ANNUAL BIOLOGICAL MONITORING REPORT, 2008
FORMER FORT ORD, CALIFORNIA

TOTAL ENVIRONMENTAL RESTORATION CONTRACT
CONTRACT NO. DACW05-96-D-0011

Submitted to:

U.S. Department of the Army
Corps of Engineers
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Revision 0

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List of Acronyms and Abbreviations

Army	U.S. Department of the Army
BLL	black legless lizard
cm	centimeter
CMC	central maritime chaparral
CTP	carbon tetrachloride plume
CTS	California Tiger Salamander
FONR	Fort Ord Natural Reserve
GPS	global positioning system
HA	historical area
HMP	Habitat Management Plan
m	meter
sqft	square feet
USACE	U.S. Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

1.0 Report Introduction

This report contains results of the 2008 biological monitoring surveys that are required as part of the *Installation-Wide Multispecies Habitat Management Plan* (HMP) *for Former Fort Ord, California* (USACE, 1997a). These requirements are outlined in the HMP. Shaw Environmental, Inc. (Shaw) prepared this report under the Total Environmental Restoration Contract II No. DACW05-96-D-0011.

The HMP identifies rare, threatened or endangered species and habitats occurring on the former Fort Ord which are designated for protection and future management. Typical habitats that require surveys for potential protection and monitoring of rare species are: central maritime chaparral (CMC), wetlands or vernal ponds, and other habitats where listed species are known or suspected to occur including coastal scrub, coast live oak woodlands, and grasslands with a significant native component of grasses or forbs.

Special status species listed in the HMP, and which are addressed in these surveys are the following:

Within coastal scrub, grasslands or maritime chaparral: three annual plants - sand gilia (*Gilia tenuiflora arenaria*), Monterey spineflower (*Chorizanthe p. pungens*), and Seaside bird's beak (*Cordylanthus rigidus littoralis*); and five shrub species within maritime chaparral - Hooker's manzanita (*Arctostaphylos h. hookeri*), sandmat manzanita (*Arctostaphylos pumila*), Monterey manzanita (*Arctostaphylos montereyensis*), Monterey Ceanothus (*Ceanothus cuneatus rigidus*), and Eastwood's golden bush (*Ericameria fasciculata*).

Wetland species considered in these surveys were California tiger salamander (*Ambystoma californiense*), California linderiella (*Linderiella occidentalis*), and Contra-Costa goldfields (*Lasthenia conjugens*).

Before and after the completion of munitions removal, soil remediation, groundwater remediation, and other related environmental cleanup operations within Habitat Reserves, baseline biological and follow-up surveys are conducted to: establish whether protected species are present prior to work operations, including location and abundance; monitor the protected species and habitat after work completion to help determine whether work activities have significantly impacted rare species or habitat. The HMP also outlines avoidance measures, and mitigation measures such as habitat restoration, which would be necessary if U.S. Department of the Army (Army)'s related cleanup activities significantly impact protected species or habitats.

To determine whether mitigation measures would be needed to restore populations of affected HMP-listed special-status species, a baseline biological survey is conducted within a proposed cleanup site, and three to five monitoring events are conducted for rare species following completion of the cleanup operations. Monitoring data may be compared to a site's baseline vegetation survey data to assess whether there have been significant impacts related to the clean up operations, and whether recovery or restoration of the protected habitat (maritime chaparral, wetlands etc.) and associated species is proceeding toward the baseline conditions.

In addition to the HMP, three Biological Opinions have been issued by the United States Fish and Wildlife Service [(USFWS) 1999, 2002, 2005)] as a result of consultation with the Army which contain additional mitigation measures and recommendations relating to biological monitoring at former Fort Ord cleanup sites.

For the 2008 monitoring season, Shaw was tasked by the U.S. Army Corps of Engineers to conduct the following biological baseline and follow-up surveys for various former Fort Ord sites where work related to the environmental cleanup has either already begun, or will begin in the future. Biological surveys began early in 2008 and continued through August 2008.

