FINAL 2016 ANNUAL BIOLOGICAL MONITORING REPORT, FORT ORD DUNES STATE PARK, FORMER FORT ORD, CALIFORNIA

Prepared for:

U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Prepared by:
Bart Kowalski
Chenega Support Services

November 2016

This page was intentionally left blank.

FINAL 2016 ANNUAL BIOLOGICAL MONITORING REPORT, FORT ORD DUNES STATE PARK, FORMER FORT ORD, CALIFORNIA

Prepared for:

U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Prepared by:
Bart Kowalski
Chenega Support Services

November 2016

This page was intentionally left blank.

TABLE OF CONTENTS

Section **Page**

LIST OF FIGURES

This page was intentionally left blank.

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

CDFW	California Department of Fish and Wildlife
FODSP	Fort Ord Dunes State Park
ft^2	square feet
GIS	geographic information system
GPS	global positioning system
GWETS	groundwater extraction and treatment system
HGL	HydroGeoLogic, Inc.
HMP	Habitat Management Plan
OU	operable unit
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

This page was intentionally left blank.

FINAL 2016 ANNUAL BIOLOGICAL MONITORING REPORT, FORT ORD DUNES STATE PARK, FORMER FORT ORD, CALIFORNIA

1.0 INTRODUCTION

This report describes the methods and results for the 2nd year follow up monitoring of rare plants after the destruction of 21 wells in Operable Unit 2/12 (OU 2/12), as well as results for the study of survivorship of seacliff buckwheat (*Eriogonum parvifolium*) plants in Site 3 restoration area located in Fort Ord Dunes State Park (FODSP), former Fort Ord, California.

1.1 Well Destruction

The 21 wells destroyed at FODSP were a subset of wells that were no longer needed for collection of groundwater chemical data and/or water level data as part of the groundwater remediation activities at OU 2/12 (Figure 1). The Army obtained concurrence from the U.S. Fish and Wildlife Service (USFWS) that the removal of 21 wells on State Parks property was not likely to adversely affect listed species if specific avoidance and minimization measures were implemented (USFWS 2014). The well destruction activities are described in the HGL report (HGL 2014). In accordance with the conservation measures outlined in the Programmatic Biological Opinion (USFWS 2015) the Army will conduct three years of follow-up monitoring for federally listed species Monterey spineflower (*Chorizanthe p. pungens*) at the locations of destroyed wells to assess the impact of the activity. This report covers the second year of follow up monitoring for Monterey spineflower at FODSP.

1.2 Buckwheat Survivorship

Following lead cleanup activities at Site 3, two restoration sites were identified within coastal dune scrub habitat for habitat restoration to demonstrate that this plant community can be self-sustaining within non-remediated areas with no deleterious effects to native dune vegetation from residual metals in soil (Shaw 2008). The sites were planted with native species, including Seacliff buckwheat (*Eriogonum parvifolium*) - a host plant to the endangered Smith's blue butterfly (*Euphilotes enoptes smithi),* to determine whether healthy dune vegetation can be reintroduced in non-remediated areas. The restoration sites were located in the so called 'blue zones' which were identified as having 1-10 percent ammunition cover, and had no soil remediation because the average lead concentration was below the cleanup level deemed protective of human health (Army 1997a) and did not pose unacceptable risk to ecological receptors (Army 2005) in those areas. The corresponding reference sites were located in the remediated areas (Shaw 2008). Beginning in 2010, annual monitoring was conducted at these sites to measure plant health and habitat characteristics (State Parks 2010, 2011, 2012, 2013, 2014). After 5 years of monitoring, all of the success criteria outlined in the Site 3 Habitat

Restoration and Monitoring Plan (Shaw 2008) have been met, except for buckwheat planting survivorship and the difference in the number of leaves and peduncle lengths between the restoration and the reference sites. These differences may likely have been due to the ongoing drought and high level of herbivory (State Parks 2014). California Department of Fish and Wildlife (CDFW) expressed concern about the unexplained die-off of the seacliff buckwheat, and the Army decided to conduct additional monitoring of buckwheat plants to determine if there are differences between buckwheat survivorship in non-remediated and reference areas that could be attributed to remaining metal in the soil. This report presents one year survivorship results of that monitoring.

