Slough, the Hellman Property, Colorado Lagoon, and the Jack Dunster Marine Biological Reserve. Only qualitative observations of plant species in the transition zones were done at Colorado Lagoon and the Jack Dunster Marine Biological Reserve.

Initial sampling took place at Zedler Marsh by placing four, fifty meter transects along the transition zone (Appendix F). The transition zone is defined as the area between the upper marsh and the upland. The location of the upper marsh-transition boundary was determined by the presence of the plant species *Salicornia subterminalis* and *Frankenia salina*. The location of the transition-upland boundary was determined by the presence of

Isocoma menziesii and *Atriplex spp*. The position of each transect was determined by observing the healthiest areas of the transition zone within the pre-assigned boundaries. Ten, one meter-squared quadrats, were assigned randomly along each transect using a random number table. Using two GPS units, the Magellan Explorist 500LE and Garmin eTrex, coordinates of each quadrat were recorded.

Plant species considered to be of special interest that were observed, but did not fall within the quadrats, were also documented. Photographs (Appendix E) were taken of each quadrat using three digital cameras, Canon Elph 650, Samung Blast, and Samsung i760. Photographs of each species seen in the field are also provided in Appendix E.

Data analysis

Percent cover of each plant species, as well as bare ground, was visually estimated and recorded within each quadrat. Corrections were made for overlapping plant species using the following equation:

$$\text{Corrected \% of each species in quadrat} = \frac{\text{\% of individual species}}{\sum \text{\% of species in quadrat}} \times 100$$

The average percent cover of each species among the forty quadrats, at each site, was determined using the following equation:

$$\text{Average \% cover species 1} = \frac{\sum (\text{\% cover quadrat 1} + 2 + \ldots x)}{\text{Total \# of quadrats in site}}$$

After determining whether the species were native or non-native, the total percent cover of native, non-native, and unvegetated coverage (among the forty quadrats, within each site) was determined using the following equations:

$$\text{Total \% cover of native species} = \sum (\text{Avg. \% cover native species } 1 + 2 + \ldots x)$$

$$\text{Total \% cover of non-native species} = \sum (\text{Avg. \% cover non-native species } 1 + 2 + \ldots x)$$

The total unvegetated % cover equals that of the average % cover for each site as previously calculated.

The data was analyzed by performing a one-way ANOVA in order to determine if there was any differentiation between three distribution types: native, non-native, and unvegetated coverage.

Research Locations

The Los Cerritos Wetlands Complex has locations in both Los Angeles and Orange Counties. The surrounding waters of the Complex include the Los Cerritos Channel, the San Gabriel River, and a cooling channel for the Haynes power plant. The Complex currently has wetlands ranging from highly degraded to pristine conditions and include mitigation sites, freshwater marshes, brackish marshes as well as our main study focus of salt-water marshes (Los Cerritos Wetlands Authority, 2007).

There are eight salt marshes located in the Los Cerritos Wetlands Complex, Melissa's Degraded, Calloway Marsh, Zedler Marsh, Steamshovel Slough, Campgrounds, the Hellman property, Colorado Lagoon and Jack Dunster Marine Biological Reserve. However, due to initial visual observations, we only conducted vegetation surveys of four sites and qualitative vegetation observations of two sites. These sites were chosen because of their accessibility and varying degrees of transition zones from no tidal influence to full tidal influence. To prevent disturbance of the endangered species, Belding's Savannah Sparrow, during their nesting season (January-August), we avoided the lower marsh *Salicornia virginica* habitat. We conducted vegetation surveys of Zedler Marsh, Steamshovel Slough, Campgrounds and the Hellman property (Appendix A). Qualitative vegetation observations were conducted of Colorado Lagoon and Jack Dunster Marine Biological Reserve. The surveys provide valuable information for upcoming restoration projects.

<u>Specific Study Sites</u>
Vegetation Surveys

Zedler Marsh (ES&P Biology Team, 2008)

1) Zedler Marsh has limited tidal influence from the San Gabriel River

Zedler Marsh is nestled between the San Gabriel River and the Haynes Cooling Channel. Although public access is restricted, people can look at the marsh from the San Gabriel River bike path. Zedler Marsh appeared to have the healthiest transition zone, due to the abundance of the transition zone species, *Isocoma menziesii*. One side of the marsh has a gentle slope, allowing for distinct zonations of species. The other side retains a berm, to refrain water from entering the oil wells. There is a road adjacent to the marsh and is the only access to the oil derricks, ensuing heavy truck traffic.

Campgrounds (ES&P Biology Team, 2008)

2) Campgrounds has no tidal influence

Upon initial observation, Campgrounds appeared to be the most degraded site of the four specific study areas. The lack of water influx suggests minimal existence of salt marsh vegetation; however, vegetation surveys have proven otherwise. The overall topography is moderately flat, with several shallow depressions that fill with water during wet periods. Several roads lead to oil derricks throughout the site; in areas determined to be transition zones.

Hellman property (ES&P Biology Team, 2008)

3) Hellman property has limited tidal influence from the San Gabriel River

The Hellman property is located off Pacific Coast Highway. It is privately owned, but the Los Cerritos Wetland Authority is in the process of purchasing the land. With this basis, the 2008 Environmental Science and Policy 400 (ES&P 400) course group was the first to survey the area. The property is currently used for oil drilling and consists of numerous roads throughout the site. The property appeared degraded, with fill material in the upland and transition zone areas. The upland contains mostly non-native plants, including a variety of mustard and radish species. The Hellman property has limited tidal influence from the San Gabriel River, however, the water is constrained to a narrow channel, which flows within the property. One side of the channel retains a steep berm, providing minimal distinct plant species zonation. The opposite side has a

gentle slope consisting of fill material, creating conditions for invasive opportunistic species. Dumped materials, including old roof shingles, littered the property. Although much of the property is degraded, *Lycium californicum* is found on site in an area with extremely narrow plant species zonation. In addition, Belding's Savanna Sparrow was heard during observations.

Steamshovel Slough (ES&P Economics Team, 2007)

4) Steamshovel Slough has full tidal influence from the Los Cerritos Channel

Steamshovel Slough is located between Loynes Street, Studebaker, Second Street and Pacific Coast Highway. These roads receive high levels of traffic, polluting the wetlands with noise, light, and runoff. There are oil derricks on the outskirts of two sides of the Slough, one with a culvert emptying into it. Although there is pollution, Steamshovel Slough is considered the most pristine marsh in the Los Cerritos Wetlands Complex due to its full tidal flushing. Despite, its pristine salt marsh, the upland area is highly degraded. Instead of coastal sage scrub, non-native plant species have invaded the upland area. These opportunistic weeds expand into the transition zones. Although the upland and transition zones are degraded, many species live throughout the wetlands. California least terns were observed while studying the area, as well as a coyote den in the transition zone.

Qualitative Vegetation Observations

Colorado Lagoon (ES&P Economics Team, 2007)

5) Colorado Lagoon has muted tidal influence from Marine Stadium

Colorado Lagoon is situated between three busy streets and a golf course. Eleven storm drains empty into the lagoon, with one culvert providing tidal flow from Marine Stadium. Influxes of pollution from storm drains make the lagoon highly polluted. Despite pollution levels, Colorado Lagoon is a popular recreation site. A sandy beach adjacent to the wetlands and an education center, attract crowds during the summer. Only one side of the wetlands hosts vegetation. There is a gentle slope, but it lacks plant species zonation. The vegetation is a mix of weeds, with some native species. Colorado Lagoon is important to the study because there is restoration drafting plans underway. The 2008 Biology Team suggest the data collected from the other sites in the wetlands will be helpful and used in the restorations.

6) Jack Dunster Marine Biological Reserve has full tidal influence from Alamitos Bay

Jack Dunster Marine Biological Reserve (ES&P Biology Team, 2008)

Jack Dunster is a mitigated site. The site is constrained by a residential area on one side and Los Alamitos Bay on the other. For the most part, it is healthy; however, it lacks a transition zone. Rocks placed along Jack Dunster prevent slides during higher tides and separates the marsh into layers, preventing a mixing between zones. Additionally, a walk path covers the ideal salt marsh-transition areas. There is an overall lack of a transition

zone, however, one *Isocoma menziesii* plant, a specialized transitional species, was found along the walk path.

Timeline & Schedule

Field work was conducted between April 09, 2008 and April 28, 2008.

Date	**Field Location**	**Field Surveyors**
April 09, 2008 12:15pm	Zedler Marsh	Erika Bjorkquist Jovairia Loan Jessica Nava Mary Ngo Eric Zahn
April 14, 2008 12:15pm	Zedler Marsh Campgrounds	Erika Bjorkquist Jovairia Loan Jessica Nava Mary Ngo Eric Zahn
April 16, 2008 12:15pm	Hellman Property	Erika Bjorkquist Jovairia Loan Jessica Nava Mary Ngo Eric Zahn
April 28, 2008 1:00pm	Steamshovel Slough Jack Dunster Marine Biological Reserve Colorado Lagoon	Erika Bjorkquist Jovairia Loan Mary Ngo Eric Zahn

Results

There were a total of fourteen non-native plant species and eight native plant species identified in Zedler Marsh (Figure 5). The non-native species with the highest percent cover was *Mesumbryanthemum nodiflorum* (Little iceplant) at 17.10%, while the highest percent cover for a native species was the species *Isocoma menziesii* (Golden bush) at 14.86%. The percent cover of non-native species (42.52) was higher than native (19.44) and unvegetated cover (38.01) (appendix C). The standard error of native plant species was ±1.79 and non-native plant species was ±1.18. The comparison of all three distribution types, show a significant difference ($p \leq 0.05$). However, there was no significant difference when comparing native versus non-native species ($p=0.77$). There is a 23.08% cover difference between non-native and native plant species. Unvegetated cover accounts for 38.01% (Figure 1).

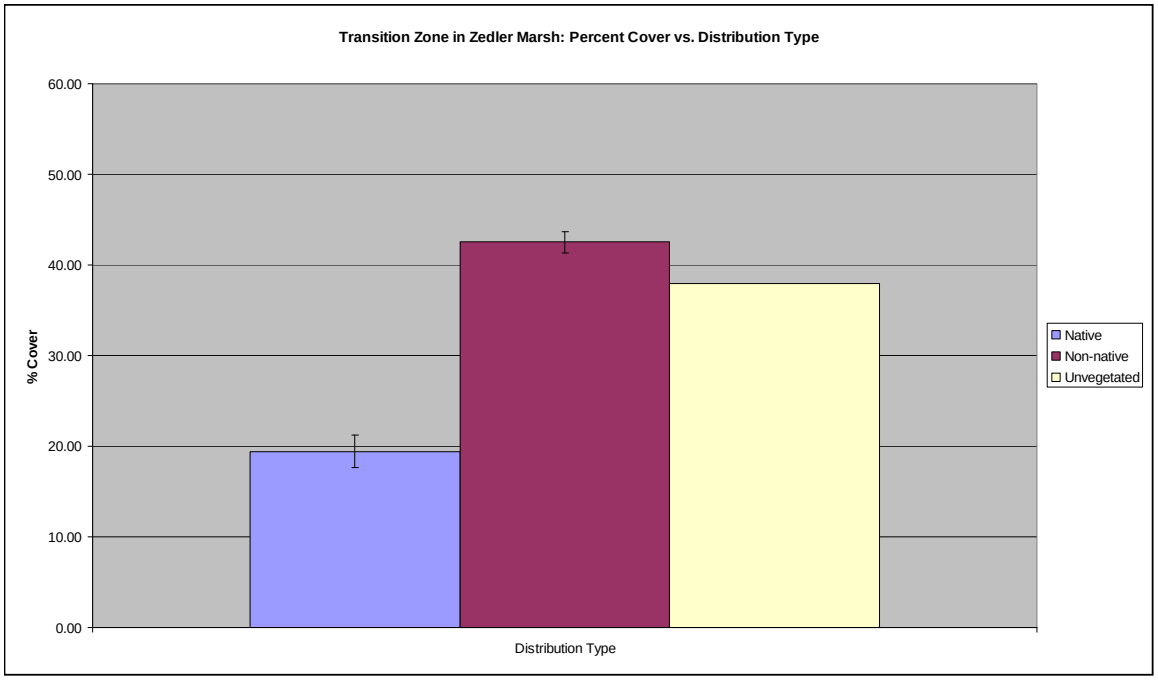

Figure 1: The percent cover of native/non-native plant species and unvegetated cover surveyed within the salt marsh-upland transitional zones of Zedler Marsh. Standard error of native (±1.79) and non-native (±1.18). Note: Error bars have only been provided for native and non-native distribution types due to the variation in species found within those categories; unvegetated cover has no variance. *(ES&P Biology Team, 2008)*

There were a total of sixteen non-native plant species and six native plant species identified in Campgrounds (Figure 5). The non-native species with the highest percent cover was *Parapholis incurva (*European sicklegrass*)* at 15.07%, while the highest percent cover for a native species was the species *Distichlis spicata* (Coastal saltgrass) at 24.77%. The percent cover of non-native species (55.00) was higher than native (45.42) and unvegetated cover (16.38) (Appendix C). The standard error of native species was ±3.97 and non-native species was ±1.24. The comparison of all three distribution types, show a significant difference ($p \leq 0.05$). However, there was no significant difference when comparing native versus non-native species ($p=0.18$). There is a 9.58% cover difference between non-native and native plant species. Unvegetated cover accounts for 16.38% (Figure 2).

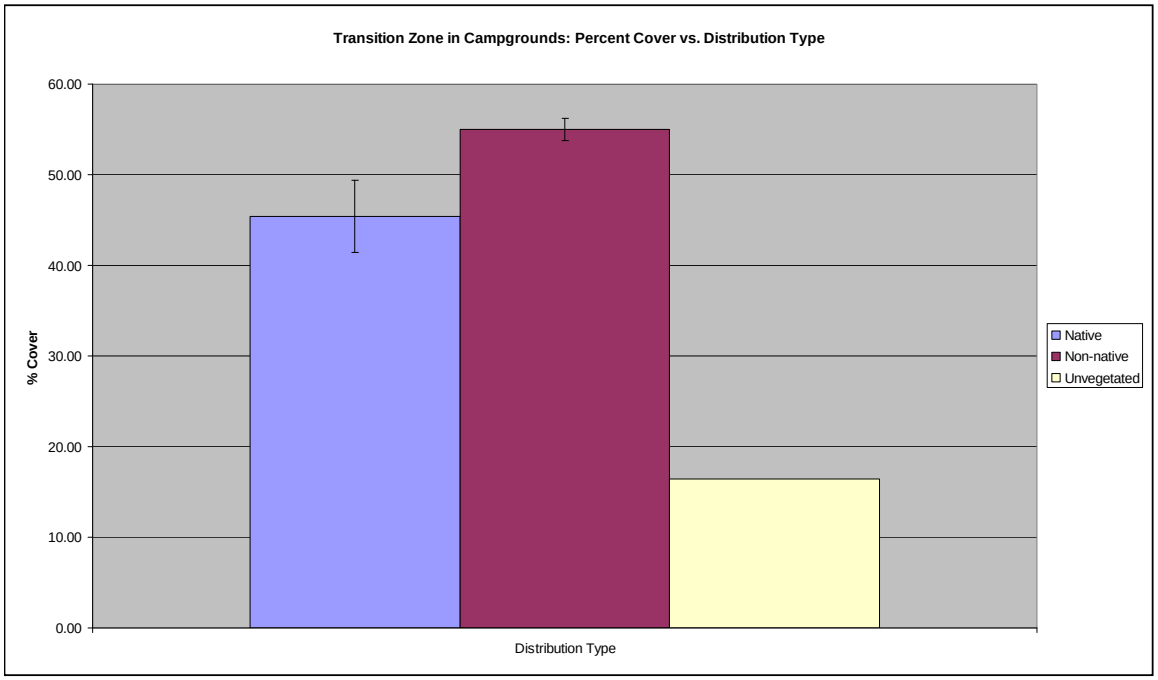

Figure 2: The percent cover of native/non-native plant species and unvegetated cover surveyed within the salt marsh-upland transitional zones of Campgrounds. Standard error of native (±3.97) and non-native (±1.24). Note: Error bars have only been provided for native and non-native distribution types due to the variation in species found within those categories; unvegetated cover has no variance. *(ES&P Biology Team, 2008)*

There were a total of fifteen non-native plant species and four native plant species identified at the Hellman Property (Figure 5). The non-native species with the highest percent cover was *Mesumbryanthemum nodiflorum* (Little iceplant) at 31.25%, while the highest percent cover for a native species was the species *Salicornia virginica* (Pickleweed) at 12.31%. The percent cover of non-native species (56.19) was higher than native (19.03) and unvegetated cover (23.28) with a standard error of ±3.86 for native species and ±1.49 for non-native species (Appendix C). There is a 37.16% cover difference between non-native and native plant species. Unvegetated cover accounts for 23.28%. The comparison of all three distribution types, show a significant difference ($p \leq 0.05$). However, there was no significant difference when comparing native versus non-native species ($p=0.81$) (Figure 3).

