THIRD ANNUAL RESTORATION MONITORING REPORT

LENTZNER SPRING RESTORATION PROJECT
CONTRA COSTA COUNTY, CALIFORNIA

NOVEMBER 2011

Prepared for

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Section 1. INTRODUCTION

1.1. MONITORING SUMMARY

The Lentzner Spring wetland restoration project was completed in October 2008 as outlined in the *Lentzner Spring Restoration Management Plan* (Restoration Management Plan; ICF Jones and Stokes 2009a). The plan specifies annual monitoring methods and performance criteria by which the project's success will be evaluated.

This report presents the results of Year 3 monitoring conducted on May 10, 2011, which was carried out as detailed in the Restoration Management Plan (ICF Jones and Stokes 2009a) with some changes based on the recommendations in the 2010 monitoring report (Nomad Ecology 2010). This report provides: a summary of the restoration project; monitoring requirements and methodology; performance standards; monitoring results; and recommendations. Year 1 of monitoring was conducted by ICF Jones and Stokes (2009b).

The restoration project is currently meeting its performance criteria of 75% survival of planted species. Two of the planted species, saltgrass (*Distichlis spicata*), and Great Valley gumweed (*Grindelia camporum*) are surviving and spreading. Two of the planted species, alkali heath (*Frankenia salina*), and bulrush (*Scirpus* sp.), were not recorded within the transects in 2011. Although the performance criteria are being met, only two of the transects: 3 and 4, are showing characteristics of an alkali wetland. Transects 1 and 2 are supporting vegetation characteristic of alkali grasslands. Recommendations include continued monitoring and weed control.

1.2. RESTORATION PROJECT SUMMARY

The Letnzner Spring wetland restoration project was initiated as a component of the East Contra Costa County Habitat Conservation Plan / Natural Community Conservation Plan (HCP/NCCP) (Jones and Stokes 2006). The restoration site is located in the Plan Acquisition Zone 2, in northeast Contra Costa County, on the Lentzner parcel adjacent to Black Diamond Mines (Figure 1). This project was completed by the East Contra Costa Habitat Conservancy (Conservancy) and the East Bay Regional Park District (EBRPD) in 2008. The goal of the project was to restore 0.15 acres of alkali seasonal wetlands. This includes one large 0.13 acre area downstream (north) of the spring and west of the unnamed drainage and one smaller 0.02 acre area upstream and east of the spring. For the restoration projects, the site was cleared, grubbed, and graded to enhance hydrologic flow to support wetlands. The wetlands were planted with four species: saltgrass, alkali heath, Great Valley gumweed, and bulrush.

1.3. SETTING

The 320-acre Lentzner parcel is located in northeast Contra Costa County, approximately 5 miles south of Highway 4 in Antioch (Figure 1). It is located in the HCP/NCCP Acquisition Zone 2. On the Antioch South 7.5-minute USGS quadrangle, it lies in Township 01 North, Range 01 East. Black Diamond Mines Regional Preserve, owned and operated by the EBRPD, is adjacent to the Lentzner parcel, and the restoration site is just south of the property line between Lentzner and Black Diamond Mines. Access to the site is by unpaved roads from the Black Diamond Mines Regional Preserve office on Somersville Road or via the Stewartville Trail entrance on Frederickson Lane in Antioch. Both entrances have gates locked to vehicular traffic (ICF Jones and Stokes 2009a). The parcel lies on the boundary of the San Francisco Bay and San Joaquin Valley subregions of the California Floristic Province.

The Lentzner parcel is located in the northern half of the HCP/NCCP inventory area within the Mt. Diablo foothills. The entire parcel is designated as a high acquisition priority in the HCP/NCCP because of its proximity to surrounding open space, potential to provide habitat for covered species, and opportunities for stream and wetland restoration. Black Diamond Mines Regional Preserve is just north of the parcel, Clayton Ranch is one mile south of the property, and Roddy Ranch, a private deed-restricted open space area, is 0.5 miles to the west (ICF Jones and Stokes 2009a).

The project occurs in Oil Canyon Creek Watershed, a small tributary of Sand Creek. Sand Creek (with a sub-basin size of 9,600 acres) captures flow from the project site and drains east to Marsh Creek in Brentwood. The Marsh Creek Watershed is the second largest watershed in Contra Costa County, totaling more than 60,000 acres (ICF Jones and Stokes 2009a).

The restoration project is located on Lentzner's valley floor, and includes an unnamed spring contained in a spring-box, and a tributary to Oil Canyon Creek. The site is located directly adjacent to the confluence of the tributary and Oil Canyon Creek. The entire project site is 0.88 acres (ICF Jones and Stokes 2009a).

Figure 1. Location of the Project Site

>>> INSERT FIGURE HERE <<<

Figure 2. Transect Locations

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Section 2. MONITORING METHODS

The 2011 monitoring followed the monitoring methods and applied the performance criteria described in the Management Plan (ICF Jones and Stokes 2009a). Modifications to the monitoring methods were implemented based on the recommendations of the 2010 monitoring report, where feasible. Due to the inaccessibility of the site in the winter and early spring due poor road conditions, wetland mapping, hydrology monitoring, and erosion monitoring were not conducted. A brief description of these follows.

2.1. PERFORMANCE CRITERIA

Performance criteria for the alkali wetland are based on survivorship and health of individual plants during the three years following implementation, as listed in Table 1. After individual survivorship performance criteria are met, monitoring will measure and evaluate absolute cover of native wetland vegetation annually for two additional years (Table 1).

Table 1. Performance Standards for Restoration Plantings

PERFORMANCE PERIOD	PERFORMANCE INDICATORS	TARGET VALUE
1	% of plants surviving	At least 75% survival in Good or Fair condition
2	% of plants surviving	At least 70% survival in Good or Fair condition
3 (and subsequent years if necessary)	% of plants surviving	At least 65% survival in Good or Fair condition
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2.2. MONITORING METHODS

Nomad botanists Heath Bartosh and Chris Thayer conducted Year 3 monitoring activities on May 5, 2011. Monitoring activities are to occur during the early to mid spring, after or during the end of the rainy season.