2.0 SITE DESCRIPTION

Fort Ord was established in 1917 as a military training base for infantry troops. In January 1991, the U.S. Secretary of Defense announced the closure of the base. In September 2006, portions of the property were transferred to California Department of Parks and Recreation, and the FODSP was opened to the public in February 2009.

The former Fort Ord is located in the northwestern part of Monterey County, California, on the boundary of Monterey Bay, approximately 80 miles south of San Francisco. FODSP is located along the coast, west of California State Highway 1, between the cities of Marina and Seaside. FODSP includes approximately 990 acres of parkland, including 4 miles of ocean beach. FODSP is characterized by coastal dunes and dune habitat with extensive areas dominated by ice plant (*Carpobrotus* species). The area's maritime climate is characterized by cool, overcast, foggy summers, and cool rainy winters, with the warmest days generally occurring in late summer and early fall.

Several federally protected species are known or suspected to be present within the FODSP. These include the federally threatened Monterey spineflower, and the endangered Smith's blue butterfly. Several special status plant and animal species are also present in the FODSP and include the following:

- Coast wallflower (*Erysimum ammophilum*);
- Coast buckwheat (*Eriogonum latifolium*);
- Seacliff buckwheat (*Eriogonum parvifolium*);
- California legless lizard (*Anniella pulchra*).

The California legless lizard (*Anniella pulchra*) and coast wallflower (*Erysimum ammophilum*) are species identified in the Habitat Management Plan (HMP, Army 1997b), while both buckwheat species are host plants to the endangered Smith's blue butterfly (*Euphilotes enoptes smithi).*