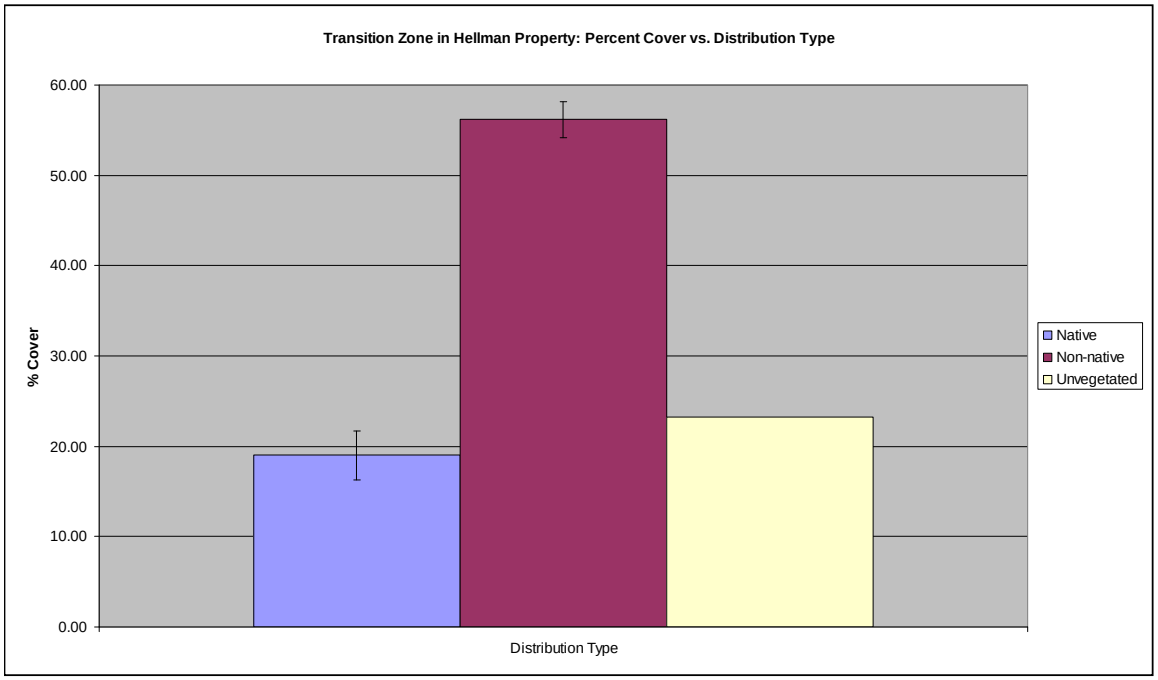

Figure 3: The percent cover of native/non-native plant species and unvegetated cover surveyed within the salt marsh-upland transitional zones of the Hellman Property. Standard error of native (±3.86) and non-native (±1.49). Note: Error bars have only been provided for native and non-native distribution types due to the variation in species found within those categories; unvegetated cover has no variance. *(ES&P Biology Team, 2008)*

There were a total of fifteen non-native plant species and six native plant species identified at Steamshovel Slough (Figure 5). The non-native species with the highest percent cover was *Mesumbryanthemum nodiflorum* (Little iceplant) at 19.60%, while the highest percent cover for a native species was the species *Monanthoechloe littoralis* (Shoregrass) at 27.69%. The percent cover of non-native species (50.73) was higher than native (32.43) and unvegetated cover (17.94) with a standard error of ±3.86 for native and ±1.49 for non-native species (Appendix C). There is a 15.88% cover difference between non-native and native plant species. Unvegetated cover accounts for 16.84%. The comparison of all three distribution types, show a significant difference ($p \leq 0.05$). However, there was no significant difference when comparing native versus non-native species ($p=0.77$) (Figure 4).

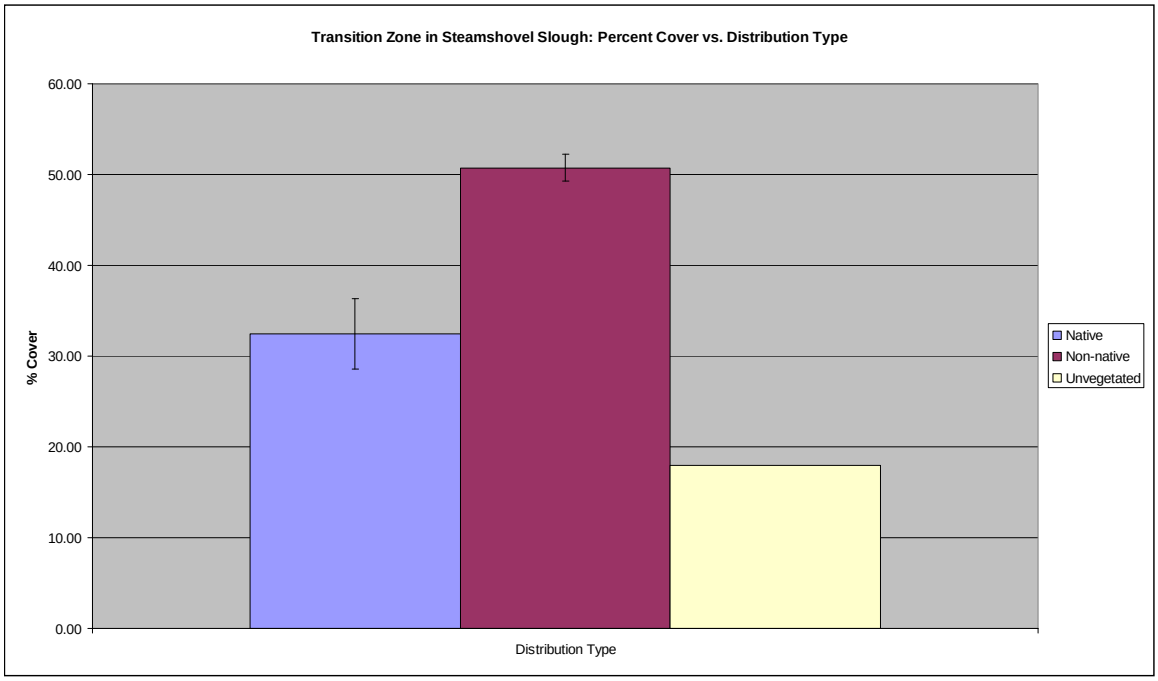

Figure 4: The percent cover of native/non-native plant species and unvegetated cover surveyed within the salt marsh-upland transitional zones of Steamshovel Slough. Standard error of native (±3.86) and non-native (±1.49). Note: Error bars have only been provided for native and non-native distribution types due to the variation in species found within those categories; unvegetated cover has no variance. *(ES&P Biology Team, 2008)*

The non-native species richness ranged from fourteen to sixteen species between all four sites, with the greatest number occurring at Campgrounds and the lowest at Zedler Marsh. The native species richness ranged from four to eight species between all four sites with the greatest number of native plant species at Zedler Marsh and the lowest at the Hellman Property. The total number of plant species that were surveyed in the transition zone, at each site, ranged from nineteen to twenty-two species (Figure 5).

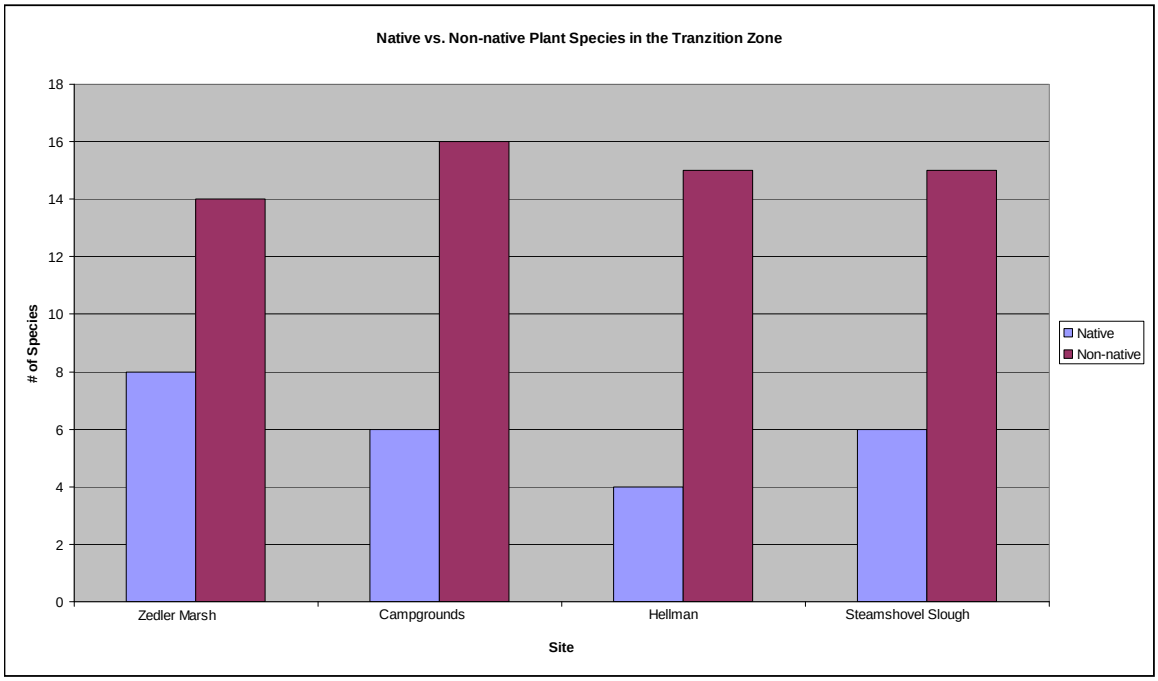

Figure 5: Comparison of species richness of non-native and native plant species in the transition zone of four sites in Los Cerritos Wetlands. *(ES&P Biology Team, 2008)*

Table 1 shows the native species surveyed in the transition zone at each site. The data shows that species distribution varies between sites; there was not one species present throughout all four sites (Appendix B). *Distichlis spicata* and *Frankenia salina* (Alkali seaheath) were both found at Zedler Marsh, Campgrounds, and Steamshovel Slough. *Salicornia subterminalis* (Parish's glasswort) was found at Zedler Marsh, the Hellman Property, and Steamshovel Slough. *Anaphalis spp.* (Pearly everlasting) and *Conyza canadensis* (Canadian horsetail) were only found at Zedler Marsh. Of all the four sites, two species were found only in Campgrounds, *Scirpus robustus* (Stout bulrush) and *Xanthium strumarium* (Cocklebur). Four species were found only in Steamshovel Slough, *Batis maritima* (Turtleweed), *Jaumea carnosa* (Marsh jaumea), *Lycium californicum* (Sea lavendar), and *Monanthochloe littoralis* (Shore grass).

Native Species	Sites			
	Zedler Marsh	Campgrounds	Hellman Property	Steamshovel Slough
Anaphalis spp.	•			
Batis maritima				•
Conyza canadensis	•			
Cressa truxillensis	•	•		
Distichlis spicata	•	•		•
Frankenia salina	•	•		•
Galium angustifoluim	•			
Isocoma menziesii	•		•	
Jaumea carnosa				•
Limonium californicum				•
Monanthochloe littoralis				•
Salicornia subterminalis	•		•	•
Salicornia virginica		•	•	
Scirpus robustus		•		
Spergularia marina			•	
Xanthium strumarium		•		

Table 1: Presence or absence of native plant species within areas of the transition zones of Los Cerritos Wetlands. *(ES&P Biology Team, 2008)*

Table 2 shows the non-native species surveyed in the transition zone at each site. Seven species were found at all four study sites, *Bassia hyssopifoila* (Smotherweed), *Bromis diandrus* (Ripgut grass), *Centuria melitensis* (Tocolate), *Melilotus indica* (Sweet clover), *Mesymbryanthemum nodiflorum* (Little iceplant), *Parapholis incurva* (European sicklegrass), *Sonchus oleraceus* (Sow thistle).

Non-native Species	Sites			
	Zedler Marsh	Campgrounds	Hellman Property	Steamshovel Slough
Atriplex semibaccata			•	•
Bassia hyssopifolia	•	•	•	•
Brassica nigra	•		•	
Bromus diandrus	•	•	•	•
Bromus madritensis	•	•		•
Centaurea melitensis	•	•	•	•
Erodium cicutarium	•	•		
Hordeum vulgare	•		•	•
Lolium multiflorum		•	•	
Malva parviflorum			•	•
Melilotus alba		•		
Melilotus indica	•	•	•	•
Mesymbryanthemum crystallinum	•	•		
Mesymbryanthemum nodiflorum	•	•	•	•
Parapholis incurva	•	•	•	•
Plantago spp.		•		
Polypogon monspeliensis	•	•	•	
Raphanus sativa			•	
Salsola tragus			•	•
Silybum marianum	•			•
Sisymbrium spp.	•	•		
Solanum spp.		•		•
Sonchus oleraceus	•	•	•	•

Table 2: Presence or absence of non-native plant species within areas of the transition zones of Los Cerritos Wetlands. *(ES&P Biology Team, 2008)*

There were no apparent transition zones observed through qualitative analyses of Jack Dunster Marine Biological Reserve and Colorado Lagoon. Initial observations at Jack Dunster revealed healthy native vegetation and a lack of transition zones. One *Isocoma menziesii* plant was observed. Colorado Lagoon had an array of non-native species including *Parapholis incurva* and *Polypogon monspeliensis* and native species, including *Monanthochloe littoralis* and *Salicornia virginica.*

Discussion

The Los Cerritos Wetlands is degraded due to numerous anthropogenic activities such as filling, proximity to residential areas, roads, and oil derricks. The degradation of the Los Cerritos Wetlands has created ideal conditions for opportunistic species to invade transition zones. One indication of the health of the Los Cerritos Wetlands is the presence of the native species in relation to non-native plant species. Vegetation analyses proved that non-native species occurred at a higher rate in comparison to native species at the four study sites within the Complex (Zedler Marsh, Campgrounds, the Hellman

Property, and Steamshovel Slough). Instead of specialized plants growing in the transition zone, we found opportunistic weedy species and an abundance of typical salt marsh plants. The absence of the specialized transition species, created a niche available to others, especially non-native plants.

Zedler Marsh has the healthiest transition zone in the Los Cerritos Wetlands Complex. Not only did it have the greatest number of native plant species, but it also had the highest percent cover of a specialized transition zone species, *Isocoma menziesii* (14.86%) (Appendix C). In addition, Zedler Marsh had the lowest non-native percent cover and species richness, which can be attributed to the high occurrence of *I. menziesii*. *I. menziesii* is specialized to inhabit the transition zone of a salt-marsh, therefore, it can outcompete non-native plant species (Zahn, 2008). Additionally, visual observations showed Zedler Marsh having a gentle slope, thus enabling an ideal habitat for a healthier transition zone.

Initial observations of the selected sites suggested Campgrounds to be the most degraded due to the lack of tidal influence, yet the highest percent cover of native plant species was found here. Campgrounds has no tidal influx, which would contribute to an extreme environment that would suggest a lower number of native transition plant species. Although it had the highest species richness of non-native plants, it also contained the highest percent coverage of native plant species. The majority of the total native percent cover consisted of two species, *Distichlis spicata* and *Salicornia virginica*. The native plant species with the highest percent cover was *Distichlis spicata* (24.77%), a marsh plain-upland transition zone plant (Appendix C) (Miller et al., 1998). The absence of a specialized transition zone species may have contributed to the evenness in percent coverage between non-native and native species.

Studies on the Los Cerritos Wetlands Complex, conducted by previous ES&P 400 course groups, have not included data on the Hellman Property due to restricted access to the study site. The 2008 ES&P 400 course group was granted access to the site, thus allowing the Biology Team to survey the area. Because access was granted, the 2008 Hydro-Chem Team based their study on the Hellman Property. The lack of data, as well as the limited tidal influence to the area, suggested it might be relatively healthy compared to the other three sites. However, Hellman had the unhealthiest transition zone in the Los Cerritos Wetlands Complex. The site contained the highest percent cover of non-native plant species and the lowest number of native plant species. An important note of mention is that Hellman and Campgrounds had similar non-native percent cover with a difference of 1.19%. The similarity between both sites is due to extensive degradation. The main causes of degradation at the Hellman Property are dredging, filling, dumping and the presence of oil derricks. Fill material was observed in the transition area. Soil core analysis provided by the Hydro-Chem Team showed that the upper forty-five centimeters of samples taken were primarily comprised of sand. Core analysis also revealed that the average salinity of the transition zone was 1.27 ppt (Davidson et al., 2008). The low salinity level could be attributed to grain size, composition, and limited tidal influence (Rosso et al., 2005). Although the Hellman property was the most degraded site, it contained three transition zone species, *Isocoma*

menziesii, Lycium californicum, and *Lasthenia glabrata coulter.* The latter two were only found at the Hellman property. *I. menziesii* made up only 1.41% (Appendix C) of the total percent cover of the survey site, preventing the species to outcompete intrusive non-native species.

Steamshovel Slough is considered to be a pristine salt-marsh, mainly due to its full tidal flushing. However, the upland region is extremely degraded with no specific transition zone plant species inhabiting the area. These conditions contribute to an unhealthy transition zone thus creating ideal conditions for invasive non-native species. In the transition zone of Steamshovel Slough, there was an abundance of salt marsh plants and non-native weedy species. The native plant species with the highest percent cover was *Monanthochloe littoralis* (27.69%) (Appendix C), a marsh plain to high marsh species. All the native plant species surveyed within the site normally inhabit the marsh plain and the high marsh. The health of the marsh allows for the upward progression of salt marsh plants, while the degradation of the upland area allows for the downward spread of weedy species.

Rules and regulations help to protect wetlands from pollution and development. Zedler Marsh is a salt marsh owned by the Los Cerritos Wetlands Authority, which strives to preserve the Los Cerritos Wetlands Complex; it is protected from development and continues to provide habitat and foraging areas for birds and animals. Steamshovel Slough, Campgrounds and the Hellman property are not publicly owned making it difficult to protect its environmentally sensitive habitat. However, the US Fish and Wildlife Agency (2008) illustrates Steamshovel Slough as wetlands with Campgrounds and the Hellman property as emergent wetlands, which allow these areas to be preserved and protected. (Appendix D).

According to the US Fish and Wildlife Agency (1979),

- Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of the year.

Under the Public Trust Doctrine and CWA 404 (1977), the salt marsh of Steamshovel Slough is protected from development because its waters are tidally connected making it navigable waters. 100 feet habitat from the highest average point of high tide in the salt marsh is protected since it acts as buffers. In some areas of Steamshovel Slough, the 100 feet protected habitat includes the transition zones.

Although the wetlands of Hellman and Campgrounds along with the transition zones of the Los Cerritos are degraded, birds and other wildlife, including several threatening, endangered and species of special concern, use this habitat and depend on the habitat for protection, sustenance. If the environmentally sensitive habitat areas

(ESHA) were not protected then commercial, domestic, and human activities would significantly affect the breeding patterns and activities of birds and wildlife.

Section 30240 of the California Coastal Act (2008) requires that:

- Environmentally sensitive habitat areas (ESHAs) shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas.
- Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts, which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

Section 30107.5 of the Coastal Act defines ESHA as follows:

- "Environmentally sensitive habitat area" means any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities.

Under the Coastal Act:

- A geographic area can be designated ESHA either because of the presence of individual species of plants or animals or because of the presence of a particular habitat. Second, in order for an area to be designated as ESHA, the species or habitat must be either rare or it must be especially valuable. Finally, the area must be easily disturbed or degrade by human activities.

The salt marsh-upland transition zones of the Los Cerritos Wetlands provide great buffers between the wetlands and urban areas to protect and reduce the edge effect of human and domestic intrusion into sensitive vegetation and foraging areas that are considered "environmentally sensitive habitat areas" (Appendix D). The transition zone consists of many plant species such as the specialized transitional species, *Isocoma menziesii*, which not only acts as buffer, but also do well against non-native species (Zahn, 2008). *Lycium californicum* is also an important specialized transitional species with biogeochemical benefits (James, 2000). Its roots are capable of reducing impacts of spills near wetlands and provide buffers by trapping inflowing materials (James, 2000). A species of special concern found within transition zones is *Lasthenia glabrata ssp. Coulteri*.