The monitoring protocol was modified in 2011 as was recommended in the 2010 report (Nomad Ecology 2010). The quadrat size increased from 1 meter by ½ meter to 2 meters by 2 meters. In addition to plant survivorship, percent cover of every species in the quadrats was recorded. Recording the percent cover will give a better picture of success than percent survival. There are no records of the original restoration planting so the current percent survival is only an estimate based on the number of dead plants observed during the monitoring. It is likely that there were dead plants that were not visible which would cause the estimated percent survival to be higher than the true percent survival. Additionally photo-monitoring points were established at the ends of all transects to help qualify change over time.

Transects were established in 2009 during the first year of monitoring (ICF Jones and Stokes 2009a). Three of the transects were placed in the larger wetland area, and one transect was placed in the smaller wetland area (Figure 2). The transects were positioned across the alkali wetlands in order to capture the hydrologic gradient. For the larger wetland, the transects started at the boundary with the grassland, and ran down-slope toward the unnamed tributary. These transects ended at the down-slope edge of the planted area. In the smaller wetland area, the transect was placed across the center of wetland (Figure 2).The end points of each transect were permanently marked using ½-inch diameter rebar pounded into

the ground and marked with fluorescent pink marking tape. Transect end points were also recorded with a sub-meter precision GPS unit. The length of each transect was recorded, and the number of quadrats sampled on each transect was equal to 10% of the length of the transect. The quadrats were oriented across the transect at each randomly chosen start point, such that the transect bisected the quadrat into two equal sections.

Plant survivorship of the planted species and percent cover of all species was measured in each quadrat. For plant survivorship the monitor counted and visually estimated the health of each planted specimen rooted in the quadrat. The condition (vigor) of surviving plants was evaluated on the basis of leaf color and size, as well as the presence of herbivore damage, disease symptoms, insect infestation, and other indictors of health, using the following qualifiers.

- Good Condition—Most or all leaves show healthy color and size, and/or <25% of plant's aboveground growth is affected by herbivore damage, disease, insect infestation, or other indicators of poor health.
- Fair Condition—Most leaves show healthy color and size, and/or 25–75% of plant's aboveground growth is affected by herbivore damage, disease, insect infestation, or other indicators of poor health.
- Poor Condition—Few or some leaves show healthy color and size, and/or more than >75% of plant's aboveground growth is affected by herbivore damage, disease, insect infestation, or other indicators of poor health.
- Dead—All aboveground plant parts exhibit no live growth.

To obtain percent cover the monitor recorded every species in the quadrat and visually estimated their percent of cover in that quadrat.

In addition to the quadrat monitoring, a qualitative assessment of the site was also recorded. This included general observations on the status of the wetlands and the survivorship of plants outside of the quadrats.

Photographs were taken as part of the qualitative assessment of the site. Photographs of each transect are located in Appendix A.

2.3. DATA ANALYSIS

In each quadrat, the number and condition of each targeted species was recorded. Data was compiled for each quadrat and for the site as a whole. All plants were assumed to have been alive at the start of the project, and survivorship was based on 100% survival at the time of project initiation. The survivorship for the site as a whole was compared to the performance criteria in Table 1.

In each quadrat all species were recorded and their percent cover estimated. This information improves the ability to detect wetland characteristics versus upland characteristics.

Data analysis and plant survivorship calculations were limited by data collection methodology which is detailed below in Limitations.

2.4. LIMITATIONS

Based on the timing of the surveys, all plant species growing within the study area may not have been observed due to varying flowering phenologies and life forms, such as bulbs, biennials, and annuals. Other potentially dominant species within vegetation communities on site may be present during other times of the year. The present study is not floristic in nature. A floristic study not only requires every

plant observed to be identified to a level necessary to determine its regulatory status, it also necessitates a sufficient number of site visits spaced throughout the growing season within the blooming periods of all plant species, including common taxa, to ensure a complete inventory is obtained (CNPS 2001, CDFG 2009, USFWS 2000). Additionally, certain plant species, especially annuals, may be absent in some years due to annual variations in temperature and rainfall, which influence germination and plant phenology. Colonization of new populations within an area may also occur from year to year.

Data analysis was limited by the assumption that dead plants would be visible and recorded, and accounted for in plant survivorship calculations. Realistically, dead plants often dry up and disappear and are not countable. Therefore plant survival calculations may be skewed toward higher plant survivorship because dead plants were not counted. The correct way to calculate percent survival is to have detailed planting plans or As-Built Plans that show the exact locations of plants, so that dead and missing plants are accounted for. Another option is to have planting flags in place, which would demonstrate where plants are missing.

Another limitation is the placement of transects may not capture plant mortality. In the 2009 monitoring report, it is reported that no bulrush survived, however the percent survival is calculated to be 94% based on data collected (ICF Jones and Stokes 2009a). No dead bulrush were recorded in the sampling quadrats placed along the transects and so this species' mortality was not accounted for in percent survivorship calculations.

Section 3. RESULTS AND DISCUSSION

3.1. QUADRAT SAMPLING

The results from the third year of monitoring survivorship are presented in Table 2. The site as a whole had 92% survival based on data totaled from all quadrats. This is a 3% decrease from 95% survival calculated during Year 2 monitoring. Though there was a slight decrease between 2010 and 2011 this number does not represent the overall survivorship for the restoration project due to the lack of original planting data as discussed in above sections.

Table 2. Percent Survival by Transect

Transect Number	Quadrat Number	Location along Transect (feet)	Species[1]	Number of Plants of each Condition			
				Good	Fair	Poor	Dead
1	Q1	2	DISP	-	-	-	1
			GRCA	43	6	4	-
	Q2	11	GRCA	4	3	2	-
2	Q3	8	GRCA	31	-	-	-
	Q4	22	DISP	8	-	-	-
			GRCA	3	-	-	-
3	Q5	18	DISP	1	-	-	-
			GRCA	3	1	-	-
	Q6	29	DISP	10	1	-	-
			GRCA	2	1	-	-
	Q7	43	DISP	20	-	-	-
	Q8	58	DISP	25	-	-	-
4	Q9	5	DISP	2	4	7	-
			GRCA	4	-	-	-
Totals				156	16	13	1
Average Percent Survival in Good or Fair Condition							**92%**

[1]DISP = saltgrass (*Distichlis spicata*)
GRCA = Great Valley gumweed (*Grindelia camporum*)

The most common species in the sample quadrats was Great Valley gumweed. There were 111 Great Valley gum weed individuals counted, with 94 (85%) in good condition, 11 (10%) in fair condition, and 6 (0.05%) in poor condition. There were a total of 92 saltgrass individuals in the quadrats, with 68 (74%) in good condition, 9 (10%) in fair condition, 14 (15%) in poor condition, and 1 (1%) dead. Great Valley gumweed increased from 2 individuals in 2010 to 107 individuals in 2011. Saltgrass increased from 31 individuals in 2010 to 79 individuals in 2011. Alkali heath decreased from 6 individuals in 2010 to 0 in 2011. There was no bulrush was not present in either year.