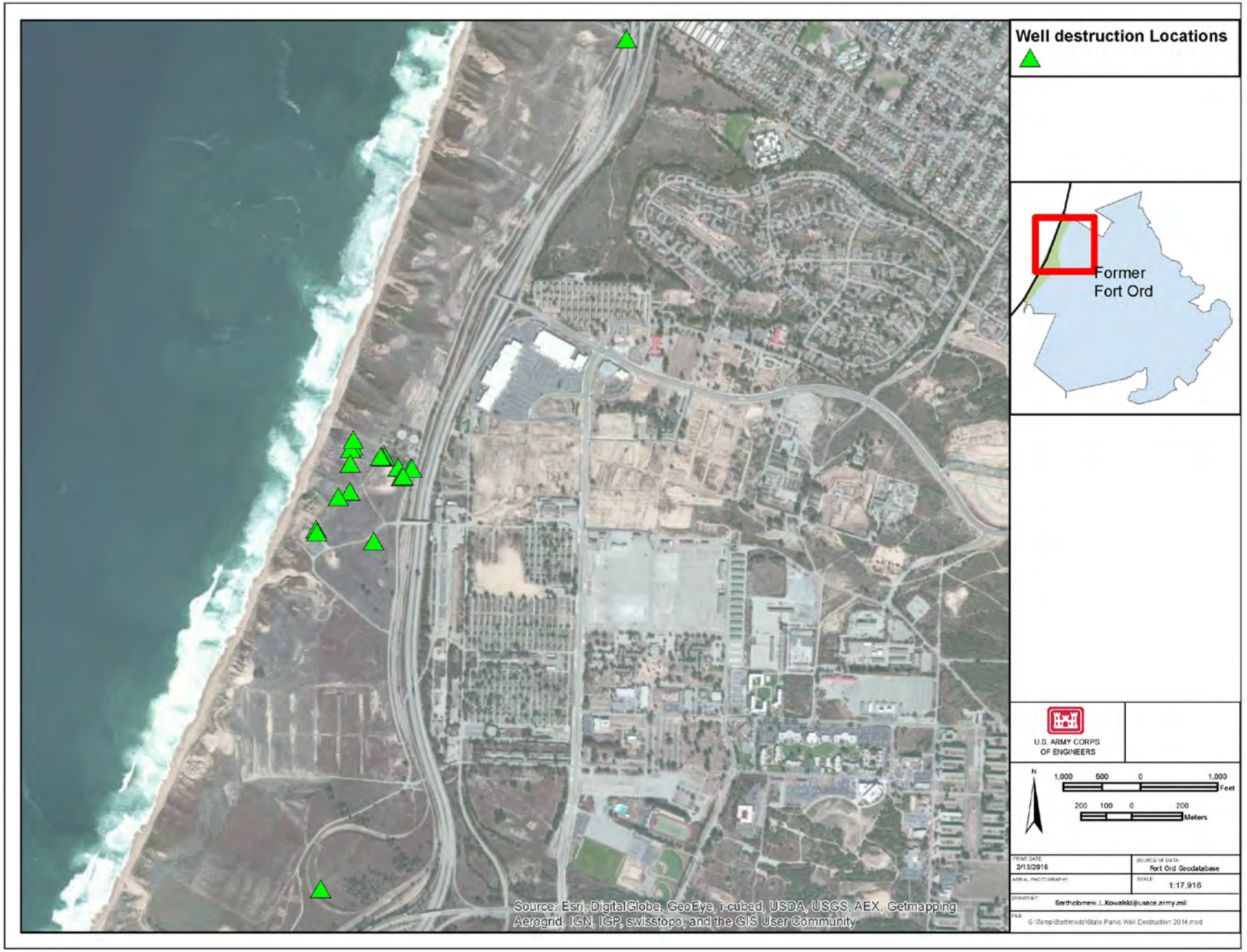

Figure 1. Locations of wells destroyed in 2014 in Fort Ord Dunes State Park

3.0 OVERVIEW OF PLANT SURVEY METHODS

3.1 Well Destruction Survey Methods

Baseline survey for special status plants in proximity to the 21 wells slated for destruction was conducted on April 28, 2014. The survey was timed to coincide with the peak blooming period which was determined by observing known occurrences of the species in the nearby areas.

Each rare plant survey was conducted along well locations and existing or proposed access routes. The width of the survey area was approximately 30 feet around the wells and beyond the edge of the roadway on either side. If a rare plant was identified, the survey in that area was extended to the boundary of the population encountered.

Large areas of Monterey spineflower were mapped as polygons using a GPS unit. Plant groups of 5 or less were mapped as points with attributes to identify the number of individuals at each location. When a Monterey spineflower was identified, the survey in that area was extended to the boundary of the population encountered. In larger populations, Monterey spineflower was characterized according to the percent of cover; specifically, the percentage of the polygon covered by the Monterey spineflower divided by the total area enclosed within the polygon. The cover classes are defined as follows:

- Very Sparse (corresponding to an absolute cover of less than 3 percent);
- Sparse (3 to 25 percent);
- Medium Low (26 to 50 percent);
- Medium (51 to 75 percent);
- Medium High (76 to 97 percent); and
- Very High (greater than 97 percent).

The first and second year follow up monitoring was conducted on April 29, 2015, and May 11, 2016, respectively.

3.2 Buckwheat survivorship methods

Seacliff buckwheat survivorship monitoring at the restoration sites was conducted during the annual surveys (State Parks 2010, 2011, 2012, 2013, 2014). In 2009, one year after initial planting, the buckwheat survivorship in Site A was 90% and 85% at Site B (State Parks 2010). In 2012, a downward trend in buckwheat percent cover was observed at Site B. In 2013, one year after additional planting of 198 buckwheat plants at Site B, the buckwheat survivorship was only 3%.

The survivorship monitoring methodology utilized in this report differs from the previous surveys in that it is specifically designed to compare survivorship of buckwheat plants between the non-remediated restoration areas and the remediated reference areas. Results of the comparison of buckwheat survivorship between remediated and non-remediated areas aid in determination if the cause of the die-off observed at Site B was caused by residual metals in the soil, and are discussed below.

Previous buckwheat survivorship monitoring was conducted only at the non-remediated restoration sites, and it was impossible to determine if the low survivorship at Site B differed from the adjacent remediated areas. Thus, the cause of the buckwheat die-off and low survivorship could not be determined. While presence of metals in the soil at the non-remediated site is a concern, State Parks reported that other environmental factors, such low precipitation or herbivory may have been the cause (State Parks 2013). While it is possible that herbivory will varied between the sites, its effects can generally be observed. Thus differences in survivorship rates between non-remediated and remediated sites that could not be explained by herbivory would be a cause for further investigation.

A power analysis was conducted in order to determine how many seacliff buckwheat plants would need to be monitored in order to be able to detect a difference in survivorship that could be attributed to geographical location. It was estimated that around 100 plants should be monitored for survivorship. The following actions were completed between June 11 and 23, 2015.