The transition zone protects lower salt marshes such as the *Salicornia virginica* habitat of the endangered, Belding Savannah Sparrow and the *Distichlis spicata* habitat of the endangered Wandering skipper. *Centromadia parryi spp. Australis* is a species of special concern, which grows in lower salt marshes and depends on the transition zone to act as a buffer. Salt pannes, mudflats and waters are also protected by transition zones which are important foraging areas for the endangered California least tern, California brown pelican, light-footed clapper rail, least Bell's Vireo, and western snowy plover. These areas are also habitat for the sensitive species, Sandy Beach tiger beetle. The Endangered Species Act (1973) protects all endangered species from extinction. Protecting threatened, endangered, and species of special concern are important because

they are part of the biodiversity that will help continue to maintain the food chain and buffers of the Los Cerritos Wetlands (Callaway, 2001). The habitat of transition zones are ESHAs that should be protected from development according to the California Coastal Act section 30240.

Remediation

The degree of degradation varies throughout the Los Cerritos Wetlands Complex but through restoration projects, the overall health and ecosystem may be improved. Transition zones provide a buffer between salt marsh and upland plants, thus creating a distinct habitat. The transition zone has often been neglected, in part, by the lack of awareness in its importance to the local ecosystem. A healthy transition zone is necessary because it provides habitat for many fauna and flora species. Transition zones must be taken into account during remediation efforts.

The 2008 ES&P 400 Economics Team developed a survey based upon the Los Cerritos Wetlands (www.intoloscerritoswetlands.org). Over 85% of those surveyed (results as of 05/07/2008) believe the wetlands should be restored. Restoration will provide economic benefits that include increased awareness, tourism, recreation, and protection against storms and floods (Bourne et al., 2008). These factors should be considered when creating a remediation plan.

Potential remediation projects should include the eradication of non-native plant species and planting of native species, including specialized transition plants. Additionally, soil composition should be evaluated for viability of potential plant growth (Noe et al., 2001). Creating and expanding waterways for tidal influx is necessary for a healthy and functioning wetland and needs to be considered during restoration. Better hydrological conditions will also increase sediment deposition, which improves distinct zonation, removal of contaminants via influx and outflow of water, and provide a variety of nutrients necessary for vegetative development.

Special factors need to be considered when re-introducing native vegetation to an area. The knowledge of endemic species, the time of year for germination, soil conditions, and ideal elevations are factors that need to be considered to ensure successful remediation (Noe et al., 2000). Furthermore, seasonal maintenance will ensure the health and growth of the vegetation.

Restoration has already begun in Los Cerritos Wetlands with the mitigation of Jack Dunster Marine Biological Reserve. However, the restoration plans excluded the establishment of a transition zone. Although the site has a high abundance of native species in relation to non-native species, the lack of a transition zone prevents its full functionality as wetlands. A transition zone would provide important buffers especially for Jack Dunster as it is narrowly confined by a residential area with potentially high runoff. Therefore, further enhancements need to be made including the planting specific transition species.

Future restoration efforts are underway for the Colorado Lagoon. The vegetative data collected will be useful in the formation of transition zones. Colorado Lagoon has muted tidal influence and eleven storm drains, inundating it with fresh water. It is highly degraded based on the lack of vegetative zonation. Establishing a transition zone within the Colorado Lagoon not only provides great buffers for the urban wetlands, but it helps to assist in education programs by providing public awareness to its importance.

Future biology projects should survey different zones of coastal salt marshes to create a more comprehensive vegetative analysis of the Los Cerritos Wetlands. Variations of growth and germination are seasonally determined and should be accounted for. Additionally, slope gradients would be beneficial in determining specific zonations. Further research needs to be conducted with an integration of the disciplines to gain a better understanding of the Los Cerritos Wetlands. This will not only help in furthering current restoration efforts but also raise public awareness. The data collected by the 2008 Biology Team will aid in future research studies and restoration.

Acknowledgements

The 2008 ES&P Biology Team would like to express our gratitude to Eric Zahn for his guidance, direction, knowledge, assistance and words of wisdom. Furthermore, we would like to thank the Environmental Science & Policy department, faculty, and fellow classmates for their support and equipment as well as Lenny Arkinstall, for his assistance at Campgrounds.

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Appendix A

Maps

Specific study sites within the Los Cerritos Wetlands Complex

Map 1. Specific study sites within the Los Cerritos Wetlands Complex. Vegetation surveys were carried out on Zedler Marsh, Steamshovel Slough, Campgrounds and the Hellman property. Qualitative vegetation observations were conducted on the Colorado Lagoon and Jack Dunster. (M. Ngo, Google Earth, 2008)

Vegetation Survey Sites

Qualitative Observation Sites

GPS coordinates at each site within the Los Cerritos Wetlands

Map 2: The GPS coordinates taken at each site within the Los Cerritos Wetlands

Overhead of Zedler Marsh

Map 3: GPS coordinates of each quadrat at Zedler Marsh.

Quadrats in Zedler Marsh

Overhead of Campgrounds

Map 4: GPS coordinates of each quadrat at Campgrounds.

Quadrats in Camgrounds

Overhead of the Hellman Property

Map 5: GPS coordinates of each quadrat at the Hellman Property.

Quadrats in the Hellman property

Overhead Map of Steamshovel Slough

Map 6: GPS coordinates of each quadrat at Steamshovel Slough.

Quadrats in Steamshovel Slough

Appendix B

Species Found

Table 1: Native species found within the quadrats.

Native Species			
Scientific Name	**Common Name**	**Location**	**Special Status**
Anaphahis spp.	Pearly Everlasting	UP	None
Batis maritima	Turtleweed	MP	CNPS: considered but rejected
Conyza canadensis	Canadian horsetail	UP	None
Cressa truxillensis	Alkali Weed	HM	None
Distichlis spicata	Coastal Saltgrass	MP-UPT	None
Frankenia salina	Alkali seaheath	MP-HM	CNPS List: 1B.2 State Rank: S2.2
Galium angustifolium	Bed Straw	UP	None
Isocoma menziesii	Golden Bush	UPT	None
Jaumea carnosa	Marsh Jaumea	MP	None
Limonium californicum	Sea Lavender	MP-HM	None
Monanthochloe littoralis	Shoregrass	MP-HM	None
Salicornia sumbterminalis	Parish's Glasswort	HM	None
Salicornia virginica	Pickleweed	MP-HM	None
Scirpus robustus	Sturdy bulrush	B	None
Spergularia marina	Sandspurry	HM-UPT	None
Xanthium strumarium	Cockelbur	UP	none

Key:

CNPS Lists	*1A*	Plants Presumed Extinct in California
	1B	Plants Rare, Threatened, or Endangered in California and Elsewhere
	2	Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
	3	Plants About Which We Need More Information - A Review List
	4	Plants of Limited Distribution - A Watch List
Threat ranks	0.1	Seriously threatened in California
	0.2	Fairly threatened in California
	0.3	Not very threatened in California
Location	MP	Marsh Plain
	UP	Upland
	UPT	Upland Transition
	HM	High Marsh
	B	Brackish

Table 2: Non-native species found within the quadrats.

Non-native Plant Species	
Scientific Name	**Common Name**
Atriplex semibaccata	Australian saltbush
Bassia hyssopifolia	Smotherweed
Brassica nigra	Black Mustard
Bromus diandrus	Ripgut Grass
Bromus madritensis	Red Brome
Centaurea melitensis	Tocalote
Erodium cicutarium	Redstem Stork's Bill
Hordeum vulgare	Framer's Foxtail
Lolium multiflorum	Italian ryegrass
Malva parviflorum	Cheeseweed
Melilotus alba	White Sweetclover
Melilotus indica	Sweetclover
Mesymbryanthemum crystallimum	Crystal Iceplant
Mesymbryanthemum nodiflorum	Little Iceplant
Parapholis incurva	European Sicklegrass
Plantago spp.	Plaintain
Polypogon monspeliensis	Rabbitfoot Beardgrass
Raphanus sativa	Wild Radish
Salsola tragus	Russian Thistle
Silybum marianum	Milk Thistle
Sisymbrium sp.	Short Pod Mustard
Solanum sp.	Nightshade
Sonchus oleraceus	Sow Thistle

Table 3: Plant species found outside transition zone.

Scientific Name	**Common Name**	**Native/Non-native**
Lycium californicum	California desert-thorn	native
Baccharis pilularis	Coyotebrush	non-native
Myoporum laetum	Ngail Tree	non-native
Lasthenia glabrata coulteri	Coulter's Goldfield	native

Appendix C

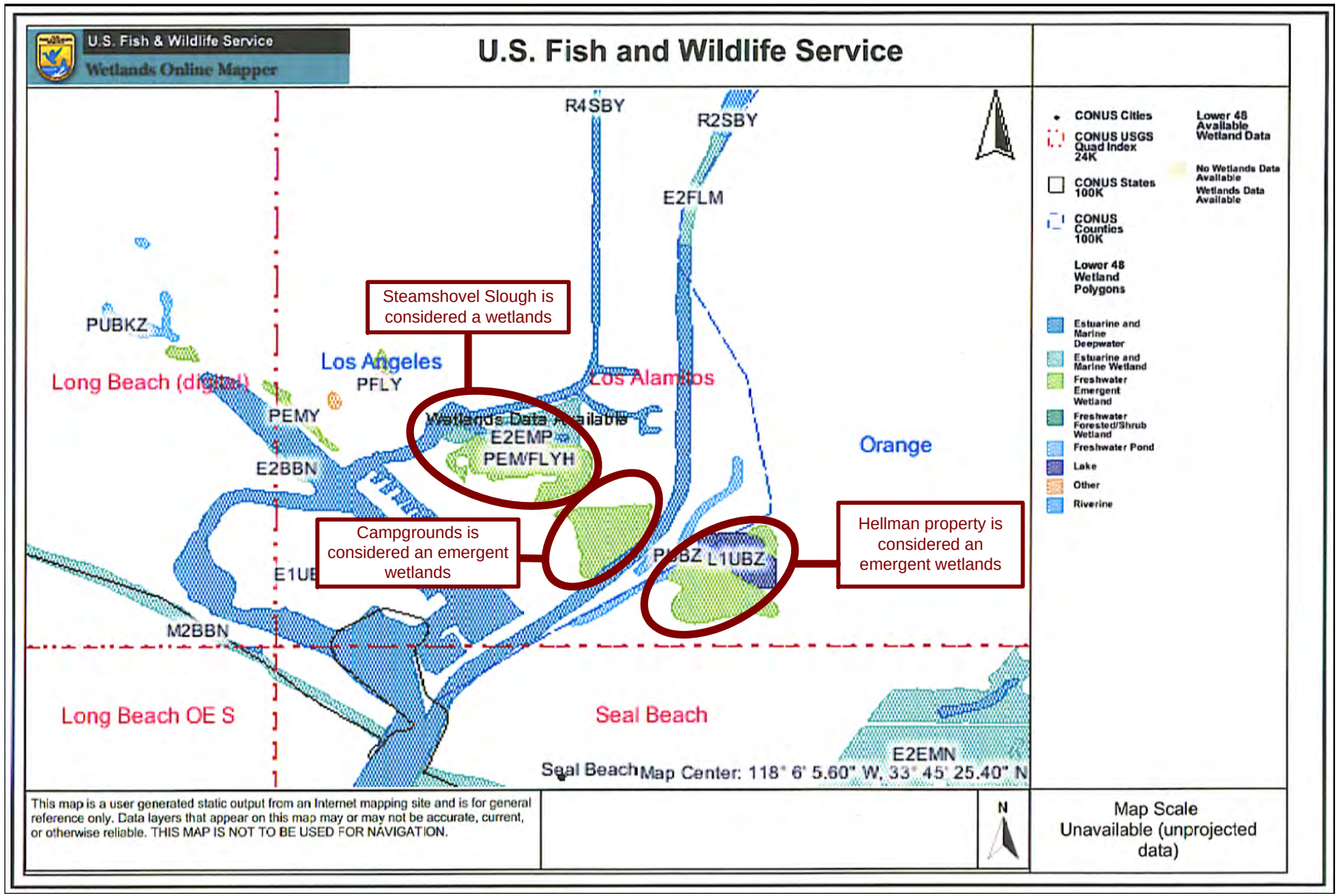
Average Percent Cover

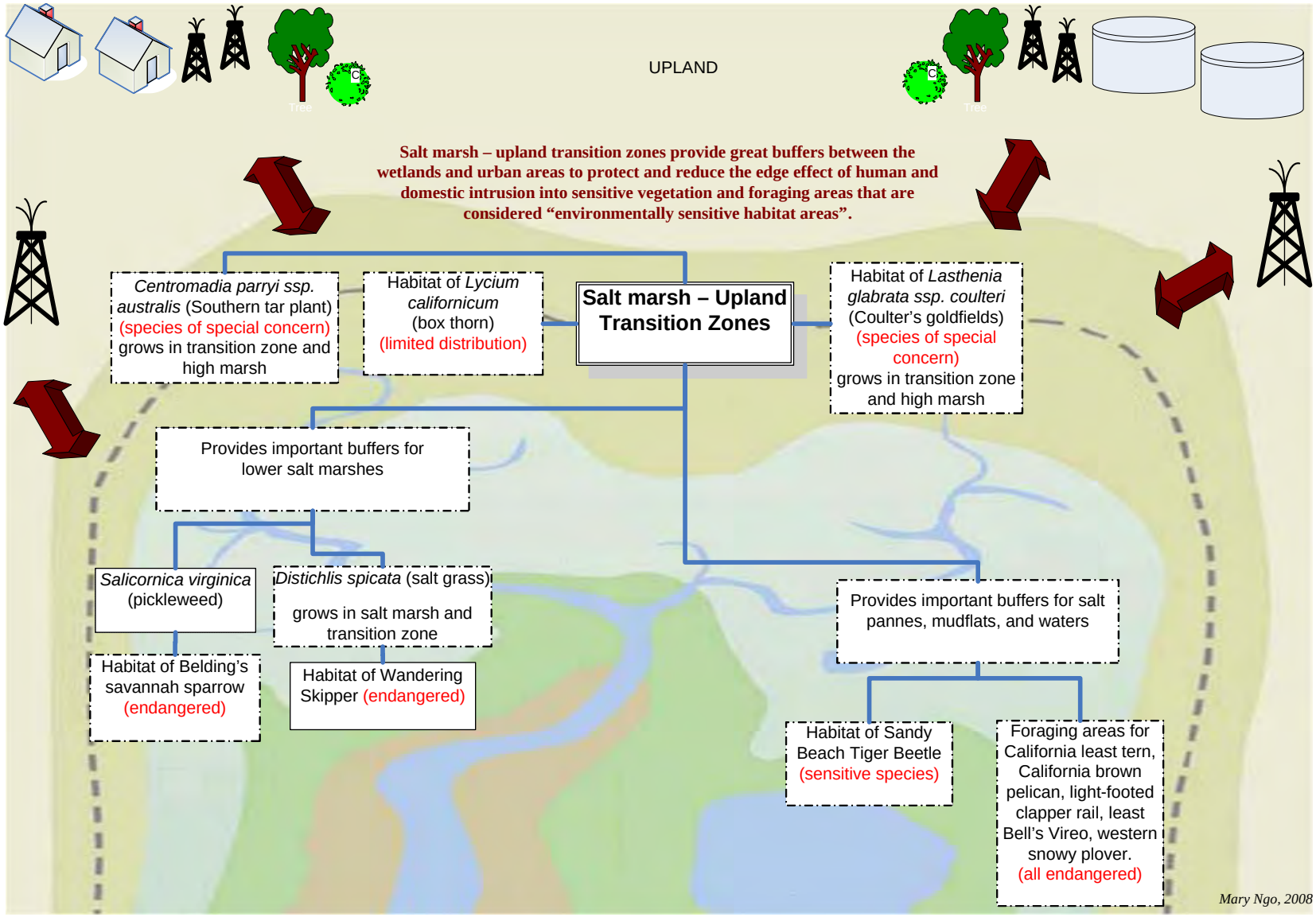
Table 3: Average percent cover of non-native and native plant species, and unvegetative cover within the Los Cerritos Wetlands.