The general increase of saltgrass and Great Valley gumweed in the plots was not expressed within all transects. Some transects are trending towards alkali wetland with an increase in saltgrass, while others are trending toward alkali grassland with an increase in Great Valley gumweed. Great Valley gumweed has a wetland indicator status of FACU (facultative upland), meaning that it "usually occurs in non-wetlands". The greatest increase of Great Valley gumweed was seen in transects 1 and 2, indicating an alkali grassland environment. Saltgrass has a wetland indicator status of FACW (facultative wetland), meaning it "usually occurs in wetlands". Though it is not uncommon in the Byron area for saltgrass to grow in upland sites its increase in transects 3 and 4 in addition to high cover of OBL and other FACW species such as dwarf peppergrass (*Lepidium latipes* var. *latipes*) and meadow barley (*Hordeum brachyantherum* var. *brachyantherum*) indicates an alkali wetland environment. Table 3 shows percent cover of all species recorded in the plots along the transects. Table 4 shows the percent cover by wetland indicator status for each of the transects. The wetland indicators used are OBL (obligate wetland), FACW (facultative wetland), FAC (facultative), and FACU (facultative upland).

Table 3. Percent Cover of Species

Species	Transect 1		Transect 2		Transect 3				Transect 4
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Bromus hordeaceus*	1	4	15	5	<1	-	-	-	-
*Bromus diandrus**	-	-	-	-	<1	-	-	-	-
*Capsella bursa-pastoris**	-	-	-	<1	<1	-	-	-	-
*Carduus pycnocephalus**	-	-	2	<1		-	-	-	-
*Centaurea solstitialis**	-	-	-	-	1	-	-	-	<1
*Convolvulus arvensis**	-	-	-	22	-	-	-	-	-
Distichlis spicata	-	-	-	15	1	15	8	15	2
Grindelia camporum	-	0.5	5	4	20	0.5	-	-	5
*Hordeum marinum subsp. gussoneanum**	<1	<1	-	-	-	2	1	1	-
*Hordeum murinum subsp. leporinum**	2	-	10	2	2	-	-	-	-
Hordeum brachyantherum var. *brachyantherum*	-	-	-	-	2	10	3	1	<1
Juncus bufonius var. bufonius	-	<1	-	<1	-	-	-	-	<1
Lepidium latipes	-		-	-	-	4	2	3	-
Lepidium nitidum	-	1	-	-	-	2	<1	-	-
*Festuca perennis**	4	20	30	3	10	<1	<1	<1	<1
*Medicago polymorpha**	-	<1	-	-	-	-	-	-	-
*Polygonum arenastrum**	-	-	-	-	<1	1	1	-	<1
*Polypogon monspeliensis**	-	-	-	2	-	<1	-	-	-
Spergularia salina	-	-	-	-	-	-	<1	2	-
Stipa pulchra	-	-	-	-	-	-	-	-	-
*Trifolium hirtum**	<1	2	-	-	-	-	-	-	-
*Xanthium strumarium**	-	<1	-	-	-	-	-	-	-
Total Cover by Quadrat	**7.4**	**28.3**	**62**	**53.6**	**36.8**	**34.9**	**15.6**	**22**	**8**
Average Cover by Transect	**17.85**		**57.8**		**27.33**				**8**

* Indicates a species with an origin other than that of California
Cover values of <1 are treated as 0.2 for calculation purposes

Table 4. Percent Cover by Wetland Indicator Status

Wetland Indicator Status	Transect 1	Transect 2	Transect 3	Transect 4
OBL	0%	0%	11%	0%
FACW	2%	20%	53%	35%
FAC	81%	43%	15%	6%
FACU	17%	37%	20%	0%
Wetland Trend	**Non-Wetland**	**Non-Wetland**	**Wetland**	**Wetland**

3.2. Qualitative Assessment

Of the planted species there was an overall increase in saltgrass and Great Valley gumweed and an absence of alkali heath and bulrush on site. The health of the saltgrass and Great Valley gumweed was good with most plants showing vigorous growth. The relatively high abundance of meadow barley and dwarf peppergrass recorded within transects 3 and 4 indicates that these areas have alkali wetland characteristics.

Outside of the restoration area, the vegetation is weedy and dominated by Italian reygrass (*Festuca perenne*[*]) and other non-native grass species. However, based on Thunder Mountain maintenance logs Great Valley gumweed is also doing well in the upland areas of the restoration site. This suggests that continued weeding and site maintenance is necessary to allow Great Valley gumweed and other native species to further establish on site. Once a high cover of saltgrass is achieved, it may exclude non-native grasses from dominating the site.

No bulrush individuals planted on the site were alive during the 2009, 2010, or 2011 monitoring. The data collection methodology and performance standard calculations do not capture the bulrush mortality, which suggests the methodology is flawed. This is discussed in Section 2.4 Limitations

Establishing alkali wetland was one of the main objectives of the restoration project. It appears at this time the objective is being achieved in the areas represented by transect 3 and 4 only. These results differ from the results found in 2010 where no transect data indicated alkali wetland characteristics. Therefore we expect that the areas that include transects 3 and 4 will continue to develop into wetlands. Transects 1 and 2 are not exhibiting wetland characteristics based on the current monitoring data.

Within transects 3 and 4 there was indication that water sheet flowed across the site but did not pond. These indicators include drift lines and matted vegetation. Within transects 1 and 2 the slope is steep and it is presumed that runoff is rapid. These observations in the field further suggest that the topography on site is too steep to support wetlands at this location that hold water for a duration characteristic of even a seasonal wetland.