- Marked and GPS'ed 50 healthy buckwheat plants in the remediated area (near site Bx)
- Marked and GPS'ed 30 healthy buckwheat plants in the adjacent non-remediated area (near site B)
- Marked and GPS'ed additional healthy 19 buckwheat plants in non-remediated area (near site A)

Healthy plants were assumed as those that had greater than 50% of stems with green leaves. The marked plants were revisited between June 10 and June 23, 2016, and their status recorded. The data were then analyzed using logistic regression.

4.0 RESULTS OF 2016 PLANT SURVEY

4.1 Well Destruction Results

Monterey spineflower was found only in proximity to one well (PZ-02-05-180) on FODSP property during baseline surveys in 2014. In the 2016 follow up survey there were two Monterey spineflower populations in the Sparse density category covering 989 ft^2. Eleven additional locations with fewer than 5 plants were identified in the vicinity of the well for a total of 13 plants (Figure 2).

4.2 Buckwheat survivorship results

Out of 50 marked buckwheat plants in the remediated area 46 were alive a year later. In the non-remediated areas, out of a total of 49 plants, 48 were alive at the time of survey. The difference in survivorship between these two populations is not statistically significant ($p = 0.202$).

The four dead plants in the remediated area were not clustered together but appeared in the center of the distribution of the marked plants (Figure 3). In the non-remediated areas, the one dead plant was located on the southern end of the distribution near Site B (Figure 3).