	Zedler Marsh	Percent Cover	Campgrounds	Percent Cover	Hellman Property	Percent Cover	Steamshovel Slough	Percent Cover
Native	*Anaphalis spp.*	0.15	*Cressa truxillensis*	8.97	*Isocoma menziesii*	1.41	*Batis maritma*	2.08
	Conyza canadensis	0.02	*Distichlis spicata*	24.77	*Salicornia subterminalis*	5.12	*Distichlis spicata*	0.09
	Cressa truxillensis	0.31	*Frankenia salina*	0.09	*Salicornia virginica*	12.31	*Frankenia salina*	0.06
	Distichlis spicata	0.72	*Salicornia virginica*	11.11	*Spergularia marina*	0.20	*Jaumea carnosa*	0.21
	Frankenia salina	2.08	*Scirpus robustus*	0.42			*Monanthochloe littoralis*	27.69
	Galium angustifolium	0.54	*Xanthium strumarium*	0.06			*Salicornia subterminalis*	1.90
	Isocoma menziesii	14.86					*Limonium californica*	0.40
	Salicornia subterminalis	0.76						
Non-native								
	Bassia hyssopifolia	5.39	*Bassia hyssopifolia*	2.27	*Atriplex semibaccata*	3.66	*Atriplex semibaccata*	0.02
	Brassica nigra	1.73	*Bromus diandrus*	0.81	*Bassia hyssopifolia*	0.77	*Bassia hyssopifolia*	7.58
	Bromus diandrus	0.39	*Bromus madritensis*	0.49	*Brassica nigra*	0.08	*Bromus diandrus*	8.11
	Bromus madritensis	1.63	*Centaurea melitensis*	1.85	*Bromus diandrus*	2.77	*Bromus madritensis*	0.09
	Centaurea melitensis	4.48	*Erodium cicutarium*	0.17	*Centaurea melitensis*	0.38	*Centaurea melitensis*	0.95
	Hordeum vulgare	0.05	*Lolium multiflorum*	0.91	*Hordeum vulgare*	1.21	*Hordeum vulgare*	0.84
	Melilotus indica	5.10	*Melilotus alba*	0.22	*Lolium multiflorum*	1.56	*Malva parviflorum*	0.24
	Mesymbryanthemum crystallinum	1.54	*Melilotus indica*	8.83	*Malva parviflorum*	0.10	*Melilotus indica*	7.51
	Mesumbryanthemum nodiflorum	17.10	*Mesymbryanthemum crystallinum*	0.27	*Melilotus indica*	1.04	*Mesymbryanthemum nodiflorum*	19.60
	Parapholis incurva	1.01	*Mesymbryanthemum nodiflorum*	2.50	*Mesymbryanthemum nodiflorum*	31.25	*Parapholis incurva*	4.54
	Polypogon monspeliensis	2.48	*Parapholis incurva*	15.07	*Parapholis incurva*	5.70	*Salsola tragus*	0.08
	Silybum marianum	0.03	*Plantago spp.*	0.50	*Polypogon monspeliensis*	1.15	*Silybum marianum*	0.48
	Sisymbrium spp.	1.51	*Polypogon monspeliensis*	2.00	*Raphanus sativa*	0.59	*Solanum spp.*	0.09
	Sonchus oleraceus	0.07	*Sisymbrium spp.*	0.42	*Salsola tragus*	3.12	*Sonchus oleraceus*	0.61
			Solanum spp.	0.21	*Sonchus oleraceus*	2.84		
			Sonchus oleraceus	2.10				
	Unvegetated	38.01	*Unvegetated*	16.38	*Unvegetated*	23.28	*Unvegetated*	17.94

Appendix D

Law and Policy


U.S. Fish & Wildlife Service
Wetlands Online Mapper
U.S. Fish and Wildlife Service
R4SBY
R2SBY
E2FLM
PUBKZ
Long Beach (digital)
Los Angeles
PFLY
PEMY
E2BBN
Los Alamitos
Wetlands Data Available
E2EMP
PEM/FLYH
Orange
Steamshovel Slough is considered a wetlands
Campgrounds is considered an emergent wetlands
Hellman property is considered an emergent wetlands
PUBZ L1UBZ
E1UB
M2BBN
Long Beach OE S
Seal Beach
E2EMN
Seal Beach
Map Center: 118° 6' 5.60" W, 33° 45' 25.40" N
CONUS Cities
CONUS USGS Quad Index 24K
CONUS States 100K
CONUS Counties 100K
Lower 48 Wetland Polygons
Estuarine and Marine Deepwater
Estuarine and Marine Wetland
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Other
Riverine
Lower 48 Available Wetland Data
No Wetlands Data Available
Wetlands Data Available
This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.
N
Map Scale Unavailable (unprojected data)


UPLAND
Salt marsh – upland transition zones provide great buffers between the wetlands and urban areas to protect and reduce the edge effect of human and domestic intrusion into sensitive vegetation and foraging areas that are considered "environmentally sensitive habitat areas".
Centromadia parryi ssp. australis (Southern tar plant) (species of special concern) grows in transition zone and high marsh
Habitat of Lycium californicum (box thorn) (limited distribution)
Salt marsh – Upland Transition Zones
Habitat of Lasthenia glabrata ssp. coulteri (Coulter's goldfields) (species of special concern) grows in transition zone and high marsh
Provides important buffers for lower salt marshes
Salicornica virginica (pickleweed)
Distichlis spicata (salt grass)
grows in salt marsh and transition zone
Habitat of Belding's savannah sparrow (endangered)
Habitat of Wandering Skipper (endangered)
Provides important buffers for salt pannes, mudflats, and waters
Habitat of Sandy Beach Tiger Beetle (sensitive species)
Foraging areas for California least tern, California brown pelican, light-footed clapper rail, least Bell's Vireo, western snowy plover. (all endangered)
Mary Ngo, 2008

Appendix E

Vegetation and Quadrat Photographs

Non-Native Plant Species Found

Atriplex semibaccata

©John M. Randall/The Natural Conservancy

Bassia hyssopifolia

Joe F. Duft @ USDA-NRCS PLANTS Database / USDA NRCS. 1992. Western wetland flora: Field office guide to plant species. West Region, Sacramento.

Brassica nigra

©John M. Randall/The Natural Conservancy

Bromus diandrus

©John M. Randall/The Natural Conservancy

Bromus madritensis

©John M. Randall/The Natural Conservancy

Centaurea melitensis

©John M. Randall/The Natural Conservancy

Erodium cicutarium

©John M. Randall/The Natural Conservancy

Hordeum vulgare

Lolium multiflorum

©John M. Randall/The Natural Conservancy

Malva parviflorum

Melilotus alba

©John M. Randall/The Natural Conservancy

Melilotus indica

© Eric Hunt

Mesymbranthemum nodiflorum

Mesymbryanthemum crystallinum

©John M. Randall/The Natural Conservancy

Parapholis incurva

Hitchcock, A.S. (rev. A. Chase). 1950. Manual of the grasses of the United States. USDA Miscellaneous Publication No. 200. Washington, DC. 1950.

Polypogon monspeliensis

©John M. Randall/The Natural Conservancy

Raphanus sativa

©John M. Randall/The Natural Conservancy

Salsola tragus

Silybum marianum

©John M. Randall/The Natural Conservancy

Sonchus oleraceus

© Carl Farmer

Native Plant Species Found

Batis maritma

©Forest & Kim Starr

Cressa truxillensis

© 2003 George W. Hartwell

Distichlis spicata

© 2003 George W. Hartwell

Conyza Canadensis

© 1995 Saint Mary's College of California

Frankenia salina

© 1995 Saint Mary's College of California

Galium angustifolium

© 1995 Saint Mary's College of California

Jaumea carnosa

© 1995 Saint Mary's College of California

Isocoma menziesii

© 2003 Michelle Cloud-Hughes

Limonium californicum

© 1995 Saint Mary's College of California

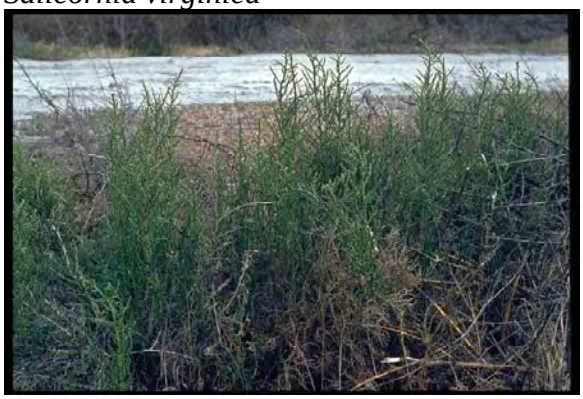
Monanthochloe littoralis

© 1999 California Academy of Sciences

Salicornia subterminalis

© 2004 Debra Valov

Salicornia virginica



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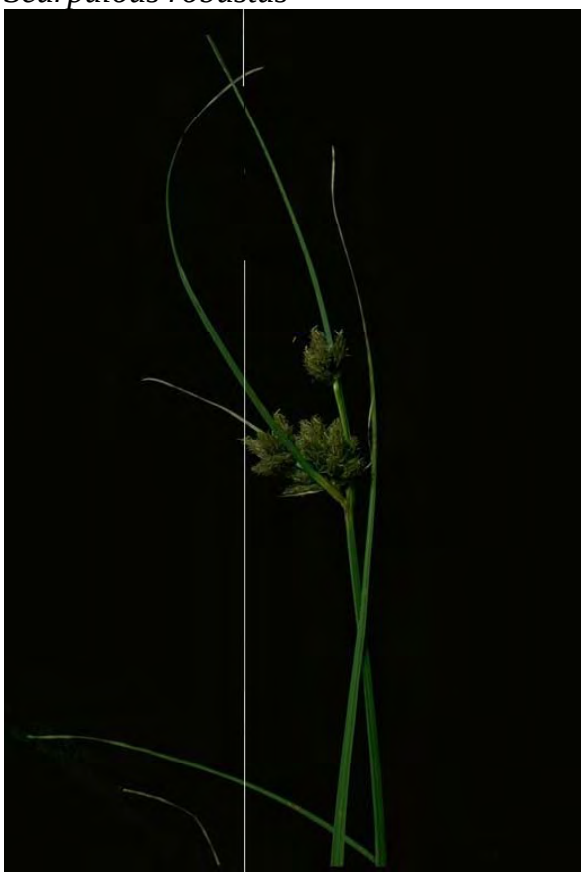
Scurpulous robustus



© 1995 Saint Mary's College of California

Spergularia marina

© 2003 George W. Hartwell

Xanthium strumarium

© 1995 Saint Mary's College of California

Anaphahis spp.