[*] Denotes a non-native species that has an origin other than that of California

Section 4. RECOMMENDATIONS

Over the past two years results of monitoring have indicated that the Lentzner restoration is progressing toward becoming wetlands as is evidenced by the transition of the areas within transect 3 and 4 to alkali wetland. Although there is no evidence that the areas within transects 1 and 2 are currently wetland in character continued monitoring during years 4 and 5 will yield more data revealing whether this area will transition to wetland or not. In light of the implementation of the 2010 recommendations to the monitoring effort the only recommendations resulting from 2011 monitoring relate to site maintenance.

4.1. SITE MAINTENANCE

As detailed above, non-native weedy species are present in abundance outside of the project area. In addition to weed species within the restoration exclosure, thistles such as milk thistle (*Silybum marianum**) and Italian thistle (*Carduus pycnocephalus**) are abundant in the area to the west of the exclosure. These weeds should be controlled so they do not become established within the restoration area. The site should continue to be maintained during spring and summer months for the third year on a bi-monthly basis. Maintenance should include removal of non-native invasive species, including annual grasses, in the restoration area.

Section 5. REFERENCES

California Department of Fish and Game (CDFG). 2009. *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural communities.* Wildlife and Habitat Data Analysis Branch

California Native Plant Society (CNPS). 2001. *Inventory of Rare and Endangered Plants of California.* 6th Edition. Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. Sacramento, California. 388 pp.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual,* Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. January. 100 pp. plus appendices.

ICF Jones and Stokes 2009a. *Lentzner Spring Restoration Management Plan*. December 2009.

_____2009b. *Lentzner Spring Restoration Monitoring Report, Year 1, 2009*. December

Jones and Stokes. 2006. *East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan.* October. (J&S 01478.01.) San Jose, CA.

Nomad Ecology. 2010. *Second Annual Restoration Monitoring Report, Lentzner Spring Restoration Project, Contra Costa County, California*. October.

Reed, P.B. 1988 *National List of Plant Species that Occur in Wetlands; California (Region 0).* National Wetlands Inventory, U.S. Fish and Wildlife Service. Biological Report 88 (26.10).

U.S. Army Corps of Engineers. 2006a. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. ed. J.S. Wakely, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-06-16. MS: U.S. Army Engineer Research and Development Center.

U.S. Fish and Wildlife Service. 2000. *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants*. Ventura Fish & Wildlife Office. January.

APPENDIX A MONITORING PHOTOGRAPHS

Photo 1. Transect 1. Facing northeast. May 13, 2011.

Photo 2. Transect 1. Facing southwest. May 13, 2011.

Photo 3. Transect 2. May 13, 2011.

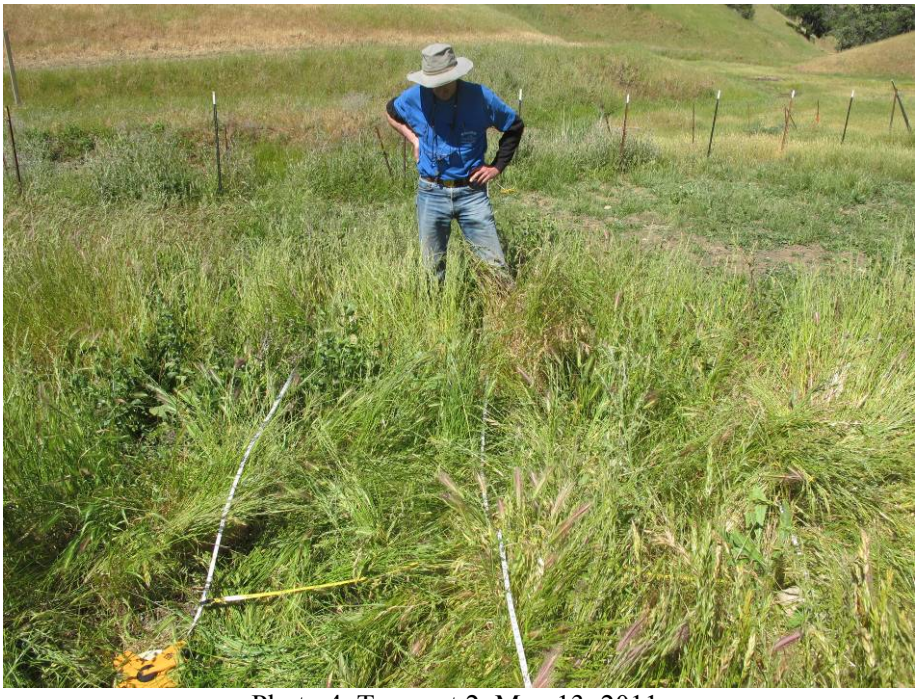

Photo 4. Transect 2. May 13, 2011.

Photo 5. Transect 3. May 13, 2011.

Photo 6. Transect 3. May 13, 2011.

Photo 7. Transect 4. May 13, 2011.