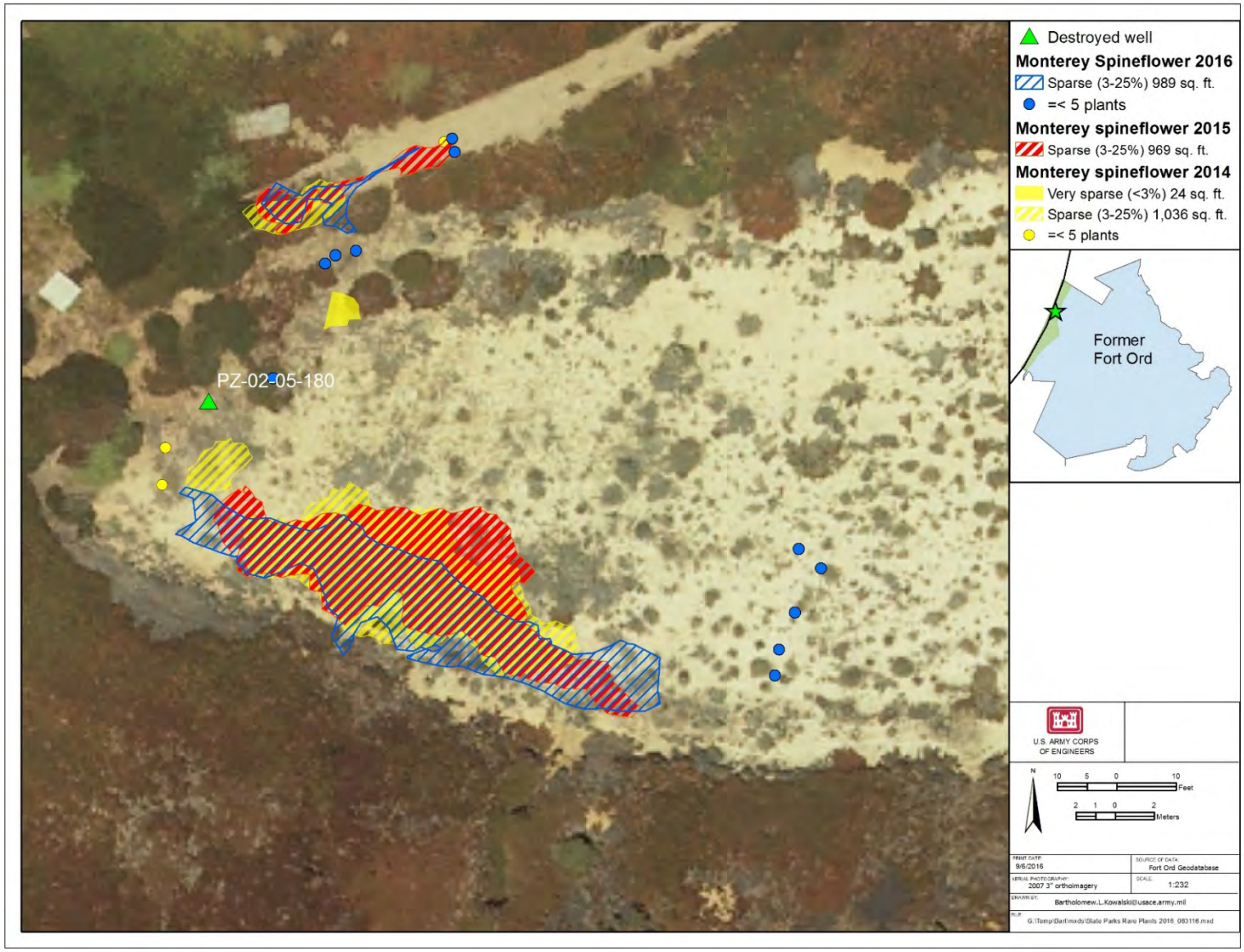

Figure 2. Results of baseline, first, and second year follow up monitoring of Monterey spineflower near well PZ-02-05-180