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Quadrats at Zelder Marsh


Zedler Marsh 1.1

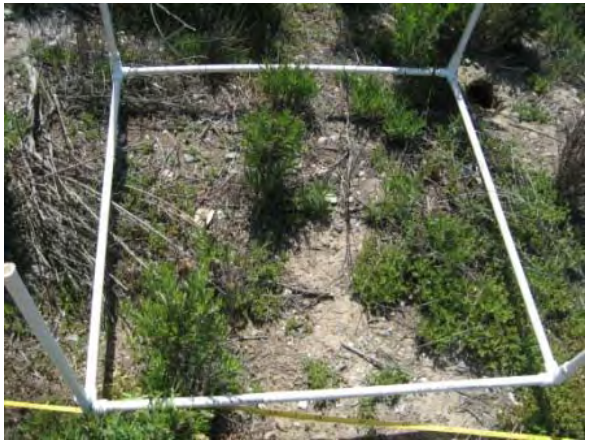

Zedler Marsh 1.2


Zedler Marsh 1.3


Zedler Marsh 1.4


Zedler Marsh 1.5

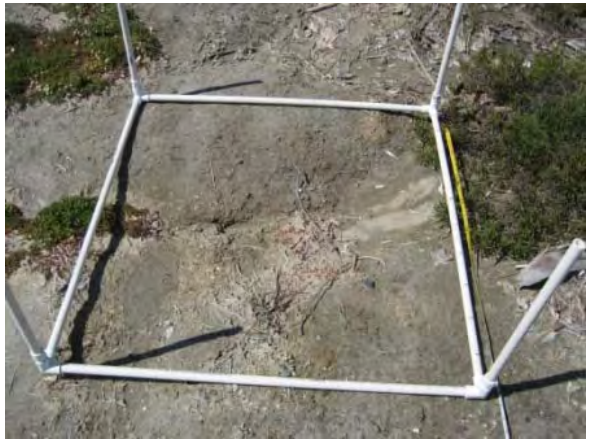

Zedler Marsh 1.6



Zedler Marsh 1.7

Zedler Marsh 1.8

Zedler Marsh 1.9



Zedler Marsh 1.10

Zedler Marsh 2.1

Zedler Marsh 2.2


Zedler Marsh 2.3


Zedler Marsh 2.4


Zedler Marsh 2.5


Zedler Marsh 2.6


Zedler Marsh 2.7

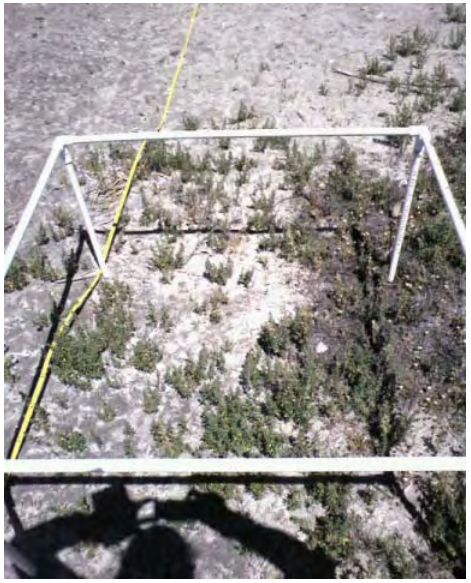

Zedler Marsh 2.8

Zedler Marsh 2.9

Zedler Marsh 2.10


Zedler Marsh 3.1


Zedler Marsh 3.2


Zedler Marsh 3.3


Zedler Marsh 3.4

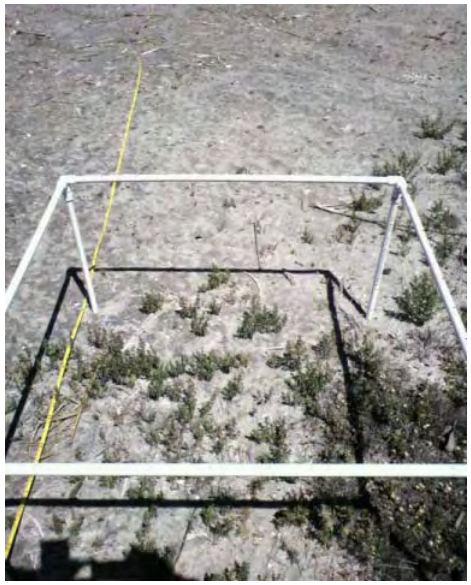

Zedler Marsh 3.5


Zedler Marsh 3.6


Zedler Marsh 3.7

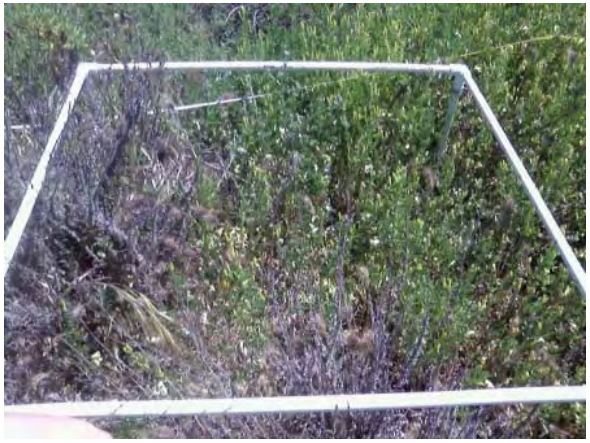

Zedler Marsh 3.9


Zedler Marsh 3.8


Zedler Marsh 3.10

Zedler Marsh 4.1

Zedler Marsh 4.3



Zedler Marsh 4.5

Zedler Marsh 4.2

Zedler Marsh 4.4

Zedler Marsh 4.6

Zedler Marsh 4.7

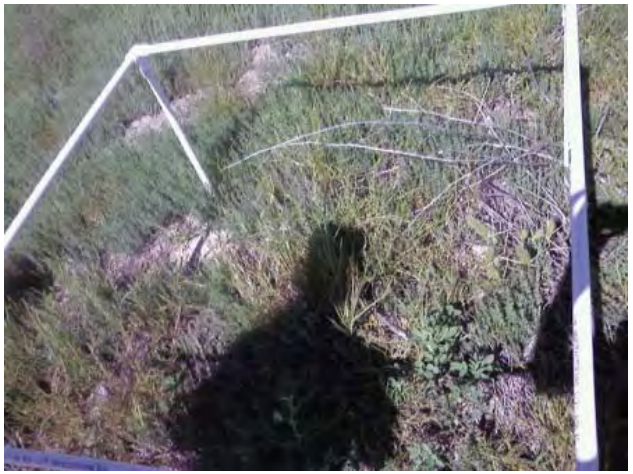
Zedler Marsh 4.9

Zedler Marsh 4.8

Zedler Marsh 4.10

Quadrats at Campgrounds

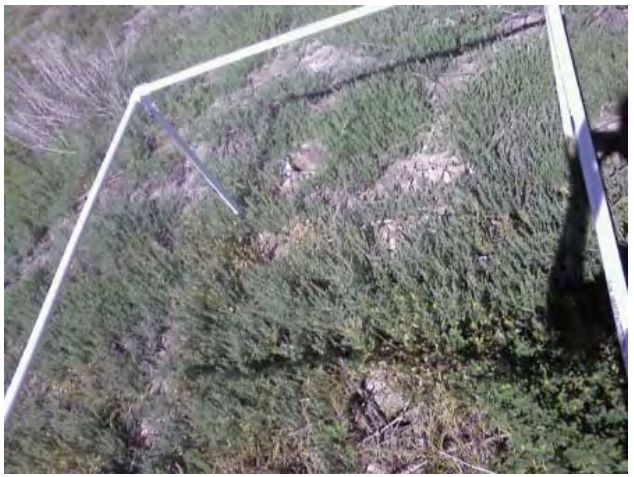

Campgrounds 1.1


Campgrounds 1.3


Campgrounds 1.5


Campgrounds 1.2


Campgrounds 1.4


Campgrounds 1.6


Campgrounds 1.7


Campgrounds 1.9

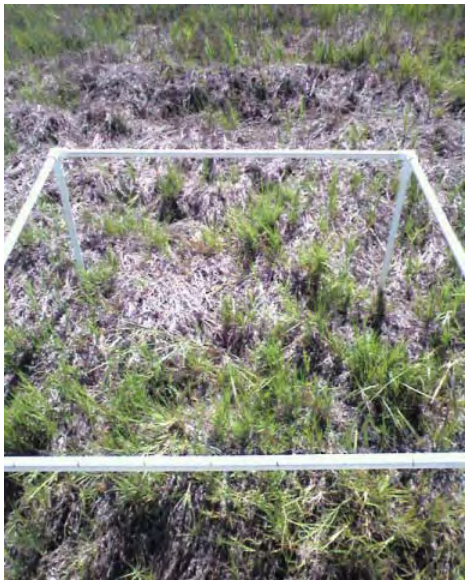

Campgrounds 1.8


Campgrounds 1.10


Campgrounds 2.1


Campgrounds 2.2


Campgrounds 2.3


Campgrounds 2.4


Campgrounds 2.5


Campgrounds 2.6

Campgrounds 2.7

Campgrounds 2.9

Campgrounds 2.8

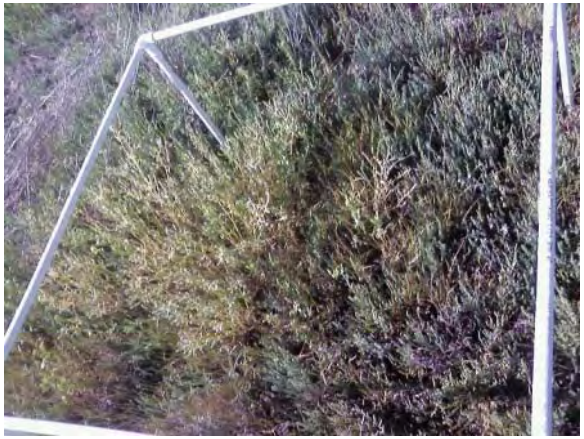
Campgrounds 2.10


Campgrounds 3.1


Campgrounds 3.3


Campgrounds 3.5


Campgrounds 3.2


Campgrounds 3.4


Campgrounds 3.6


Campgrounds 3.7


Campgrounds 3.9


Campgrounds 3.8


Campgrounds 3.10


Campgrounds 4.1


Campgrounds 4.2


Campgrounds 4.3


Campgrounds 4.4


Campgrounds 4.5


Campgrounds 4.6


Campgrounds 4.7


Campgrounds 4.9


Campgrounds 4.8

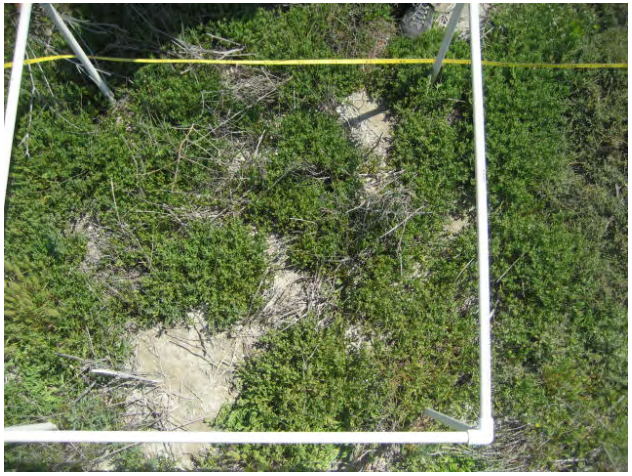

Campgrounds 4.10

Pictures of Each Quadrat at the Hellman Property


Hellman 1.1


Hellman 1.2


Hellman 1.3

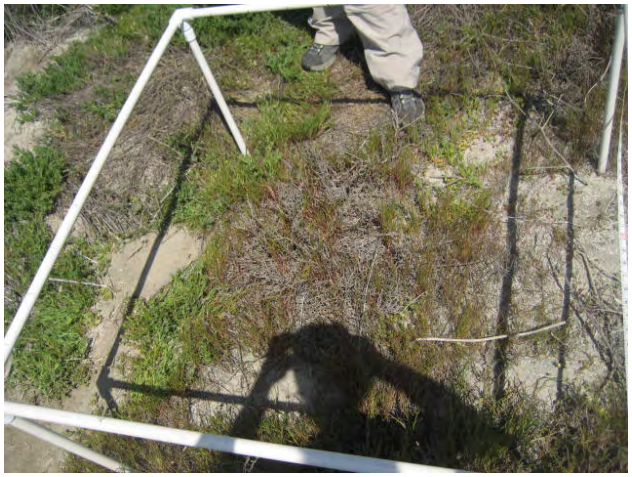

Hellman 1.4


Hellman 1.5


Hellman 1.6

Hellman 1.7

Hellman 1.9



Hellman 2.1

Hellman 1.8

Hellman 1.10

Hellman 2.2

Hellman 2.3

Hellman 2.5

Hellman 2.7

Hellman 2.4

Hellman 2.6

Hellman 2.8

Hellman 2.9

Hellman 2.10

Hellman 3.1

Hellman 3.3

Hellman 3.5

Hellman 3.2

Hellman 3.4

Hellman 3.6

Hellman 3.7

Hellman 3.9

Hellman 4.1

Hellman 3.8

Hellman 3.10

Hellman 4.2

Hellman 4.3

Hellman 4.5

Hellman 4.7

Hellman 4.4

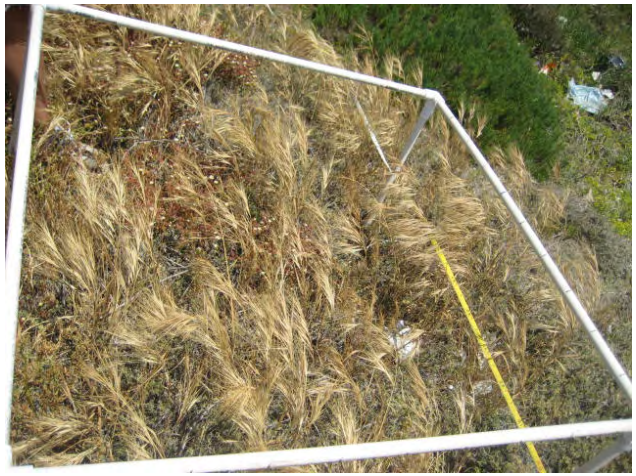
Hellman 4.6

Hellman 4.8

Hellman 4.9

Hellman 4.10

Pictures of Each Quadrat at Steamshovel Slough



Steamshovel Slough 1.1

Steamshovel Slough 1.3

Steamshovel Slough 1.5

Steamshovel Slough 1.2

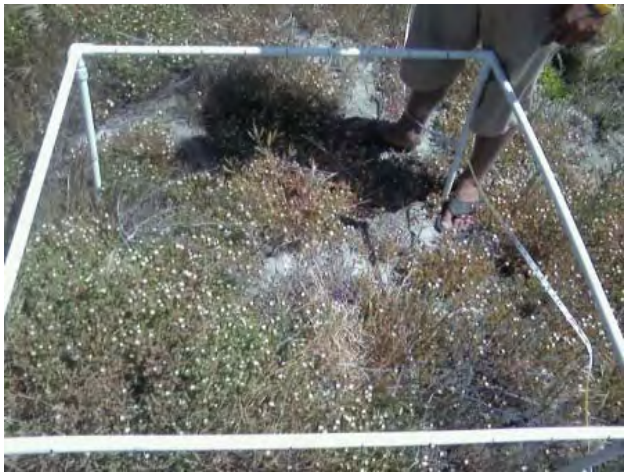
Steamshovel Slough 1.4

Steamshovel Slough 1.6

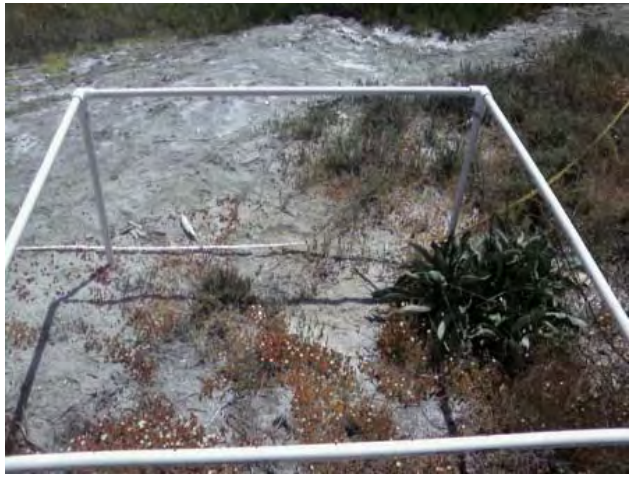
Steamshovel Slough 1.7

Steamshovel Slough 1.9

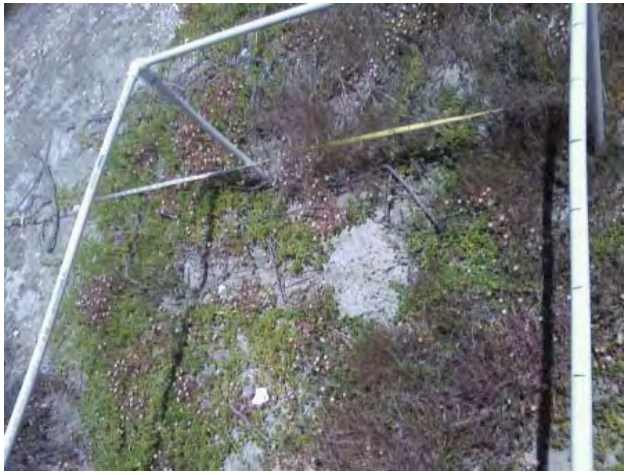
Steamshovel Slough 1.8



Steamshovel Slough 1.10



Steamshovel Slough 2.1



Steamshovel Slough 2.3

Steamshovel Slough 2.5

Steamshovel Slough 2.2

Steamshovel Slough 2.4

Steamshovel Slough 2.6

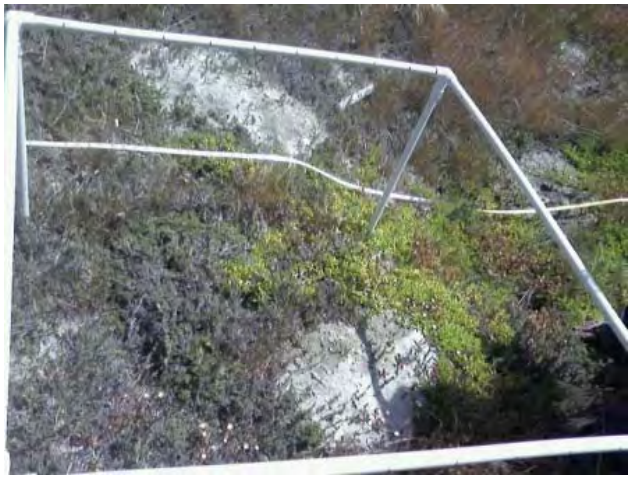
Steamshovel Slough 2.7

Steamshovel Slough 2.9

Steamshovel Slough 2.8

Steamshovel Slough 2.10

Steamshovel Slough 3.1



Steamshovel Slough 3.3

Steamshovel Slough 3.5

Steamshovel Slough 3.2

Steamshovel Slough 3.4

3.6

Steamshovel Slough 3.7

Steamshovel Slough 3.9

Steamshovel Slough 3.10

Steamshovel Slough 3.8

Steamshovel Slough 4.1

Steamshovel Slough 4.3

Steamshovel Slough 4.5

Steamshovel Slough 4.2

Steamshovel Slough 4.4

Steamshovel Slough 4.6

Steamshovel Slough 4.7

Steamshovel Slough 4.9

Steamshovel Slough 4.8

Steamshovel Slough 4.10

Appendix D

Vegetation Survey Data Sheet

BIOLOGY TEAM

VEGETATION SURVEY DATA SHEET

SITE NAME: Zedler Marsh

DATE/TIME: 04/09/08 @ 12:40 p.m. & 04/14/08 @ 12:30 p.m.

NAME OF OBSERVER: The Biology Team

DESCRIPTION OF STUDY AREA: Things seen that were not in quadrats were a coyote bush, olive tree, and *Lymonium californicum.*

TRANSECT DIMENSIONS: 50m transect

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.1	6545-6549	N 33°45.340 W 118°05.977	*Mesumbryanthemum nodiflorum*	95	76.61	
1.1			*Bassia hyssopifolia*	10	8.06	
1.1			*Bromus madritensis*	1	0.81	
1.1			*Distichlis spicata*	2	1.61	
1.1			*Polypogon monspeliensis*	5	4.03	
1.1			*Unvegetated*	11	8.87	
1.2	50-60	N 33°45.339 W 118°05.976	*Mesumbryanthemum nodiflorum*	70	47.67	
1.2			*Bassia hyssopifolia*	20	13.61	
1.2			*Polypogon monspeliensis*	7	4.76	
1.2			*Centaurea melitensis*	20	13.61	
1.2			*Unvegetated*	30	20.41	
1.3	61-31	N 33°45.338 W 118°05.976	*Polypogon monspeliensis*	20	12.34	
1.3			*Mesumbryanthemum nodiflorum*	65	40.12	Flowering
1.3			*Melilotus indica*	10	6.17	
1.3			*Silybum marianum*	2	1.23	
1.3			*Centaurea melitensis*	17	10.49	
1.3			*Bassia hyssopifolia*	3	1.85	
1.3			*Unvegetated*	45	27.78	
1.4	64-65	N 33°45.339 W 118°05.973	*Bassia hyssopifolia*	2	1.48	
1.4			*Centaurea melitensis*	2		

*If the name of the species is not known then a description and photo will be taken. The determination of the species will be further investigated.
** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.4			*Mesumbryanthemum nodiflorum*	60	1.48	
1.4			*Isocoma menziesii*	40	44.44	Dead
1.4			*Polypogon monspeliensis*	1	29.63	
1.4			*Unvegetated*	30	0.74	
1.5	66-67	N 33°45.343 W 118°05.979	*Mesumbryanthemum nodiflorum*	35	28.69	
1.5			*Bassia hyssopifolia*	5	4.1	
1.5			*Isocoma menziesii*	75	61.48	
1.5			*Unvegetated*	7	5.74	
1.6	68	N 33°45.344 W 118°05.979	*Mesumbryanthemum nodiflorum*	35	30.17	
1.6			*Bassia hyssopifolia*	1	0.86	
1.6			*Unvegetated*	80	68.96	
1.7	69	N 33°45.350 W 118°05.968	*Isocoma menziesii*	35	25.36	
1.7			*Centaurea melitensis*	15	10.87	
1.7			*Bassia hyssopifolia*	3	2.17	
1.7			*Mesumbryanthemum nodiflorum*	30	21.74	
1.7			*Unvegetated*	55	39.86	
1.8	72	N 33°45.351 W 118°05.986	*Polypogon monspeliensis*	1	0.83	
1.8			*Isocoma menziesii*	1	0.83	
1.8			*Bassia hyssopifolia*	30	24.79	
1.8			*Melilotus indica*	3	2.48	
1.8			*Centaurea melitensis*	30	24.79	
1.8			*Mesumbryanthemum nodiflorum*	11	9.09	
1.8			*Unvegetated*	45	37.19	
1.9	73	N 33°45.354 W 118°05.992	*Melilotus indica*	7	5.22	
1.9			*Isocoma menziesii*	10	7.46	
1.9			*Mesumbryanthemum nodiflorum*	20	14.93	
1.9			*Parapholis incurva*	7	5.22	
1.9			*Unvegetated*	90	67.16	

*If the name of the species is not known then a description and photo will be taken. The determination of the species will be further investigated.
** Percent of plot covered by species.

CALIFORNIA STATE UNIVERSITY, LONG BEACH
ENVIRONMENTAL SCIENCE & POLICY

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.10	75	N 33°45.356 W 118°05.994	*Mesumbryanthemum nodiflorum*	8	7.55	
1.10			*Salicornia subterminalis*	3	2.83	
1.10			*Unvegetated*	95	89.62	
2.1	78-79	N 33°45.334 W 118°05.966	*Cressa truxillensis*	2	1.6	
2.1			*Bassia hyssopifolia*	10	8	
2.1			*Mesumbryanthemum nodiflorum*	28	22.4	
2.1			*Unvegetated*	85	68	
2.2	80	N 33°45.335 W 118°05.962	*Isocoma menziesii*	5	3.88	
2.2			*Bassia hyssopifolia*	45	34.88	
2.2			*Centaurea melitensis*	5	3.88	
2.2			*Galium angustifolium*	2	1.55	Native
2.2			*Polypogon monspeliensis*	45	34.88	
2.2			*Brassica nigra*	1	0.78	Unid.1
2.2			*Sisymbrium spp.*	1	0.78	Unid.2
2.2			*Mesumbryanthemum nodiflorum*	5	3.88	
2.2			*Unvegetated*	20	15.5	
2.3	84	N 33°45.334 W 118°05.961	*Isocoma menziesii*	25	21.37	
2.3			*Bassia hyssopifolia*	35	29.91	
2.3			*Melilotus indica*	3	2.56	
2.3			*Brassica nigra*	5	4.27	
2.3			*Sisymbrium spp.*	10	8.55	
2.3			*Centaurea melitensis*	15	12.82	
2.3			*Galium angustifolium*	1	0.85	
2.3			*Polypogon monspeliensis*	5	4.27	
2.3			*Mesumbryanthemum nodiflorum*	3	2.56	
2.3			*Unvegetated*	15	12.82	
2.4	85	N 33°45.336 W 118°05.959	*Isocoma menziesii*	20	19.23	
2.4			*Melilotus indica*	2	1.92	

*If the name of the species is not known then a description and photo will be taken. The determination of the species will be further investigated.
** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
2.4			*Centaurea melitensis*	17	16.35	
2.4			*Sisymbrium spp.*	10	9.62	
2.4			*Bassia hyssopifolia*	15	14.42	
2.4			*Polypogon monspeliensis*	2	1.92	
2.4			*Bromus madritensis*	1	0.96	
2.4			*Galium angustifolium*	2	1.92	
2.4			*Unvegetated*	35	33.65	
2.5	85	N 33°45.337 W 118°05.957	*Sisymbrium spp.*	30	17.34	
2.5			*Brassica nigra*	10	5.78	
2.5			*Melilotus indica*	23	13.29	
2.5			*Bassia hyssopifolia*	35	20.23	
2.5			*Mesumbryanthemum nodiflorum*	23	13.29	
2.5			*Centaurea melitensis*	2	1.16	
2.5			*Isocoma menziesii*	5	2.89	
2.5			*Unvegetated*	45	26.01	
2.6	93	N 33°45.338 W 118°05.955	*Isocoma menziesii*	50	40.65	
2.6			*Melilotus indica*	15	12.2	
2.6			*Mesumbryanthemum nodiflorum*	2	1.63	
2.6			*Centaurea melitensis*	5	4.07	
2.6			*Anaphalis spp.*	1	0.81	
2.6			*Bassia hyssopifolia*	5	4.07	
2.6			*Unvegetated*	45	36.59	
2.7	94	N 33°45.338 W 118°05.955	*Melilotus indica*	40	27.4	
2.7			*Isocoma menziesii*	50	34.25	
2.7			*Brassica nigra*	10	6.85	
2.7			*Bassia hyssopifolia*	15	10.27	
2.7			*Centaurea melitensis*	5	3.42	
2.7			*Sisymbrium spp.*	5	3.42	

*If the name of the species is not known then a description and photo will be taken. The determination of the species will be further investigated.
** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
2.7			*Mesumbryanthemum nodiflorum*	5	3.42	
2.7			*Bromus madritensis*	1	0.68	
2.7			*Unvegetated*	15	10.27	
2.8	97-98	N 33°45.340 W 118°05.952	*Cressa truxillensis*	10	8.7	
2.8			*Brassica nigra*	20	17.39	
2.8			*Galium angustifolium*	20	17.39	
2.8			*Melilotus indica*	5	4.35	
2.8			*Centaurea melitensis*	4	3.48	
2.8			*Conyza canadensis*	1	0.87	
2.8			*Anaphalis spp.*	5	4.35	
2.8			*Unvegetated*	50	43.48	
2.9	99	N 33°45.340 W 118°05.949	*Isocoma menziesii*	10	8.2	
2.9			*Brassica nigra*	20	16.39	
2.9			*Melilotus indica*	3	2.46	
2.9			*Centaurea melitensis*	2	1.64	
2.9			*Mesymbryanthemum crystallinum*	75	61.48	
2.9			*Mesumbryanthemum nodiflorum*	5	4.1	
2.9			*Unvegetated*	7	5.74	
2.10	600	N 33°45.340 W 118°05.949	*Isocoma menziesii*	55	53.92	
2.10			*Mesumbryanthemum nodiflorum*	15	14.71	
2.10			*Polypogon monspeliensis*	1	0.98	
2.10			*Centaurea melitensis*	20	19.61	
2.10			*Brassica nigra*	1	0.98	
2.10			*Melilotus indica*	1	0.98	
2.10			*Sisymbrium spp.*	2	1.96	
2.10			*Unvegetated*	7	6.86	
3.2	2	N 33°45.351 W 118°05.930	*Mesumbryanthemum nodiflorum*	85	70.25	

*If the name of the species is not known then a description and photo will be taken. The determination of the species will be further investigated.
** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
3.2			*Isocoma menziesii*	10	8.26	
3.2			*Sisymbrium spp.*	1	0.83	
3.2			*Unvegetated*	25	20.66	Flowering
3.3	3	N 33°45.351 W 118°05.927	*Isocoma menziesii*	90	53.25	
3.3			*Mesumbryanthemum nodiflorum*	40	23.67	
3.3			*Melilotus indica*	5	2.96	
3.3			*Polypogon monspeliensis*	20	11.83	
3.3			*Salicornia subterminalis*	4	2.37	
3.3			*Unvegetated*	10	5.92	
3.4	4	N 33°45.354 W 118°05.929	*Mesumbryanthemum nodiflorum*	85	76.58	
3.4			*Cressa truxillensis*	1	0.9	
3.4			*Unvegetated*	25	22.52	
3.5	5	N 33°45.355 W 118°05.923	*Mesumbryanthemum nodiflorum*	3	2.97	
3.5			*Distichlis spicata*	3	2.97	
3.5			*Unvegetated*	95	94.06	
3.6	6	N 33°45.355 W 118°05.924	*Frankenia salina*	50	33.33	
3.6			*Mesumbryanthemum nodiflorum*	20	13.33	
3.6			*Distichlis spicata*	20	13.33	
3.6			*Unvegetated*	60	40	
3.7	7	N 33°45.357 W 118°05.923	*Frankenia salina*	45	28.66	
3.7			*Mesumbryanthemum nodiflorum*	15	9.55	
3.7			*Distichlis spicata*	15	9.55	
3.7			*Cressa truxillensis*	2	1.27	
3.7			*Unvegetated*	80	50.96	
3.8	8	N 33°45.358 W 118°05.922	*Unvegetated*	100	100	
3.9	9	N 33°45.362 W 118°05.920	*Unvegetated*	100	100	
3.10	10	N 33°45.363 W 118°05.918	*Unvegetated*	100	100	

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** Percent of plot covered by species.