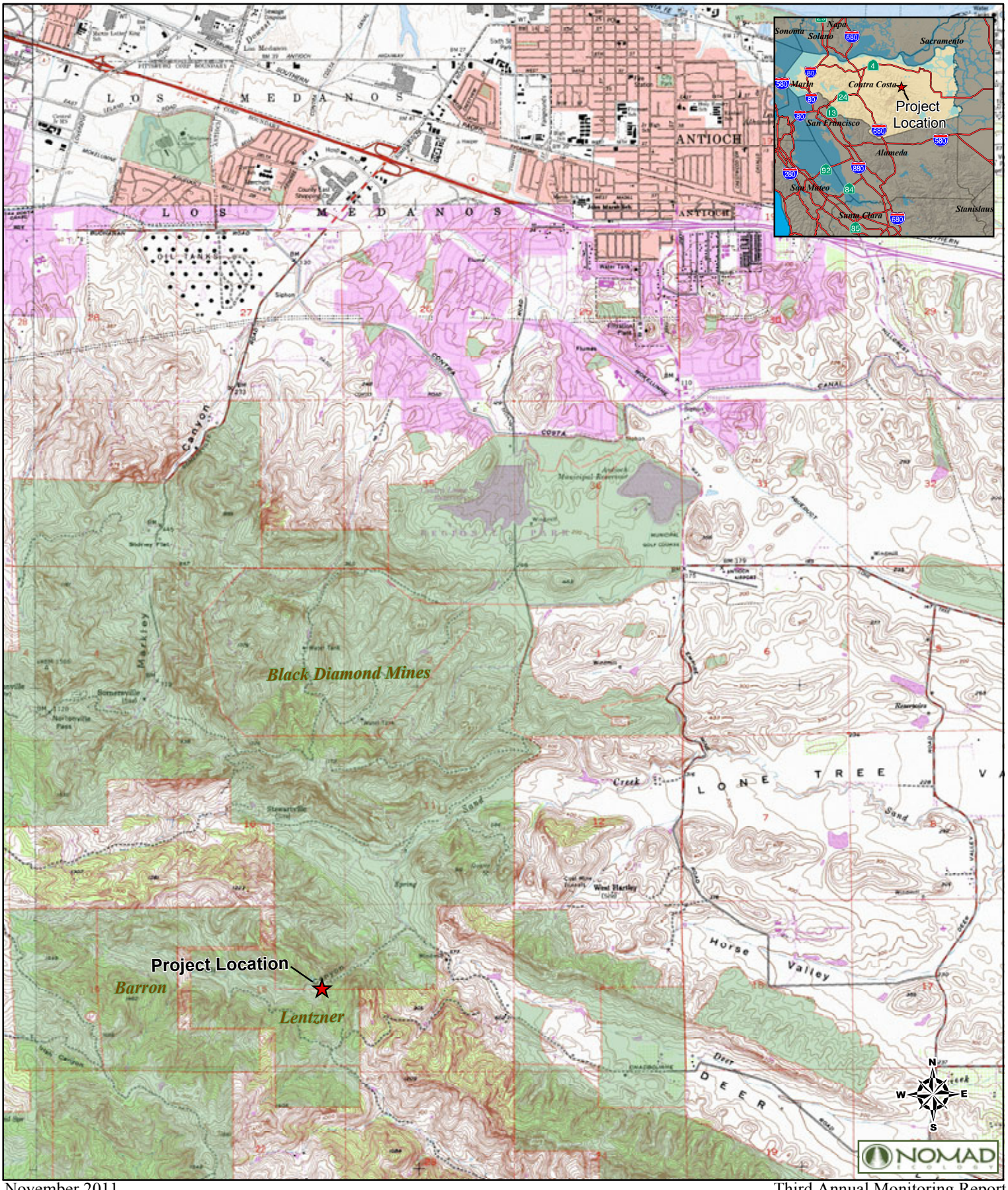

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Figure 1
Location of the Project
Lentzner Springs Restoration Project
Contra Costa County Department of Conservation and Development

Sources: USGS, California Spatial Information Library, Contra Costa County, Bay Area Open Space Council. Projection: State Plane NAD 83 Feet.

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2.2. MONITORING METHODS

Nomad botanists Heath Bartosh and Chris Thayer conducted Year 3 monitoring activities on May 5, 2011. Monitoring activities are to occur during the early to mid spring, after or during the end of the rainy season.

The monitoring protocol was modified in 2011 as was recommended in the 2010 report (Nomad Ecology 2010). The quadrat size increased from 1 meter by ½ meter to 2 meters by 2 meters. In addition to plant survivorship, percent cover of every species in the quadrats was recorded. Recording the percent cover will give a better picture of success than percent survival. There are no records of the original restoration planting so the current percent survival is only an estimate based on the number of dead plants observed during the monitoring. It is likely that there were dead plants that were not visible which would cause the estimated percent survival to be higher than the true percent survival. Additionally photo-monitoring points were established at the ends of all transects to help qualify change over time.

Transects were established in 2009 during the first year of monitoring (ICF Jones and Stokes 2009a). Three of the transects were placed in the larger wetland area, and one transect was placed in the smaller wetland area (Figure 2). The transects were positioned across the alkali wetlands in order to capture the hydrologic gradient. For the larger wetland, the transects started at the boundary with the grassland, and ran down-slope toward the unnamed tributary. These transects ended at the down-slope edge of the planted area. In the smaller wetland area, the transect was placed across the center of wetland (Figure 2).The end points of each transect were permanently marked using ½-inch diameter rebar pounded into

the ground and marked with fluorescent pink marking tape. Transect end points were also recorded with a sub-meter precision GPS unit. The length of each transect was recorded, and the number of quadrats sampled on each transect was equal to 10% of the length of the transect. The quadrats were oriented across the transect at each randomly chosen start point, such that the transect bisected the quadrat into two equal sections.

Plant survivorship of the planted species and percent cover of all species was measured in each quadrat. For plant survivorship the monitor counted and visually estimated the health of each planted specimen rooted in the quadrat. The condition (vigor) of surviving plants was evaluated on the basis of leaf color and size, as well as the presence of herbivore damage, disease symptoms, insect infestation, and other indictors of health, using the following qualifiers.

- Good Condition—Most or all leaves show healthy color and size, and/or <25% of plant's aboveground growth is affected by herbivore damage, disease, insect infestation, or other indicators of poor health.
- Fair Condition—Most leaves show healthy color and size, and/or 25–75% of plant's aboveground growth is affected by herbivore damage, disease, insect infestation, or other indicators of poor health.
- Poor Condition—Few or some leaves show healthy color and size, and/or more than >75% of plant's aboveground growth is affected by herbivore damage, disease, insect infestation, or other indicators of poor health.
- Dead—All aboveground plant parts exhibit no live growth.

To obtain percent cover the monitor recorded every species in the quadrat and visually estimated their percent of cover in that quadrat.

In addition to the quadrat monitoring, a qualitative assessment of the site was also recorded. This included general observations on the status of the wetlands and the survivorship of plants outside of the quadrats.

Photographs were taken as part of the qualitative assessment of the site. Photographs of each transect are located in Appendix A.

2.3. DATA ANALYSIS

In each quadrat, the number and condition of each targeted species was recorded. Data was compiled for each quadrat and for the site as a whole. All plants were assumed to have been alive at the start of the project, and survivorship was based on 100% survival at the time of project initiation. The survivorship for the site as a whole was compared to the performance criteria in Table 1.

In each quadrat all species were recorded and their percent cover estimated. This information improves the ability to detect wetland characteristics versus upland characteristics.

Data analysis and plant survivorship calculations were limited by data collection methodology which is detailed below in Limitations.