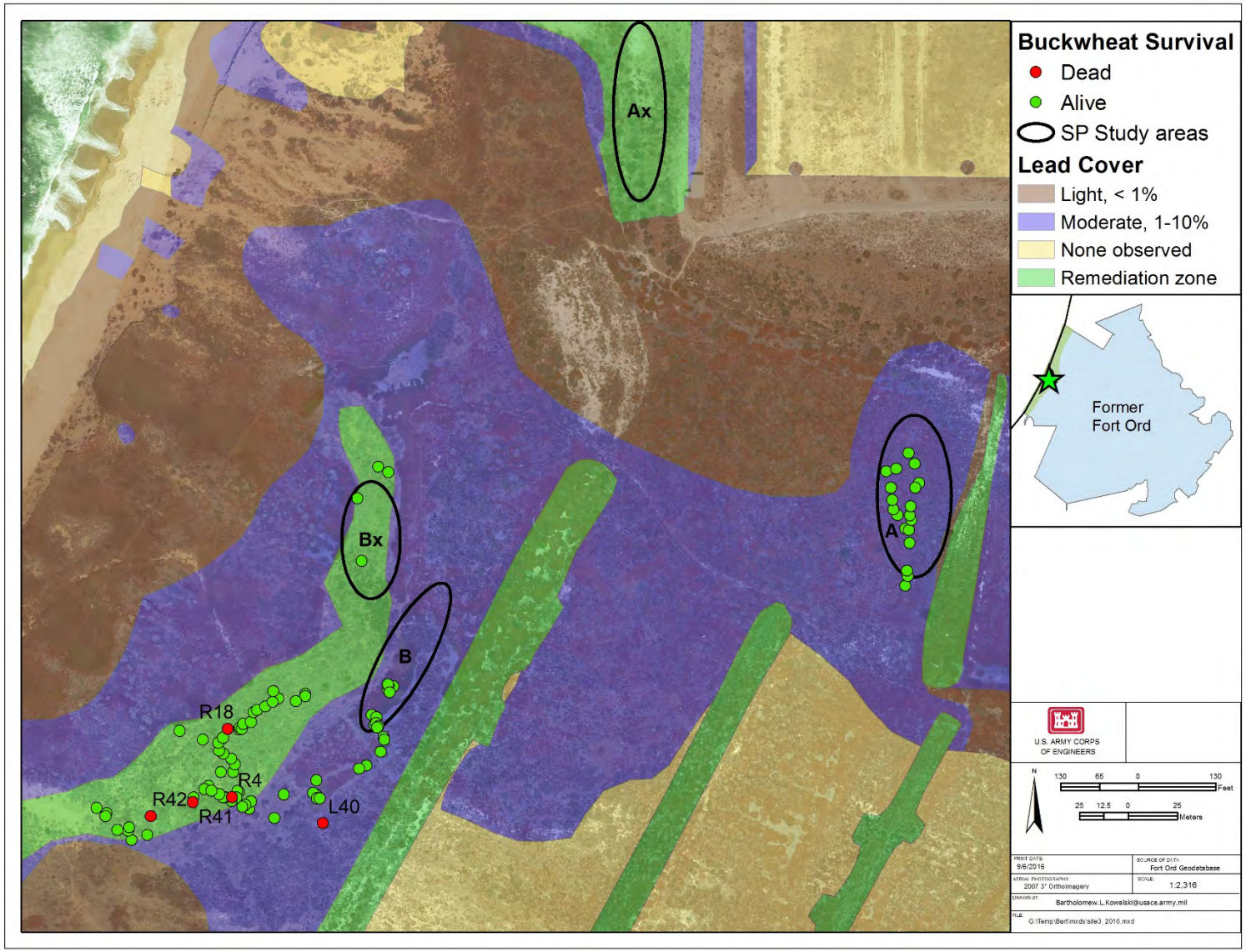

Figure 3. Results and location of one year buckwheat survivorship at FODSP.

5.0 DISCUSSION

5.1 Well Destruction

Well destruction efforts were undertaken by HGL in 2014 to remove 21 groundwater treatment and monitoring wells within the Operable Unit 2/12 portion of the FODSP. Well destruction activities at well PZ-02-05-180 included the following;

- Conducting baseline surveys for special status species
- Marking the present special status species in the field
- Developing a Habitat Checklist for the field crews
- Giving environmental awareness training to the field crews
- Presence of a qualified biologist overseeing destruction activities
- Staging equipment outside of the areas with special status species
- Pressure filling the well with bentonite using a hose

Well PZ-02-05-180 was a flush mounted well and it did not require removal of any well casings or bollards, thus no heavy equipment was utilized near that well.

The results from the second year of monitoring are consistent with baseline and first year monitoring. The two populations in the sparse category covered 989 ft^2, which is less than 1,036 ft^2 found during baseline surveys, but more than 969 ft^2 found during first year follow up surveys. These differences likely have not been a result of the well destruction activities, but instead may reflect a natural variation in the population size between years. There are several environmental factors that affect the amount of Monterey spineflower that blooms in a given year, the length of time since El Niño events being an important factor (Fox et al., 2006). The monitoring will be continued for an additional year, as required per the 2015 BO.

5.2 Buckwheat Survivorship

The results of buckwheat survivorship analysis showed relative high buckwheat survivorship in remediated and non-remediated areas during the last year (92% and 98%, respectively), and did not indicate a statistically significant difference between the survivorship rates in both populations. If remaining lead in the non-remediated area was a cause for buckwheat mortality, it would have been expected that survivorship rate was higher in the remediated area. The fact that the opposite was true (4 dead plants in remediated area as compared to 1 in non-remediated area) suggests that other factors may have been responsible for the buckwheat die-off observed at Site B during 2012 and 2013 buckwheat survivorship monitoring (State Parks 2013; 2014).

The relative high buckwheat survivorship during the last year may likely be due to higher precipitation in the 2015/2016 rainy season (Table 1). Low precipitation was suspected to be the

reason for high mortality at the restoration sites (State Parks 2013, 2014). The amount of precipitation in 2015/2016 season was almost twice the amount in the 2012/2013 season.

Rain year	Inches
2016	19.87
2015	13.83
2014	8.4
2013	10.55
2012	11.78

Table 1.Precipitation at the Naval Postgraduate School Campus (NPS), Monterey, (elevation 45'). Rain year is measured from July 1 of the previous year to June 30 of the current year. Source: http://met.nps.edu/~ldm/renard_wx/ ; accessed 9/8/16.

It is important to note that there were no dead plants observed at Site A this year, and previous monitoring did not show significant buckwheat mortality at that site. Site A is approximately 40 feet higher than the Sites B and Bx, and is much more exposed to the direct fog and mist drift from the shore. Sites B and Bx are more protected from the onshore winds by the sand dunes. The extra water that Site A receive from the fog drip and ocean mist may partially explain why this site showed higher buckwheat survivorship rates.

The plant community differs between the study areas. Near Sites B and Bx *Artemisia pycnocephala* is very prevalent, and appears to be outcompeting buckwheat plants at several locations (Figure 4). *Ericameria ericoides* and large patches of iceplant (*Carpobrotus spp*) are also present and in some locations encroach on buckwheat plants. Prevalent plant species near Site A are *Acmispon glaber*, *Mimulus aurantiacus*, *Baccharis pilularis*, and iceplant. The differences in plant communities also suggest variability in weather and/or soil conditions between the sites.