CALIFORNIA STATE UNIVERSITY, LONG BEACH
ENVIRONMENTAL SCIENCE & POLICY

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
4.1	1	N 33°45.399 W 118°05.935	*Mesumbryanthemum nodiflorum*	30	18.75	
4.1			*Melilotus indica*	9	5.63	
4.1			*Salicornia subterminalis*	15	9.38	
4.1			*Parapholis incurva*	25	15.63	
4.1			*Polypogon monspeliensis*	1	0.63	
4.1			*Frankenia salina*	25	15.63	
4.1			*Centaurea melitensis*	5	3.13	
4.1			*Unvegetated*	50	31.25	
4.2	#2-3	N 33°45.396 W 118°05.935	*Mesumbryanthemum nodiflorum*	30	23.44	
4.2			*Salicornia subterminalis*	20	15.63	
4.2			*Frankenia salina*	1	0.78	
4.2			*Centaurea melitensis*	1	0.78	
4.2			*Bassia hyssopifolia*	3	2.34	
4.2			*Parapholis incurva*	3	2.34	
4.2			*Unvegetated*	70	54.69	
4.3	#4-5	N 33°45.394 W 118°05.938	*Melilotus indica*	25	17.73	
4.3			*Isocoma menziesii*	20	14.18	
4.3			*Polypogon monspeliensis*	20	14.18	
4.3			*Mesumbryanthemum nodiflorum*	30	21.28	
4.3			*Centaurea melitensis*	2	1.42	
4.3			*Bromus diandrus*	1	0.71	
4.3			*Parapholis incurva*	18	12.77	
4.3			*Unvegetated*	25	17.73	
4.4	#6-7	N 33°45.392 W 118°05.940	*Melilotus indica*	23	21.1	
4.4			*Centaurea melitensis*	17	15.6	
4.4			*Isocoma menziesii*	10	9.17	
4.4			*Mesumbryanthemum nodiflorum*	7	6.42	
4.4			*Anaphalis spp.*	1	0.92	Pic#8: Pearly

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
4.4			*Bromus diandrus*	3	2.75	
4.4			*Parapholis incurva*	5	4.59	
4.4			*Polypogon monspeliensis*	3	2.75	
4.4			*Unvegetated*	40	36.7	
4.5	#9-10	N 33°45.389 W 118°05.944	*Bromus madritensis*	18	16.67	No iceplant!
4.5			*Isocoma menziesii*	22	20.37	
4.5			*Melilotus indica*	32	29.63	
4.5			*Centaurea melitensis*	7	6.48	
4.5			*Bromus diandrus*	9	8.33	
4.5			*Polypogon monspeliensis*	5	4.63	
4.5			*Frankenia salina*	5	4.63	
4.5			*Sonchus oleraceus*	3	2.78	
4.5			*Unvegetated*	7	6.48	
4.6	#11-12	N 33°45.387 W 118°05.943	*Isocoma menziesii*	56	55.45	
4.6			*Bromus madritensis*	9	8.91	
4.6			*Melilotus indica*	28	27.72	
4.6			*Bromus diandrus*	3	2.97	
4.6			*Hordeum vulgare*	2	1.98	
4.6			*Unvegetated*	3	2.97	
4.7	#13-14	N 33°45.388 W 118°05.944	*Isocoma menziesii*	25	25	
4.7			*Bromus madritensis*	5	5	
4.7			*Bromus diandrus*	1	1	
4.7			*Melilotus indica*	6	6	
4.7			*Mesumbryanthemum nodiflorum*	2	2	
4.7			*Centaurea melitensis*	1	1	
4.7			*Bassia hyssopifolia*	3	3	
4.7			*Unvegetated*	57	57	
4.8	#15-16	N 33°45.386 W 118°05.947	*Isocoma menziesii*	17	16.04	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
4.8			*Melilotus indica*	12	11.32	
4.8			*Bromus madritensis*	22	20.75	
4.8			*Sisymbrium spp.*	4	3.77	
4.8			*Bassia hyssopifolia*	22	20.75	
4.8			*Centaurea melitensis*	12	11.32	
4.8			*Unvegetated*	17	16.04	
4.9	#17-18	N 33°45.385 W 118°05.947	*Isocoma menziesii*	50	49.02	
4.9			*Bromus madritensis*	7	6.86	
4.9			*Bassia hyssopifolia*	10	9.8	
4.9			*Unvegetated*	35	34.31	
4.10	#19-20	N 33°45.383 W 118°05.953	*Bromus madritensis*	5	4.67	
4.10			*Isocoma menziesii*	10	9.35	
4.10			*Mesumbryanthemum nodiflorum*	10	9.35	
4.10			*Centaurea melitensis*	8	7.48	
4.10			*Bassia hyssopifolia*	1	0.93	
4.10			*Distichlis spicata*	3	2.8	
4.10			*Unvegetated*	70	65.42	

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CALIFORNIA STATE UNIVERSITY, LONG BEACH
ENVIRONMENTAL SCIENCE & POLICY

BIOLOGY TEAM
VEGETATION SURVEY DATA SHEET

SITE NAME: Campgrounds

DATE/TIME: 04/14/08 @ 2:00 p.m.

NAME OF OBSERVER: The Biology Team

DESCRIPTION OF STUDY AREA: North of the road near oil drilling and along river.

TRANSECT DIMENSIONS: 50m transect

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.1	#24-25	N 33°45.449 W 118°06.130	*Cressa truxillensis*	25	23.36	
1.1			*Distichlis spicata*	40	37.38	
1.1			*Parapholis incurva*	40	37.38	
1.1			*Unvegetated*	2	1.87	
1.2	#26	N 33°45.447 W 118°06.127	*Cressa truxillensis*	28	27.45	
1.2			*Distichlis spicata*	10	9.8	Flowering
1.2			*Melilotus indica*	10	9.8	
1.2			*Parapholis incurva*	38	37.25	
1.2			*Polypogon monspeliensis*	6	5.88	
1.2			*Mesymbryanthemum nodiflorum*	4	3.92	
1.2			Unvegetated	6	5.88	
1.3	#27	N 33°45.444 W 118°06.125	*Distichlis spicata*	6	5.71	
1.3			*Cressa truxillensis*	13	12.38	
1.3			*Parapholis incurva*	16	15.24	
1.3			*Sonchus oleraceus*	10	9.52	
1.3			*Melilotus indica*	18	17.14	
1.3			*Mesymbryanthemum nodiflorum*	9	8.57	
1.3			*Bassia hyssopifolia*	2	1.9	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.3			Unvegetated	31	29.52	
1.4	#28	N 33°45.442 W 118°06.125	*Cressa truxillensis*	15	13.39	Flowering
1.4			*Distichlis spicata*	5	4.46	
1.4			*Melilotus indica*	45	40.18	
1.4			*Sonchus oleraceus*	15	13.39	
1.4			*Polypogon monspeliensis*	5	4.46	
1.4			*Mesymbryanthemum nodiflorum*	5	4.46	
1.4			*Parapholis incurva*	7	6.25	
1.4			*Unvegetated*	15	13.39	
1.5	#29-30	N 33°45.437 W 118°06.120	*Cressa truxillensis*	48	46.15	
1.5			*Bassia hyssopifolia*	4	3.84	
1.5			*Melilotus indica*	26	25	
1.5			*Distichlis spicata*	3	2.88	
1.5			*Parapholis incurva*	14	13.46	
1.5			*Sonchus oleraceus*	2	1.92	
1.5			*Unvegetated*	7	6.73	
1.6	#31	N 33°45.440 W 118°06.122	*Cressa truxillensis*	13	13	
1.6			*Sonchus oleraceus*	8	8	
1.6			*Parapholis incurva*	28	28	
1.6			*Melilotus indica*	23	23	
1.6			*Distichlis spicata*	5	5	
1.6			*Unvegetated*	23	23	
1.7	#32	N 33°45.436 W 118°06.120	*Cressa truxillensis*	26	24.76	
1.7			*Sonchus oleraceus*	8	7.62	
1.7			*Melilotus indica*	21	20	
1.7			*Polypogon monspeliensis*	4	3.81	
1.7			*Bromus madritensis*	6	5.71	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.7			*Solanum spp.*	2	1.9	Pic#33
1.7			*Bassia hyssopifolia*	7	6.67	
1.7			*Unvegetated*	31	29.52	
1.8	#34	N 33°45.435 W 118°06.130	*Cressa truxillensis*	13	12.26	
1.8			*Distichlis spicata*	2	1.89	
1.8			*Centaurea melitensis*	22	20.75	
1.8			*Parapholis incurva*	5	4.72	
1.8			*Erodium cicutarium*	7	6.6	
1.8			*Sonchus oleraceus*	1	0.94	
1.8			*Melilotus indica*	6	5.66	
1.8			*Unvegetated*	50	47.17	
1.9	#35	N 33°45.453 W 118°06.133	*Distichlis spicata*	60	59.41	Flowering
1.9			*Mesymbryanthemum nodiflorum*	8	7.92	
1.9			*Melilotus indica*	22	21.78	
1.9			*Sonchus oleraceus*	1	0.99	
1.9			*Bromus diandrus*	2	1.98	
1.9			*Unvegetated*	8	7.92	
1.10	#36	N 33°45.454 W 118°06.134	*Distichlis spicata*	53	52.48	
1.10			*Mesymbryanthemum nodiflorum*	16	15.84	
1.10			*Bromus madritensis*	5	4.95	
1.10			*Bromus diandrus*	4	3.96	
1.10			*Parapholis incurva*	5	4.95	
1.10			*Melilotus indica*	4	3.96	
1.10			*Unvegetated*	14	13.86	
2.1	11	N 33°45.450 W 118°06.137	*Salicornia virginica*	30	21.43	
2.1			*Mesymbryanthemum crystallinum*	15	10.71	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
2.1			*Polypogon monspeliensis*	10	7.14	
2.1			*Distichlis spicata*	50	35.71	
2.1			*Sisymbrium spp.*	8	5.71	
2.1			*Sonchus oleraceus*	1	0.71	
2.1			*Cressa truxillensis*	1	0.71	
2.1			*Unvegetated*	25	17.86	
2.2	12	N 33°45.449 W 118°06.137	*Sisymbrium spp.*	10	7.41	
2.2			*Polypogon monspeliensis*	25	18.52	
2.2			*Salicornia virginica*	10	7.41	
2.2			*Lolium multiflorum*	9	6.67	
2.2			*Scirpus robustus*	10	7.41	
2.2			*Distichlis spicata*	30	22.22	
2.2			*Melilotus indica*	1	0.74	
2.2			*Mesymbryanthemum nodiflorum*	1	0.74	
2.2			*Solanum spp.*	3	2.22	
2.2			*Sonchus oleraceus*	15	11.11	
2.2			*Parapholis incurva*	1	0.74	
2.2			*Unvegetated*	20	14.81	
2.3	13	N 33°45.450 W 118°06.136	*Lolium multiflorum*	20	18.69	
2.3			*Scirpus robustus*	10	9.35	
2.3			*Polypogon monspeliensis*	10	9.35	
2.3			*Distichlis spicata*	25	23.36	
2.3			*Sisymbrium spp.*	4	3.74	
2.3			*Parapholis incurva*	30	28.04	
2.3			*Plantago spp.*	1	0.93	
2.3			*Cressa truxillensis*	2	1.87	
2.3			*Unvegetated*	5	4.67	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
2.4	14	N 33°45.443 W 118°06.127	*Distichlis spicata*	20	19.05	
2.4			*Bromus diandrus*	20	19.05	
2.4			*Parapholis incurva*	20	19.05	
2.4			*Unvegetated*	45	42.86	
2.5	15	N 33°45.441 W 118°06.127	*Bassia hyssopifolia*	80	42.33	
2.5			*Mesymbryanthemum nodiflorum*	15	7.94	
2.5			*Parapholis incurva*	75	39.68	
2.5			*Salicornia virginica*	7	3.7	
2.5			*Polypogon monspeliensis*	1	0.53	
2.5			*Cressa truxillensis*	1	0.53	
2.5			*Unvegetated*	10	5.29	
2.6	16	N 33°45.438 W 118°06.130	*Polypogon monspeliensis*	5	3.91	
2.6			*Parapholis incurva*	80	62.5	
2.6			*Bassia hyssopifolia*	4	3.13	
2.6			*Mesymbryanthemum nodiflorum*	4	3.13	
2.6			*Unvegetated*	35	27.34	
2.7	17	N 33°45.440 W 118°06.128	*Distichlis spicata*	80	62.5	
2.7			*Salicornia virginica*	15	11.72	
2.7			*Mesymbryanthemum nodiflorum*	5	3.91	
2.7			*Bassia hyssopifolia*	1	0.78	
2.7			*Melilotus indica*	1	0.78	
2.7			*Polypogon monspeliensis*	1	0.78	
2.7			*Unvegetated*	25	19.53	
2.8	18	N 33°45.441 W 118°06.127	*Distichlis spicata*	80	62.02	
2.8			*Salicornia virginica*	15	11.63	
2.8			*Polypogon monspeliensis*	1	0.78	
2.8			*Parapholis incurva*	20	15.5	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
2.8			*Mesymbryanthemum nodiflorum*	3	2.33	
2.8			*Unvegetated*	10	7.75	
2.9	19	N 33°45.430 W 118°06.124	*Bromus madritensis*	5	4.55	
2.9			*Distichlis spicata*	90	81.82	
2.9			*Bromus diandrus*	5	4.55	
2.9			*Unvegetated*	10	9.09	
2.10	20	N 33°45.434 W 118°06.134	*Centaurea melitensis*	60	53.1	
2.10			*Bromus madritensis*	5	4.42	
2.10			*Mesymbryanthemum nodiflorum*	15	13.27	
2.10			*Melilotus indica*	3	2.65	
2.10			*Solanum spp.*	5	4.42	
2.10			*Unvegetated*	25	22.12	
3.1	37	N 33°45.470 W 118°06.116	*Cressa truxillensis*	12	11.54	
3.1			*Salicornia virginica*	15	14.42	
3.1			*Melilotus indica*	28	26.92	
3.1			*Bassia hyssopifolia*	8	7.69	
3.1			*Distichlis spicata*	18	17.31	
3.1			*Parapholis incurva*	5	4.81	
3.1			*Polypogon monspeliensis*	4	3.85	
3.1			*Unvegetated*	14	13.46	
3.2	39	N 33°45.470 W 118°06.115	*Salicornia virginica*	38	36.54	
3.2			*Bassia hyssopifolia*	5	4.81	
3.2			*Cressa truxillensis*	11	10.58	
3.2			*Polypogon monspeliensis*	5	4.81	
3.2			*Parapholis incurva*	18	17.31	
3.2			*Melilotus indica*	6	5.77	
3.2			*Distichlis spicata*	6	5.77	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
3.2			*Unvegetated*	15	14.42	
3.3	40	N 33°45.470 W 118°06.115	*Salicornia virginica*	40	37.74	
3.3			*Distichlis spicata*	5	4.72	
3.3			*Bassia hyssopifolia*	5	4.72	
3.3			*Parapholis incurva*	35	33.02	
3.3			*Melilotus indica*	3	2.83	
3.3			*Polypogon monspeliensis*	1	0.94	
3.3			*Unvegetated*	17	16.04	
3.4	41	N 33°45.469 W 118°06.108	*Cressa truxillensis*	45	36.89	
3.4			*Salicornia virginica*	30	24.59	
3.4			*Melilotus indica*	22	18.03	
3.4			*Parapholis incurva*	25	20.49	
3.5	42	N 33°45.469 W 118°06.101	*Cressa truxillensis*	16	16	
3.5			*Salicornia virginica*	1	1	
3.5			*Lolium multiflorum*	6	6	
3.5			*Parapholis incurva*	35	35	
3.5			*Melilotus indica*	25	25	
3.5			*Polypogon monspeliensis*	2	2	
3.5			*Distichlis spicata*	9	9	
3.5			*Sonchus oleraceus*	4	4	
3.5			*Bassia hyssopifolia*	2	2	
3.6	43	N 33°45.469 W 118°06.098	*Cressa truxillensis*	23	21.7	
3.6			*Salicornia virginica*	12	11.32	
3.6			*Distichlis spicata*	13	12.26	
3.6			*Melilotus indica*	30	28.3	
3.6			*Polypogon monspeliensis*	5	4.72	
3.6			*Parapholis incurva*	13	12.26	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
3.6			*Melilotus alba*	6	5.66	
3.6			*Plantago spp.*	4	3.77	
3.7	44	N 33°45.469 W 118°06.094	*Cressa truxillensis*	19	18.1	
3.7			*Salicornia virginica*	19	18.1	
3.7			*Distichlis spicata*	10	9.52	
3.7			*Melilotus indica*	32	30.48	
3.7			*Plantago spp.*	8	7.61	
3.7			*Parapholis incurva*	17	16.2	
3.8	45	N 33°45.468 W 118°06.091	*Cressa truxillensis*	11	10.78	
3.8			*Salicornia virginica*	21	20.59	
3.8			*Melilotus indica*	23	22.55	
3.8			*Parapholis incurva*	43	42.16	
3.8			*Bassia hyssopifolia*	4	3.92	
3.9	46	N 33°45.468 W 118°06.090	*Cressa truxillensis*	23	22.33	
3.9			*Salicornia virginica*	12	11.65	
3.9			*Melilotus indica*	4	3.88	
3.9			*Plantago spp.*	4	3.88	
3.9			*Polypogon monspeliensis*	4	3.88	
3.9			*Parapholis incurva*	43	41.75	
3.9			*Distichlis spicata*	13	12.62	
3.10	47	N 33°45.468 W 118°06.087	*Cressa truxillensis*	17	15.89	
3.10			*Salicornia virginica*	21	19.63	
3.10			*Distichlis spicata*	8	7.48	
3.10			*Melilotus indica*	18	16.82	
3.10			*Parapholis incurva*	18	16.82	
3.10			*Polypogon monspeliensis*	5	4.67	
3.10			*Plantago spp.*	4	3.74	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
3.10			*Bassia hyssopifolia*	5	4.67	
3.10			*Unvegetated*	11	10.28	
4.1	21	N 33°45.469 W 118°06.128	*Melilotus indica*	1	0.93	
4.1			*Salicornia virginica*	75	69.44	
4.1			*Lolium multiflorum*	5	4.63	
4.1			*Distichlis spicata*	19	17.59	
4.1			*Cressa truxillensis*	4	3.7	
4.1			*Parapholis incurva*	4	3.7	
4.2	22	N 33°45.468 W 118°06.129	*Salicornia virginica*	85	57.43	
4.2			*Lolium multiflorum*	15	10.14	
4.2			*Distichlis spicata*	30	20.27	
4.2			*Cressa truxillensis*	2	1.35	
4.2			*Parapholis incurva*	15	10.14	
4.2			*Sonchus oleraceus*	1	0.68	
4.3	23	N 33°45.468 W 118°06.134	*Lolium multiflorum*	7	6.31	
4.3			*Distichlis spicata*	100	90.1	
4.3			*Melilotus indica*	1	0.9	
4.3			*Sonchus oleraceus*	3	2.7	
4.4	24	N 33°45.469 W 118°06.133	*Sonchus oleraceus*	4	3.17	
4.4			*Distichlis spicata*	25	19.84	
4.4			*Cressa truxillensis*	7	5.56	
4.4			*Unvegetated*	90	90	
4.5	25	N 33°45.469 W 118°06.134	*Xanthium strumarium*	3	2.27	
4.5			*Sonchus oleraceus*	5	3.79	
4.5			*Distichlis spicata*	20	15.15	
4.5			*Frankenia salina*	5	3.79	
4.5			*Cressa truxillensis*	8	6.06	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
4.5			*Salicornia virginica*	6	4.55	
4.5			*Unvegetated*	85	64.39	
4.6	26	N 33°45.467 W 118°06.136	*Sonchus oleraceus*	10	8	
4.6			*Salicornia virginica*	5	4	
4.6			*Parapholis incurva*	7	5.6	
4.6			*Distichlis spicata*	100	80	
4.6			*Cressa truxillensis*	3	2.4	
4.7	48	N 33°45.468 W 118°06.137	*Sonchus oleraceus*	8	7.62	Mary's Camera
4.7			*Parapholis incurva*	2	1.9	
4.7			*Distichlis spicata*	80	76.19	
4.7			Unvegetated	15	14.29	
4.8	49	N 33°45.469 W 118°06.143	*Salicornia virginica*	60	57.69	
4.8			*Distichlis spicata*	40	38.46	
4.8			*Parapholis incurva*	4	3.85	
4.9	50	N 33°45.473 W 118°06.150	*Distichlis spicata*	90	62.5	
4.9			*Bromus diandrus*	4	2.78	
4.9			*Parapholis incurva*	35	24.31	
4.9			*Lolium multiflorum*	4	2.78	
4.9			*Mesymbryanthemum nodiflorum*	1	0.69	
4.9			*Unvegetated*	10	6.94	
4.10	51	N 33°45.471 W 118°06.152	*Mesymbryanthemum nodiflorum*	15	13.27	
4.10			*Distichlis spicata*	7	6.19	
4.10			*Bassia hyssopifolia*	5	4.42	
4.10			*Parapholis incurva*	1	0.88	
4.10			*Unvegetated*	85	75.22	