2.4. LIMITATIONS

Based on the timing of the surveys, all plant species growing within the study area may not have been observed due to varying flowering phenologies and life forms, such as bulbs, biennials, and annuals. Other potentially dominant species within vegetation communities on site may be present during other times of the year. The present study is not floristic in nature. A floristic study not only requires every

plant observed to be identified to a level necessary to determine its regulatory status, it also necessitates a sufficient number of site visits spaced throughout the growing season within the blooming periods of all plant species, including common taxa, to ensure a complete inventory is obtained (CNPS 2001, CDFG 2009, USFWS 2000). Additionally, certain plant species, especially annuals, may be absent in some years due to annual variations in temperature and rainfall, which influence germination and plant phenology. Colonization of new populations within an area may also occur from year to year.

Data analysis was limited by the assumption that dead plants would be visible and recorded, and accounted for in plant survivorship calculations. Realistically, dead plants often dry up and disappear and are not countable. Therefore plant survival calculations may be skewed toward higher plant survivorship because dead plants were not counted. The correct way to calculate percent survival is to have detailed planting plans or As-Built Plans that show the exact locations of plants, so that dead and missing plants are accounted for. Another option is to have planting flags in place, which would demonstrate where plants are missing.

Another limitation is the placement of transects may not capture plant mortality. In the 2009 monitoring report, it is reported that no bulrush survived, however the percent survival is calculated to be 94% based on data collected (ICF Jones and Stokes 2009a). No dead bulrush were recorded in the sampling quadrats placed along the transects and so this species' mortality was not accounted for in percent survivorship calculations.

Section 3. RESULTS AND DISCUSSION

3.1. QUADRAT SAMPLING

The results from the third year of monitoring survivorship are presented in Table 2. The site as a whole had 92% survival based on data totaled from all quadrats. This is a 3% decrease from 95% survival calculated during Year 2 monitoring. Though there was a slight decrease between 2010 and 2011 this number does not represent the overall survivorship for the restoration project due to the lack of original planting data as discussed in above sections.

Table 2. Percent Survival by Transect

Transect Number	Quadrat Number	Location along Transect (feet)	Species[1]	Number of Plants of each Condition			
				Good	Fair	Poor	Dead
1	Q1	2	DISP	-	-	-	1
			GRCA	43	6	4	-
	Q2	11	GRCA	4	3	2	-
2	Q3	8	GRCA	31	-	-	-
	Q4	22	DISP	8	-	-	-
			GRCA	3	-	-	-
3	Q5	18	DISP	1	-	-	-
			GRCA	3	1	-	-
	Q6	29	DISP	10	1	-	-
			GRCA	2	1	-	-
	Q7	43	DISP	20	-	-	-
	Q8	58	DISP	25	-	-	-
4	Q9	5	DISP	2	4	7	-
			GRCA	4	-	-	-
Totals				156	16	13	1
Average Percent Survival in Good or Fair Condition							**92%**

[1]DISP = saltgrass (*Distichlis spicata*)
GRCA = Great Valley gumweed (*Grindelia camporum*)

The most common species in the sample quadrats was Great Valley gumweed. There were 111 Great Valley gum weed individuals counted, with 94 (85%) in good condition, 11 (10%) in fair condition, and 6 (0.05%) in poor condition. There were a total of 92 saltgrass individuals in the quadrats, with 68 (74%) in good condition, 9 (10%) in fair condition, 14 (15%) in poor condition, and 1 (1%) dead. Great Valley gumweed increased from 2 individuals in 2010 to 107 individuals in 2011. Saltgrass increased from 31 individuals in 2010 to 79 individuals in 2011. Alkali heath decreased from 6 individuals in 2010 to 0 in 2011. There was no bulrush was not present in either year.

The general increase of saltgrass and Great Valley gumweed in the plots was not expressed within all transects. Some transects are trending towards alkali wetland with an increase in saltgrass, while others are trending toward alkali grassland with an increase in Great Valley gumweed. Great Valley gumweed has a wetland indicator status of FACU (facultative upland), meaning that it "usually occurs in non-wetlands". The greatest increase of Great Valley gumweed was seen in transects 1 and 2, indicating an alkali grassland environment. Saltgrass has a wetland indicator status of FACW (facultative wetland), meaning it "usually occurs in wetlands". Though it is not uncommon in the Byron area for saltgrass to grow in upland sites its increase in transects 3 and 4 in addition to high cover of OBL and other FACW species such as dwarf peppergrass (*Lepidium latipes* var. *latipes*) and meadow barley (*Hordeum brachyantherum* var. *brachyantherum*) indicates an alkali wetland environment. Table 3 shows percent cover of all species recorded in the plots along the transects. Table 4 shows the percent cover by wetland indicator status for each of the transects. The wetland indicators used are OBL (obligate wetland), FACW (facultative wetland), FAC (facultative), and FACU (facultative upland).

Table 3. Percent Cover of Species

Species	Transect 1		Transect 2		Transect 3				Transect 4
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Bromus hordeaceus*	1	4	15	5	<1	-	-	-	-
*Bromus diandrus**	-	-	-	-	<1	-	-	-	-
*Capsella bursa-pastoris**	-	-	-	<1	<1	-	-	-	-
*Carduus pycnocephalus**	-	-	2	<1		-	-	-	-
*Centaurea solstitialis**	-	-	-	-	1	-	-	-	<1
*Convolvulus arvensis**	-	-	-	22	-	-	-	-	-
Distichlis spicata	-	-	-	15	1	15	8	15	2
Grindelia camporum	-	0.5	5	4	20	0.5	-	-	5
*Hordeum marinum subsp. gussoneanum**	<1	<1	-	-	-	2	1	1	-
*Hordeum murinum subsp. leporinum**	2	-	10	2	2	-	-	-	-
Hordeum brachyantherum var. *brachyantherum*	-	-	-	-	2	10	3	1	<1
Juncus bufonius var. bufonius	-	<1	-	<1	-	-	-	-	<1
Lepidium latipes	-		-	-	-	4	2	3	-
Lepidium nitidum	-	1	-	-	-	2	<1	-	-
*Festuca perennis**	4	20	30	3	10	<1	<1	<1	<1
*Medicago polymorpha**	-	<1	-	-	-	-	-	-	-
*Polygonum arenastrum**	-	-	-	-	<1	1	1	-	<1
*Polypogon monspeliensis**	-	-	-	2	-	<1	-	-	-
Spergularia salina	-	-	-	-	-	-	<1	2	-
Stipa pulchra	-	-	-	-	-	-	-	-	-
*Trifolium hirtum**	<1	2	-	-	-	-	-	-	-
*Xanthium strumarium**	-	<1	-	-	-	-	-	-	-
Total Cover by Quadrat	**7.4**	**28.3**	**62**	**53.6**	**36.8**	**34.9**	**15.6**	**22**	**8**
Average Cover by Transect	**17.85**		**57.8**		**27.33**				**8**