It is impossible to determine the causes of buckwheat die-off at the restoration sites in previous years as possible environmental predictive variables were not measured. While areas with localized higher lead concentrations may be present in the non-remediated areas, there is no evidence that low buckwheat survivorship at Site B in the previous years was caused by higher lead concentrations in the soil at that site.

6.0 CONLUSIONS AND RECOMMENDATIONS

6.1 Well Destruction

This is the second year of follow up surveys after destruction of 21 wells on FODSP. Baseline surveys indicated Monterey spineflower presence in proximity to one well. Second year follow up survey identified Monterey spineflower covered a smaller area than in the baseline surveys, but larger than in Year 1 surveys. The trend of Monterey spineflower population at that well will be monitored for an additional year.

6.2 Buckwheat Survivorship

The purpose of this monitoring was to determine if the buckwheat die-off was continuing, and if it was, whether there were significant differences in survivorship between remediated and non-remediated areas. Results from the monitoring showed high survivorship at both remediated and non-remediated sites during the 2015/2016 monitoring season. The differences in survivorship between the two populations were not statistically significant, but survivorship was 6% higher in the non-remediated area. The results suggest other factors than lead concentrations may have been responsible for buckwheat die-off in the previous monitoring periods. Based on the findings presented in this report no additional monitoring is recommended.

Figure 4. Photo of Seacliff buckwheat (*Eriogonum parvifolium*) plant surrounded by *Artemisia pycnocephala* and *Ericameria ericoides* at FODSP study area.

7.0 REFERENCES

California State Parks, (State Parks), 2010. 2009 Habitat Restoration and Monitoring Report, Non-remediated Areas, Fort Ord Dunes State Park, Former Fort Ord, California. Administrative Record Series Number BW-2526A.

California State Parks, (State Parks), 2011. 2010 Habitat Restoration and Monitoring Report, Non-remediated Areas, Fort Ord Dunes State Park, Former Fort Ord, California. Administrative Record Series Number BW-2549A.

California State Parks, (State Parks), 2012. 2011 Habitat Restoration and Monitoring Report, Non-remediated Areas, Fort Ord Dunes State Park, Former Fort Ord, California. Administrative Record Series Number BW-2595A.

California State Parks, (State Parks), 2013. 2012 Habitat Restoration and Monitoring Report, Non-remediated Areas, Fort Ord Dunes State Park, Former Fort Ord, California. Administrative Record Series Number BW-2638.

California State Parks, (State Parks), 2014. 2013 Habitat Restoration and Monitoring Report, Non-remediated Areas, Fort Ord Dunes State Park, Former Fort Ord, California. Administrative Record Series Number BW-2677B.

Fox, L., H. Steele, K. Holl, and M. Fusari. 2006. Contrasting demographies and persistence of rare annual plants in highly variable environments. Plant Ecology. Vol 183. Pp. 157-170.

HydroGeoLogic, Inc. (HGL), 2014. Well Destruction and Former OU-1 Treatment Plant Decommissioning Completion Report, Former Fort Ord, California. August. Administrative Record Series Number OU1-611A.

Shaw Environmental, Inc. (Shaw), 2008. Final Habitat Restoration And Monitoring Plan Non-remediated Areas, Fort Ord Dunes State Park (Formerly Site 3), Former Fort Ord, California. June. Administrative Record Series Number BW-2279J.

U.S. Army, (Army), 1997a. Interim Record of Decision Site 3 Beach Trainfire Ranges, Fort Ord, California. Administrative Record Series Number Site3-070.

U.S. Army, 1997b. Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California. April. Administrative Record Series Number BW-1787.

U.S. Army, 2005. Record of Decision, No Further Action Related to Munitions and Explosives of Concern – Track 1 Sites, No Further Remedial Action with Monitoring for Ecological Risks from Chemical Contamination at Site 3 (MRS-22), Former Fort Ord, California. Administrative Record Series Number OE-0526.

United States Fish and Wildlife Service, (USFWS), 2015. Programmatic Biological Opinion for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California (8-8-09-F-74). May 28. Administrative Record Series Number BW-2747.

USFWS, 2014. Well Abandonment Activities conducted by the U.S. Department of the Army on Fort Ord Dunes State Park, Marina, Monterey County, California. May 21. Administrative Record Series Number BW-2715.1.

This page was intentionally left blank.