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CALIFORNIA STATE UNIVERSITY, LONG BEACH
ENVIRONMENTAL SCIENCE & POLICY

BIOLOGY TEAM
VEGETATION SURVEY DATA SHEET

SITE NAME: The Hellman Property

DATE/TIME: 04/16/08 @ 1:15 p.m.

NAME OF OBSERVER: The Biology Team

DESCRIPTION OF STUDY AREA: Degraded.

TRANSECT DIMENSIONS: 50m transect

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.1	#3-4	N 33°45.033 W 118°06.194	*Atriplex semibaccata*	100	100.00	
1.2	#1-2	N 33°45.030 W 118°06.190	*Mesymbryanthemum nodiflorum*	45	40.18	
1.2			*Polypogon monspeliensis*	10	8.93	
1.2			*Parapholis incurva*	40	35.71	
1.2			*Bromus diandrus*	6	5.35	
1.2			*Sonchus oleraceus*	1	0.89	
1.2			*Unvegetated*	10	8.93	
1.3	#5-6	N 33°45.030 W 118°06.186	*Salicornia virginica*	5	3.14	
1.3			*Parapholis incurva*	40	25.16	
1.3			*Mesymbryanthemum nodiflorum*	45	28.30	
1.3			*Sonchus oleraceus*	1	0.63	
1.3			*Polypogon monspeliensis*	15	9.43	
1.3			*Spergularia marina*	2	1.26	Flowering; found in freshwater impulses
1.3			*Unvegetated*	51	32.08	
1.4	#7-8	N 33°45.029 W 118°06.182	*Bassia hyssopifolia*	4	3.42	Saw *Frankenia* but not in quadrat
1.4			*Polypogon monspeliensis*	7	5.95	
1.4			*Mesymbryanthemum nodiflorum*	80	68.38	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.4			*Parapholis incurva*	5	4.27	
1.4			*Sonchus oleraceus*	1	0.85	
1.4			*Unvegetated*	20	17.09	
1.5	#9-10	N 33°45.03 W 118°06.180	*Bassia hyssopifolia*	10	8.93	
1.5			*Mesymbryanthemum nodiflorum*	90	80.36	
1.5			*Polypogon monspeliensis*	4	3.57	
1.5			*Unvegetated*	8	7.14	
1.6	#11-12	N 33°45.032 W 118°06.180	*Salicornia virginica*	15	17.31	
1.6			*Parapholis incurva*	20	22.12	
1.6			*Mesymbryanthemum nodiflorum*	17	19.23	
1.6			*Polypogon monspeliensis*	2	4.81	
1.6			*Unvegetated*	35	36.54	
1.7	#13-14	N 33°45.031 W 118°06.176	*Salicornia virginica*	23	23.76	
1.7			*Parapholis incurva*	20	20.79	
1.7			*Mesymbryanthemum nodiflorum*	10	10.89	
1.7			*Polypogon monspeliensis*	3	3.96	
1.7			*Sonchus oleraceus*	1	1.98	
1.7			*Lolium multiflorum*	2	2.97	
1.7			*Unvegetated*	35	35.64	
1.8	#15-16	N 33°45.032 W 118°06.175	*Bassia hyssopifolia*	6	5.04	
1.8			*Mesymbryanthemum nodiflorum*	70	58.82	
1.8			*Parapholis incurva*	5	4.20	
1.8			*Lolium multiflorum*	2	1.68	
1.8			*Sonchus oleraceus*	1	8.40	
1.8			*Unvegetated*	10	0.84	
1.9	#17-18	N 33°45.030 W 118°06.171	*Salicornia virginica*	25	23.81	
1.9			*Salicornia subterminalis*	40	38.10	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.9			*Mesymbryanthemum nodiflorum*	10	9.52	
1.9			*Lolium multiflorum*	1	0.95	
1.9			*Parapholis incurva*	3	2.86	
1.9			*Sonchus oleraceus*	1	0.95	
1.9			*Unvegetated*	25	23.81	
1.10	#19	N 33°45.032 W 118°06.171	*Salicornia subterminalis*	90	87.38	
1.10			*Salicornia virginica*	2	1.94	
1.10			*Parapholis incurva*	7	6.80	
1.10			*Sonchus oleraceus*	1	0.97	
1.10			*Mesymbryanthemum nodiflorum*	1	0.97	
1.10			*Unvegetated*	2	1.94	
2.1	#20-21	N 33°45.033 W 118°06.153	*Salicornia virginica*	3	7.69	
2.1			*Parapholis incurva*	40	38.46	
2.1			*Mesymbryanthemum nodiflorum*	15	14.42	
2.1			*Sonchus oleraceus*	1	0.96	
2.1			*Unvegetated*	20	19.23	
2.2	#22-23	N 33°45.033 W 118°06.150	*Salicornia virginica*	30	28.85	Saw Frankenia but not in transect
2.2			*Sonchus oleraceus*	2	1.92	
2.2			*Parapholis incurva*	10	9.62	
2.2			*Mesymbryanthemum nodiflorum*	40	38.46	
2.2			*Lolium multiflorum*	2	1.92	
2.2			*Unvegetated*	20	19.23	
2.3	#24-25	N 33°45.034 W 118°06.149	*Salicornia virginica*	7	10.48	
2.3			*Spergularia marina*	3	6.67	
2.3			*Hordeum vulgare*	25	27.62	
2.3			*Mesymbryanthemum nodiflorum*	20	22.86	
2.3			*Bassia hyssopifolia*	7	10.48	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
2.3			*Parapholis incurva*	5	8.57	
2.3			*Unvegetated*	10	13.33	
2.4	#26-27	N 33°45.032 W 118°06.146	*Mesymbryanthemum nodiflorum*	75	74.26	
2.4			*Bassia hyssopifolia*	1	0.99	
2.4			*Hordeum vulgare*	1	0.99	
2.4			*Raphanus sativa*	4	3.96	
2.4			*Unvegetated*	20	19.80	
2.5	#28-29	N 33°45.0333 W 118°06.141	*Salicornia virginica*	20	19.23	
2.5			*Hordeum vulgare*	5	4.81	
2.5			*Parapholis incurva*	5	4.81	
2.5			*Mesymbryanthemum nodiflorum*	35	33.65	
2.5			*Lolium multiflorum*	3	2.88	
2.5			*Sonchus oleraceus*	1	0.96	
2.5			*Unvegetated*	35	33.65	
2.6	#30-31	N 33°45.033 W 118°06.140	*Bromus diandrus*	7	6.54	
2.6			*Salicornia virginica*	8	7.48	
2.6			*Mesymbryanthemum nodiflorum*	60	56.07	
2.6			*Unvegetated*	25	23.36	
2.7	#32-33	N 33°45.034 W 118°06.137	*Raphanus sativa*	2	1.87	
2.7			*Lolium multiflorum*	5	4.67	
2.7			*Bromus diandrus*	7	5.74	
2.7			*Hordeum vulgare*	5	4.10	
2.7			*Mesymbryanthemum nodiflorum*	40	32.79	
2.7			*Salsola tragus*	15	12.30	
2.7			*Unvegetated*	55	45.08	
2.8	#34-35	N 33°45.035 W 118°06.131	*Salicornia virginica*	25	20.49	
2.8			*Bromus diandrus*	5	4.10	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
2.8			*Mesymbryanthemum nodiflorum*	55	45.08	
2.8			*Sonchus oleraceus*	10	8.20	
2.8			*Hordeum vulgare*	4	3.28	
2.8			*Lolium multiflorum*	1	0.82	
2.8			*Salsola tragus*	2	16.39	
2.8			*Unvegetated*	20	1.64	
2.9	#36-37	N 33°45.038 W 118°06.131	*Salsola tragus*	70	57.85	
2.9			*Raphanus sativa*	2	1.65	
2.9			*Mesymbryanthemum nodiflorum*	45	37.19	
2.9			*Bromus diandrus*	1	0.83	
2.9			*Lolium multiflorum*	1	0.83	
2.9			*Centaurea melitensis*	2	1.65	
2.10	#38-39	N 33°45.038 W 118°06.131	*Raphanus sativa*	20	16.13	
2.10			*Mesymbryanthemum nodiflorum*	55	44.35	
2.10			*Lolium multiflorum*	1	0.81	
2.10			*Bromus diandrus*	5	4.03	
2.10			*Salsola tragus*	2	1.61	
2.10			*Hordeum vulgare*	1	0.81	
2.10			*Unvegetated*	40	32.26	
3.1	#1h	N 33°45.060 W 118°06.115	*Mesymbryanthemum nodiflorum*	35	33.65	
3.1			*Sonchus oleraceus*	5	4.81	
3.1			*Bassia hyssopifolia*	1	0.96	
3.1			*Bromus diandrus*	2	1.92	
3.1			*Lolium multiflorum*	2	1.92	
3.1			*Salsola tragus*	4	3.85	
3.1			*Unvegetated*	55	52.88	
3.2	#2h	N 33°45.059 W 118°06.114	*Mesymbryanthemum nodiflorum*	40	32.52	3.2

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
3.2			*Sonchus oleraceus*	15	12.20	
3.2			*Lolium multiflorum*	7	5.69	
3.2			*Salsola tragus*	15	12.20	
3.2			*Bromus diandrus*	5	4.07	
3.2			*Bassia hyssopifolia*	1	0.82	
3.2			*Unvegetated*	40	32.52	
3.3	#3h	N 33°45.060 W 118°06.118	*Mesymbryanthemum nodiflorum*	50	38.46	
3.3			*Polypogon monspeliensis*	12	9.23	
3.3			*Melilotus indica*	4	3.08	
3.3			*Bromus diandrus*	3	2.31	
3.3			*Sonchus oleraceus*	6	4.62	
3.3			*Salsola tragus*	25	19.23	
3.3			*Unvegetated*	30	23.08	
3.4	#4h	N 33°45.051 W 118°06.119	*Salicornia virginica*	15	12.40	
3.4			*Mesymbryanthemum nodiflorum*	55	45.45	
3.4			*Lolium multiflorum*	1	0.83	
3.4			*Unvegetated*	50	41.32	
3.5	#5h	N 33°45.049 W 118°06.120	*Mesymbryanthemum nodiflorum*	90	88.24	
3.5			*Lolium multiflorum*	2	1.96	
3.5			*Unvegetated*	10	9.80	
3.6	#6h	N 33°45.047 W 118°06.121	*Salicornia virginica*	25	24.75	
3.6			*Mesymbryanthemum nodiflorum*	25	24.75	
3.6			*Lolium multiflorum*	1	0.99	
3.6			*Sonchus oleraceus*	30	29.70	
3.6			*Unvegetated*	20	19.80	
3.7	#7h	N 33°45.048 W 118°06.121	*Salicornia virginica*	90	70.87	
3.7			*Parapholis incurva*	30	23.62	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
3.7			*Sonchus oleraceus*	3	2.36	
3.7			*Centaurea melitensis*	1	0.79	
3.7			*Unvegetated*	3	2.36	
3.8	#8h	N 33°45.047 W 118°06.124	*Salicornia virginica*	80	61.54	
3.8			*Parapholis incurva*	15	3.85	
3.8			*Lolium multiflorum*	5	11.54	
3.8			*Mesymbryanthemum nodiflorum*	10	7.69	
3.8			*Unvegetated*	20	15.38	
3.9	#9h	N 33°45.044 W 118°06.124	*Mesymbryanthemum nodiflorum*	85	79.44	
3.9			*Lolium multiflorum*	2	1.87	
3.9			*Hordeum vulgare*	5	4.67	
3.9			*Unvegetated*	15	14.02	
3.10	#10h	N 33°45.042 W 118°06.124	*Mesymbryanthemum nodiflorum*	60	60.00	
3.10			*Brassica nigra*	3	3.00	
3.10			*Sonchus oleraceus*	2	2.00	
3.10			*Hordeum vulgare*	2	2.00	
3.10			*Bromus diandrus*	7	7.00	
3.10			*Lolium multiflorum*	1	1.00	
3.10			*Unvegetated*	5	5.00	
4.1	#11h	N 33°45.078 W 118°06.051	*Salicornia virginica*	20	16.67	
4.1			*Mesymbryanthemum nodiflorum*	10	8.33	
4.1			*Parapholis incurva*	5	4.17	
4.1			*Unvegetated*	85	70.83	
4.2	#12h	N 33°45.079 W 118°06.050	*Salicornia virginica*	80	61.54	
4.2			*Mesymbryanthemum nodiflorum*	25	19.23	
4.2			*Sonchus oleraceus*	5	3.85	
4.2			*Unvegetated*	20	15.38	

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** Percent of plot covered by species.