* Indicates a species with an origin other than that of California
Cover values of <1 are treated as 0.2 for calculation purposes

Table 4. Percent Cover by Wetland Indicator Status

Wetland Indicator Status	Transect 1	Transect 2	Transect 3	Transect 4
OBL	0%	0%	11%	0%
FACW	2%	20%	53%	35%
FAC	81%	43%	15%	6%
FACU	17%	37%	20%	0%
Wetland Trend	**Non-Wetland**	**Non-Wetland**	**Wetland**	**Wetland**

3.2. Qualitative Assessment

Of the planted species there was an overall increase in saltgrass and Great Valley gumweed and an absence of alkali heath and bulrush on site. The health of the saltgrass and Great Valley gumweed was good with most plants showing vigorous growth. The relatively high abundance of meadow barley and dwarf peppergrass recorded within transects 3 and 4 indicates that these areas have alkali wetland characteristics.

Outside of the restoration area, the vegetation is weedy and dominated by Italian reygrass (*Festuca perenne*[*]) and other non-native grass species. However, based on Thunder Mountain maintenance logs Great Valley gumweed is also doing well in the upland areas of the restoration site. This suggests that continued weeding and site maintenance is necessary to allow Great Valley gumweed and other native species to further establish on site. Once a high cover of saltgrass is achieved, it may exclude non-native grasses from dominating the site.

No bulrush individuals planted on the site were alive during the 2009, 2010, or 2011 monitoring. The data collection methodology and performance standard calculations do not capture the bulrush mortality, which suggests the methodology is flawed. This is discussed in Section 2.4 Limitations

Establishing alkali wetland was one of the main objectives of the restoration project. It appears at this time the objective is being achieved in the areas represented by transect 3 and 4 only. These results differ from the results found in 2010 where no transect data indicated alkali wetland characteristics. Therefore we expect that the areas that include transects 3 and 4 will continue to develop into wetlands. Transects 1 and 2 are not exhibiting wetland characteristics based on the current monitoring data.

Within transects 3 and 4 there was indication that water sheet flowed across the site but did not pond. These indicators include drift lines and matted vegetation. Within transects 1 and 2 the slope is steep and it is presumed that runoff is rapid. These observations in the field further suggest that the topography on site is too steep to support wetlands at this location that hold water for a duration characteristic of even a seasonal wetland.

[*] Denotes a non-native species that has an origin other than that of California

Section 4. RECOMMENDATIONS

Over the past two years results of monitoring have indicated that the Lentzner restoration is progressing toward becoming wetlands as is evidenced by the transition of the areas within transect 3 and 4 to alkali wetland. Although there is no evidence that the areas within transects 1 and 2 are currently wetland in character continued monitoring during years 4 and 5 will yield more data revealing whether this area will transition to wetland or not. In light of the implementation of the 2010 recommendations to the monitoring effort the only recommendations resulting from 2011 monitoring relate to site maintenance.

4.1. SITE MAINTENANCE

As detailed above, non-native weedy species are present in abundance outside of the project area. In addition to weed species within the restoration exclosure, thistles such as milk thistle (*Silybum marianum**) and Italian thistle (*Carduus pycnocephalus**) are abundant in the area to the west of the exclosure. These weeds should be controlled so they do not become established within the restoration area. The site should continue to be maintained during spring and summer months for the third year on a bi-monthly basis. Maintenance should include removal of non-native invasive species, including annual grasses, in the restoration area.

Section 5. REFERENCES

California Department of Fish and Game (CDFG). 2009. *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural communities.* Wildlife and Habitat Data Analysis Branch

California Native Plant Society (CNPS). 2001. *Inventory of Rare and Endangered Plants of California.* 6th Edition. Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. Sacramento, California. 388 pp.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual,* Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. January. 100 pp. plus appendices.

ICF Jones and Stokes 2009a. *Lentzner Spring Restoration Management Plan*. December 2009.

_____2009b. *Lentzner Spring Restoration Monitoring Report, Year 1, 2009*. December

Jones and Stokes. 2006. *East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan.* October. (J&S 01478.01.) San Jose, CA.

Nomad Ecology. 2010. *Second Annual Restoration Monitoring Report, Lentzner Spring Restoration Project, Contra Costa County, California*. October.

Reed, P.B. 1988 *National List of Plant Species that Occur in Wetlands; California (Region 0).* National Wetlands Inventory, U.S. Fish and Wildlife Service. Biological Report 88 (26.10).

U.S. Army Corps of Engineers. 2006a. Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. ed. J.S. Wakely, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-06-16. MS: U.S. Army Engineer Research and Development Center.

U.S. Fish and Wildlife Service. 2000. *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants*. Ventura Fish & Wildlife Office. January.

APPENDIX A MONITORING PHOTOGRAPHS

Photo 1. Transect 1. Facing northeast. May 13, 2011.

Photo 2. Transect 1. Facing southwest. May 13, 2011.

Photo 3. Transect 2. May 13, 2011.