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
4.3	#13h	N 33°45.079 W 118°06.049	*Salicornia virginica*	70	51.09	
4.3			*Mesymbryanthemum nodiflorum*	35	25.55	
4.3			*Sonchus oleraceus*	1	0.73	
4.3			*Lolium multiflorum*	1	0.73	
4.3			*Unvegetated*	30	21.90	
4.4	#14h	N 33°45.085 W 118°06.042	*Salicornia subterminalis*	15	56.39	
4.4			*Mesymbryanthemum nodiflorum*	75	11.28	
4.4			*Lolium multiflorum*	2	1.50	
4.4			*Melilotus indica*	3	2.26	
4.4			*Parapholis incurva*	7	5.26	
4.4			*Sonchus oleraceus*	1	0.75	
4.4			*Unvegetated*	30	22.56	
4.5	#15h	N 33°45.085 W 118°06.036	*Salicornia virginica*	40	29.17	
4.5			*Mesymbryanthemum nodiflorum*	35	33.33	
4.5			*Unvegetated*	45	37.50	
4.6	#16h	N 33°45.087 W 118°06.035	*Salicornia subterminalis*	30	22.73	
4.6			*Mesymbryanthemum nodiflorum*	7	5.30	
4.6			*Melilotus indica*	10	7.58	
4.6			*Parapholis incurva*	10	7.58	
4.6			*Unvegetated*	75	56.82	
4.7	#17h	N 33°45.087 W 118°06.034	*Bromus diandrus*	15	13.89	
4.7			*Lolium multiflorum*	8	7.41	
4.7			*Sonchus oleraceus*	10	9.26	
4.7			*Isocoma menziesii*	10	9.26	
4.7			*Melilotus indica*	5	4.63	
4.7			*Mesymbryanthemum nodiflorum*	5	4.63	
4.7			*Unvegetated*	55	50.93	

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CALIFORNIA STATE UNIVERSITY, LONG BEACH
ENVIRONMENTAL SCIENCE & POLICY

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
4.8	#18h	N 33°45.088 W 118°06.033	*Bromus diandrus*	35	32.41	
4.8			*Sonchus oleraceus*	1	0.93	
4.8			*Melilotus indica*	2	1.85	
4.8			*Lolium multiflorum*	10	9.26	
4.8			*Atriplex semibaccata*	45	41.67	
4.8			*Centaurea melitensis*	10	9.26	
4.8			*Mesymbryanthemum nodiflorum*	5	4.63	
4.9	#19h	N 33°45.090 W 118°06.030	*Isocoma menziesii*	80	47.06	
4.9			*Atriplex semibaccata*	8	4.71	
4.9			*Bromus diandrus*	25	14.71	
4.9			*Melilotus indica*	15	8.82	
4.9			*Sonchus oleraceus*	25	14.71	
4.9			*Centaurea melitensis*	2	1.18	
4.9			*Unvegetated*	15	8.82	
4.10	#20h	N 33°45.091 W 118°06.026	*Melilotus indica*	17	13.28	
4.10			*Bromus diandrus*	10	7.81	
4.10			*Malva parviflorum*	5	3.91	
4.10			*Mesymbryanthemum nodiflorum*	15	11.72	
4.10			*Centaurea melitensis*	3	2.34	
4.10			*Salsola tragus*	2	1.56	
4.10			*Sonchus oleraceus*	1	0.78	
4.10			*Unvegetated*	75	58.59	

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** Percent of plot covered by species.

CALIFORNIA STATE UNIVERSITY, LONG BEACH
ENVIRONMENTAL SCIENCE & POLICY

BIOLOGY TEAM
VEGETATION SURVEY DATA SHEET

SITE NAME: Steamshovel Slough

DATE/TIME: 04/28/08 @ 12:45 p.m.

NAME OF OBSERVER: The Biology Team

DESCRIPTION OF STUDY AREA: Saw one large Laural Sumek along the transition (not in any transect); saw 3 least Turns; heard a Belding Savannah sparrow.

TRANSECT DIMENSIONS: 50m transect

TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.1	1&2	N 33°45.912 W 118°06.580	*Monanthochloe littoralis*	60	46.15	
1.1			*Mesymbryanthemum nodiflorum*	20	15.38	
1.1			*Bromus diandrus*	40	30.77	
1.1			*Melilotus indica*	5	3.85	
1.1			*Hordeum vulgare*	5	3.85	
1.2	24	N 33°45.912 W 118°06.579	*Salicornia subterminalis*	30	26.09	
1.2			*Monanthochloe littoralis*	40	34.78	
1.2			*Batis maritima*	20	17.39	
1.2			*Mesymbryanthemum nodiflorum*	3	2.61	
1.2			*Bromus diandrus*	10	8.7	
1.2			*Unvegetated*	12	10.43	
1.3	33	N 33°45.911 W 118°06.576	*Mesymbryanthemum nodiflorum*	50	50	
1.3			*Bromus diandrus*	10	10	
1.3			*Bromus madritensis*	3	3	
1.3			*Bassia hyssopifolia*	2	2	
1.3			*Melilotus indica*	20	20	
1.3			*Monanthochloe littoralis*	2	2	
1.3			*Unvegetated*	13	13	

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TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.4	26	N 33°45.911 W 118°06.573	*Monanthochloe littoralis*	16	16	
1.4			*Mesymbryanthemum nodiflorum*	31	31	
1.4			*Melilotus indica*	26	26	
1.4			*Bromus diandrus*	16	16	
1.4			*Unvegetated*	11	11	
1.5	33	N 33°45.911 W 118°06.569	*Mesymbryanthemum nodiflorum*	35	30.43	
1.5			*Bromus diandrus*	30	26.09	
1.5			*Melilotus indica*	25	21.74	
1.5			*Centaurea melitensis*	5	4.35	
1.5			*Unvegetated*	20	17.39	
1.6	35	N 33°45.908 W 118°06.564	*Melilotus indica*	7	4.7	
1.6			*Bromus diandrus*	50	33.56	
1.6			*Monanthochloe littoralis*	80	53.7	
1.6			*Malva parviflorum*	10	6.71	
1.6			*Bassia hyssopifolia*	2	1.34	
1.7	35a	N 33°45.908 W 118°06.563	*Sonchus oleraceus*	10	9.09	
1.7			*Monanthochloe littoralis*	25	22.73	
1.7			*Malva parviflorum*	3	2.73	
1.7			*Bassia hyssopifolia*	3	2.73	
1.7			*Bromus diandrus*	55	50	
1.7			*Melilotus indica*	2	1.82	
1.7			*Mesymbryanthemum nodiflorum*	7	6.36	
1.7			*Unvegetated*	5	4.55	

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TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
1.8	40	N 33°45.908 W 118°06.562	*Centaurea melitensis*	12	8.76	
1.8			*Bassia hyssopifolia*	15	54.74	
1.8			*Bromus diandrus*	23	16.79	
1.8			*Melilotus indica*	10	7.3	
1.8			*Mesymbryanthemum nodiflorum*	15	10.95	
1.8			*Monanthochloe littoralis*	2	1.46	
1.8			*Unvegetated*	60	43.8	
1.9	40a	N 33°45.907 W 118°06.559	*Mesymbryanthemum nodiflorum*	46	43.81	
1.9			*Bassia hyssopifolia*	16	15.24	
1.9			*Bromus diandrus*	6	5.71	
1.9			*Hordeum vulgare*	6	5.71	
1.9			*Parapholis incurva*	6	5.71	
1.9			*Melilotus indica*	4	3.81	
1.9			*Unvegetated*	21	20	
1.10	43	N 33°45.906 W 118°06.558	*Centaurea melitensis*	12	8.76	
1.10			*Bassia hyssopifolia*	15	10.95	
1.10			*Bromus diandrus*	23	16.79	
1.10			*Melilotus indica*	10	7.3	
1.10			*Mesymbryanthemum nodiflorum*	15	10.95	
1.10			*Monanthochloe littoralis*	2	1.46	
1.10			*Unvegetated*	60	43.8	
2.1	50	N 33°45.906 W 118°06.555	*Mesymbryanthemum nodiflorum*	50	37.04	
2.1			*Bassia hyssopifolia*	15	11.11	
2.1			*Bromus diandrus*	7	5.19	
2.1			*Parapholis incurva*	10	7.41	

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TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
2.1			*Frankenia salina*	3	2.22	
2.1			*Monanthochloe littoralis*	20	14.81	
2.1			*Unvegetated*	30	22.22	
2.2	45	N 33°45.906 W 118°06.546	*Limonium californica*	7	5.15	
2.2			*Monanthochloe littoralis*	10	7.35	
2.2			*Mesymbryanthemum nodiflorum*	40	29.41	
2.2			*Parapholis incurva*	7	5.15	
2.2			*Melilotus indica*	2	1.47	
2.2			*Unvegetated*	70	51.47	
2.3	55	N 33°45.904 W 118°06.544	*Batis maritima*	50	37.04	
2.3			*Parapholis incurva*	30	22.22	
2.3			*Mesymbryanthemum nodiflorum*	15	11.11	
2.3			*Monanthochloe littoralis*	10	7.41	
2.3			*Unvegetated*	30	22.22	
2.4	55a	N 33°45.907 W 118°06.538	*Monanthochloe littoralis*	97	95.1	
2.4			*Bromus diandrus*	5	4.9	
2.5	57	N 33°45.908 W 118°06.536	*Silybum marianum*	17	12.59	
2.5			*Sonchus oleraceus*	7	5.19	
2.5			*Hordeum vulgare*	20	14.81	
2.5			*Monanthochloe littoralis*	62	45.93	
2.5			*Solanum spp.*	5	3.7	small white flowers; dark purple berries
2.5			*Bassia hyssopifolia*	1	0.74	
2.5			*Bromus diandrus*	3	2.22	
2.5			*Unvegetated*	20	14.81	

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TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
2.6	57a	N 33°45.909 W 118°06.538	*Centaurea melitensis*	3	2.8	
2.6			*Silybum marianum*	7	6.54	
2.6			*Monanthochloe littoralis*	62	57.94	
2.6			*Bassia hyssopifolia*	4	3.74	
2.6			*Bromus diandrus*	9	8.41	
2.6			*Distichlis spicata*	4	3.74	
2.6			*Hordeum vulgare*	6	5.61	
2.6			*Unvegetated*	12	11.21	
2.7	400	N 33°45.909 W 118°06.531	*Monanthochloe littoralis*	97	90.65	
2.7			*Sonchus oleraceus*	2	1.87	
2.7			*Bromus diandrus*	5	4.67	
2.7			*Parapholis incurva*	2	1.87	
2.7			*Melilotus indica*	1	0.93	
2.8	402	N 33°45.910 W 118°06.530	*Bromus diandrus*	2	1.64	
2.8			*Parapholis incurva*	25	20.49	
2.8			*Monanthochloe littoralis*	55	45.08	
2.8			*Mesymbryanthemum nodiflorum*	15	12.3	
2.8			*Unvegetated*	25	20.49	
2.9	403	N 33°45.910 W 118°06.529	*Monanthochloe littoralis*	90	63.83	
2.9			*Parapholis incurva*	20	14.18	
2.9			*Limonium californica*	5	3.55	
2.9			*Bromus diandrus*	10	7.09	
2.9			*Centaurea melitensis*	1	0.71	
2.9			*Unvegetated*	15	10.64	

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TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
2.10	404	N 33°45.911 W 118°06.528	*Mesymbryanthemum nodiflorum*	65	52	
2.10			*Melilotus indica*	5	4	
2.10			*Bromus diandrus*	15	12	
2.10			*Parapholis incurva*	5	4	
2.10			*Monanthochloe littoralis*	25	20	
2.10			*Unvegetated*	10	8	
3.1	412	N 33°45.910 W 118°06.523	*Monanthochloe littoralis*	65	43.05	
3.1			*Melilotus indica*	25	16.57	
3.1			*Mesymbryanthemum nodiflorum*	20	13.25	
3.1			*Bromus diandrus*	15	9.93	
3.1			*Hordeum vulgare*	1	0.66	
3.1			*Parapholis incurva*	5	3.31	
3.1			Unvegetated	20	13.25	
3.2	412a	N 33°45.911 W 118°06.523	*Melilotus indica*	40	22.99	
3.2			*Mesymbryanthemum nodiflorum*	20	11.49	
3.2			*Bromus diandrus*	25	14.37	
3.2			*Monanthochloe littoralis*	85	48.85	
3.2			*Sonchus oleraceus*	1	0.57	
3.2			*Unvegetated*	3	1.72	
3.3	415	N 33°45.912 W 118°06.513	*Parapholis incurva*	20	15.87	
3.3			*Mesymbryanthemum nodiflorum*	10	7.94	
3.3			*Batis maritima*	25	19.84	
3.3			*Monanthochloe littoralis*	45	35.71	
3.3			*Sonchus oleraceus*	1	0.79	

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TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
3.3			*Unvegetated*	25	19.84	
3.4	416	N 33°45.912 W 118°06.512	*Batis maritima*	5	4.1	
3.4			*Salicornia subterminalis*	20	16.39	
3.4			*Monanthochloe littoralis*	7	5.74	
3.4			*Mesymbryanthemum nodiflorum*	10	8.2	
3.4			*Unvegetated*	80	65.57	
3.5	417	N 33°45.912 W 118°06.511	*Mesymbryanthemum nodiflorum*	2	2	
3.5			*Salicornia subterminalis*	8	8	
3.5			*Batis maritima*	5	5	
3.5			Unvegetated	85	85	
3.6	419	N 33°45.912 W 118°06.505	*Monanthochloe littoralis*	90	84.11	
3.6			*Parapholis incurva*	10	9.35	
3.6			*Mesymbryanthemum nodiflorum*	3	2.8	
3.6			*Unvegetated*	4	3.74	
3.7	419a	N 33°45.912 W 118°.06.505	*Monanthochloe littoralis*	100	82.64	
3.7			*Parapholis incurva*	20	16.53	
3.7			*Sonchus oleraceus*	1	0.83	
3.8	421	N 33°45.914 W 118°06.504	*Limonium californica*	2	1.8	
3.8			*Parapholis incurva*	20	18.02	
3.8			*Bromus diandrus*	1	0.9	
3.8			*Monanthochloe littoralis*	80	72.07	
3.8			*Jaumea carnosa*	3	2.7	
3.8			*Unvegetated*	5	4.5	
3.9	421a	N 33°45.914 W 118°06.505	*Jaumea carnosa*	7	5.56	

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TRANSECT/ QUADRANT #	PICTURE	GPS LOCATION	Species Name (or description)*	Percent Cover	Corrected Percent Cover	Comments
3.9			*Monanthochloe littoralis*	97	76.98	
3.9			*Limonium californica*	7	5.56	
3.9			*Sonchus oleraceus*	5	3.97	
3.9			*Parapholis incurva*	10	7.94	
3.10	425.00	N 33°45.915 W 118°06.494	*Salicornia subterminalis*	35.00	25.55	
3.10			*Mesymbryanthemum nodiflorum*	10	7.3	
3.10			*Parapholis incurva*	15	10.95	
3.10			*Sonchus oleraceus*	2	1.46	
3.10			*Monanthochloe littoralis*	5	3.65	
3.10			*Unvegetated*	70	51.09	
4.1	429	N 33°45.917 W 118°06.489	*Bassia hyssopifolia*	60	42.55	
4.1			*Mesymbryanthemum nodiflorum*	10	7.09	
4.1			*Bromus diandrus*	7	4.96	
4.1			*Melilotus indica*	30	21.28	
4.1			*Monanthochloe littoralis*	1	0.71	
4.1			*Centaurea melitensis*	3	2.13	
4.1			*Unvegetated*	30	21.28	
4.2	431	N 33°45.917 W 118°06.489	*Mesymbryanthemum nodiflorum*	70	44.03	coyote den
4.2			*Bassia hyssopifolia*	50	31.45	
4.2			*Melilotus indica*	20	12.58	
4.2			*Salsola tragus*	5	3.14	
4.2			*Bromus diandrus*	4	2.52	
4.2			*Parapholis incurva*	2	1.26	
4.2			*Centaurea melitensis*	1	0.63	

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4.2			*Unvegetated*	7	4.4	
4.3	435	N 33°45.917 W 118°06.488	*Melilotus indica*	10	7.75	
4.3			*Bassia hyssopifolia*	35	27.13	
4.3			*Bromus diandrus*	15	11.63	
4.3			*Mesymbryanthemum nodiflorum*	60	46.51	
4.3			*Centaurea melitensis*	1	0.78	
4.3			*Unvegetated*	8	6.2	
4.4	438	N 33°45.919 W 118°06.485	*Atriplex semibaccata*	1	0.88	
4.4			*Mesymbryanthemum nodiflorum*	75	66.37	
4.4			*Bassia hyssopifolia*	20	17.7	
4.4			*Parapholis incurva*	7	6.19	
4.4			*Unvegetated*	10	8.85	
4.5	437	N 33°45.920 W 118°06.484	*Bassia hyssopifolia*	40	28.37	
4.5			*Mesymbryanthemum nodiflorum*	50	35.46	
4.5			*Melilotus indica*	25	17.73	
4.5			*Hordeum vulgare*	3	2.13	
4.5			*Bromus madritensis*	1	0.71	
4.5			*Parapholis incurva*	2	1.42	
4.5			*Unvegetated*	20	14.18	
4.6	441	N 33°45.919 W 118°06.484	*Bassia hyssopifolia*	70	44.87	
4.6			*Mesymbryanthemum nodiflorum*	30	19.23	
4.6			*Bromus diandrus*	5	3.21	
4.6			*Centaurea melitensis*	4	2.56	
4.6			*Melilotus indica*	20	12.82	

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4.6			*Parapholis incurva*	15	9.62	
4.6			*Hordeum vulgare*	1	0.64	
4.6			*Sonchus oleraceus*	1	0.64	
4.6			*Unvegetated*	10	6.41	
4.7	442	N 33°45.918 W 118°06.482	*Centaurea melitensis*	5	3.73	
4.7			*Mesymbryanthemum nodiflorum*	70	52.24	
4.7			*Melilotus indica*	25	18.66	
4.7			*Bromus diandrus*	5	3.73	
4.7			*Bassia hyssopifolia*	3	2.24	
4.7			*Unvegetated*	26	19.4	
4.8	443	N 33°45.919 W 118°06.480	*Mesymbryanthemum nodiflorum*	50	42.02	
4.8			*Melilotus indica*	30	25.21	
4.8			*Bromus diandrus*	5	4.2	
4.8			*Centaurea melitensis*	2	1.68	
4.8			*Bassia hyssopifolia*	2	1.68	
4.8			*Unvegetated*	30	25.21	
4.9	445	N 33°45.919 W 118°06.480	*Monanthochloe littoralis*	30	27.52	
4.9			*Mesymbryanthemum nodiflorum*	40	36.7	
4.9			*Bromus diandrus*	4	3.67	
4.9			*Melilotus indica*	4	3.67	

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4.9			*Centaurea melitensis*	1	0.92	
4.9			*Unvegetated*	30	27.52	
4.10	447.00	N 33°45.921 W 118°06.470	*Mesymbryanthemum nodiflorum*	40.00	38.10	
4.10			*Bassia hyssopifolia*	5	4.76	
4.10			*Melilotus indica*	40	38.1	
4.10			*Bromus diandrus*	5	4.76	
4.10			*Unvegetated*	15	14.29	

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