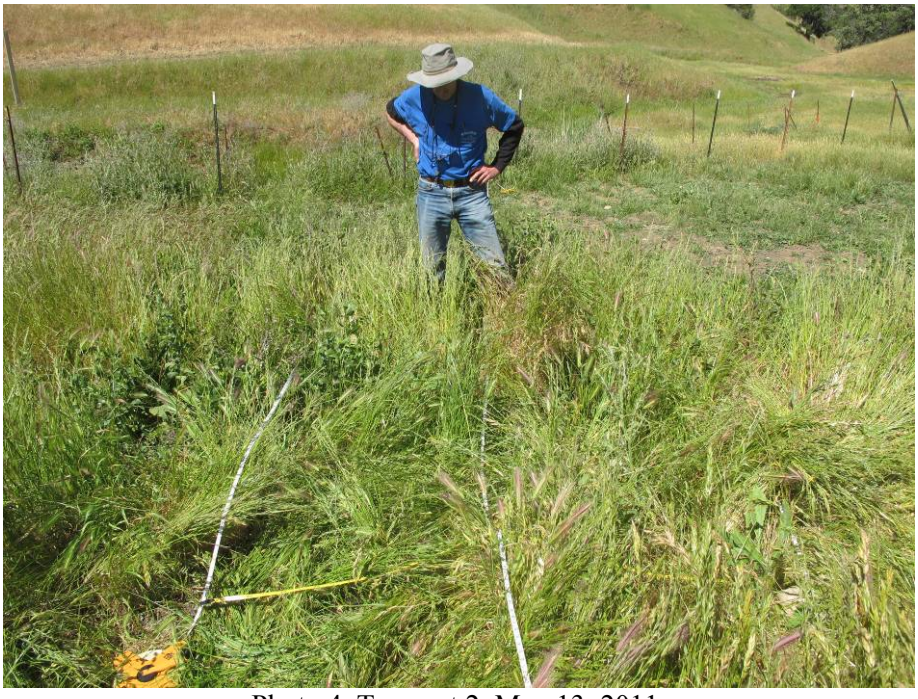
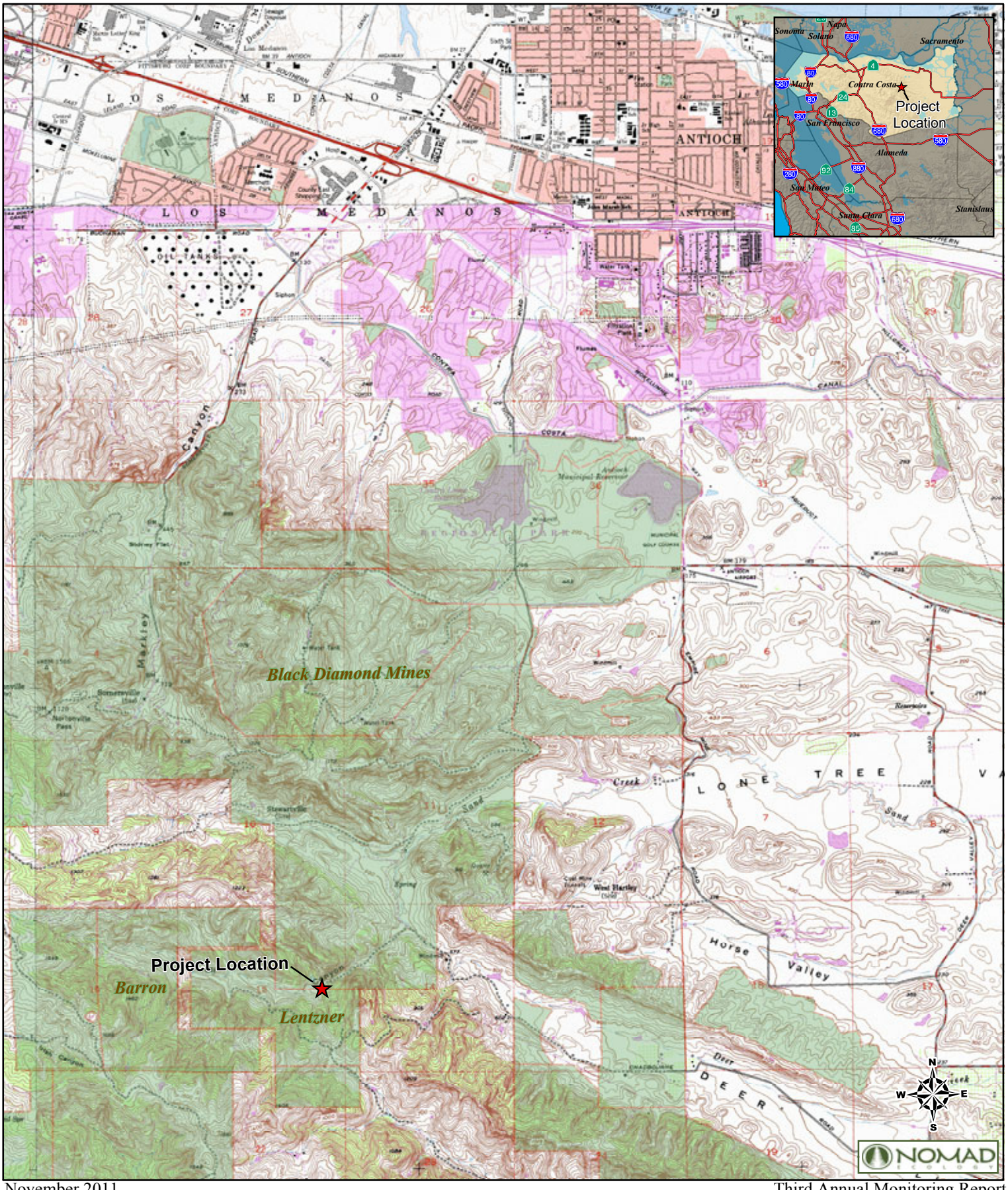


Photo 4. Transect 2. May 13, 2011.

Photo 5. Transect 3. May 13, 2011.

Photo 6. Transect 3. May 13, 2011.

Photo 7. Transect 4. May 13, 2011.



November 2011 Third Annual Monitoring Report

Figure 1
Location of the Project
Lentzner Springs Restoration Project
Contra Costa County Department of Conservation and Development

Sources: USGS, California Spatial Information Library, Contra Costa County, Bay Area Open Space Council. Projection: State Plane NAD 83 Feet.

Contra Costa County, California

November 2011

Legend

- Transect Start and End Locations*
- Transect Location and Number

*S=Transect Start. E=Transect End.

1:600

0 25 50

Feet

Figure 2

Transect Locations

Lentzner Springs Restoration Project

Contra Costa County Department of Conservation and Development

Aerial photography (2009) provided by Contra Costa County Department of Information Technology. Transect locations as recorded during June 2010 site visit. Projection:NAD 83 SP CA Zone III.