List of 2008 Biological Monitoring Sites included in this Annual Report

- Site 39, Inland Ranges identified for proposed soil remediation - Baseline vegetation surveys
- Operable Unit Carbon Tetrachloride Plume (CTP) Pilot Project – First year of follow-up biological monitoring following completion of work
- 2008 Burn Units 18 and 22 – Baseline vegetation survey
- 2008 Proposed Burn Unit 3 – Additional baseline vegetation survey of fuel breaks
- Fort Ord Parcel E29b.3.1- Yadon's Piperia survey

2.0 Site 39 - Baseline Monitoring at Soil Remediation Sites

2.1 Site 39- Baseline Monitoring- Introduction

There are several former ranges on former Fort Ord where soil remediation for lead or munitions-related contamination will be necessary. To protect wetland habitats, and rare, threatened or endangered species that could be impacted by these activities, baseline monitoring surveys are conducted before work begins. Baseline surveys consist of shrub transect surveys to characterize the maritime chaparral vegetation communities on the sites, and in the surrounding areas, and annual plant surveys to identify locations and population size of the HMP annual species, sand gilia, Monterey spineflower and Seaside bird's beak. Transect data has been recorded for many of these sites in previous monitoring reports. This section presents additional shrub transect and annual plant data that was needed to complete the baseline survey database for the Site 39 soil remediation sites. Each remediation site is associated with a range, or Historical Area (HA), which is assigned a number. The following sites were surveyed in 2008, either for shrub composition, or for HMP annual plants: HA-18, HA-22, HA-26, HA-27, HA-27A, HA-28, HA-29, HA-33, HA-34, HA-36, HA-37, HA-39/40, HA-43, and HA-48. The locations of these sites within the Site 39 (Impact Area) are shown in Figure 2-1.

Shrub transect data were collected for: HA-26, HA-28, HA-29, HA-36, HA-37, HA-39/40, HA-43, and HA-48. HA-34 was on the list for shrub transect data collection, but because of presence of munitions, and unstable terrain, no transects were installed. Instead visual observations and a species list were made to characterize the site's vegetation.

Habitat Management Plan annual plant surveys were conducted for: HA-18, HA-22, HA-27, HA-27A, HA-28, HA-29, HA-33, HA-34, HA-36, HA-37, HA-39/40.

The baseline data will be used as a reference for the success criteria that will assess the recovery of protected species or habitat on the sites following restoration (if restoration is required), or to ascertain that natural recovery of sites is adequate to ensure conservation of HMP species or habitat.

Note, there are two remediation sites associated with vernal ponds habitat that do not have recent baseline surveys for the ponds – Ponds 8 and 30. These ponds were checked both during the 2006/2007 and 2007/2008 rainy seasons, but in each year neither received enough rainfall to pond. Thus far, in the 2009 season, both ponds again have not received enough rainfall for the ponding necessary to conduct surveys. The *Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at Former Fort Ord* (USACE, 2006a) requires baseline and follow-up monitoring of ponds, where feasible, to identify any potential

impacts to these habitats during and after soil remediation. Continued attempts will be made to conduct surveys at these ponds, up until time of remediation.

2.2 Site 39- Baseline Monitoring- Methods

Methods for vegetation monitoring were consistent with the *Protocol for Conducting Vegetation Monitoring in Compliance with the Installation-wide Multispecies Habitat Management Plan at Former Fort Ord* (USACE, 2006b), with exceptions as noted below.

Shrub Transect Sampling: The line-intercept vegetation sampling was conducted along transects approximately 50 meters (m) in length. Cover for each shrub or perennial species, bare ground, or herbaceous cover was measured as the distance in centimeters (cm)] covered by each species along the length of the transect. Percent cover for each species was then estimated as the relative distance covered by each species along the transect.

Line transects were placed to represent a variety of different locations, chaparral stand-ages, species diversity and disturbance levels within the sites.

Additional species occurring within 10m of the transect were also noted to provide additional species diversity data for each location

HMP Annuals Sampling: Sand gilia populations were surveyed during mid-April through mid-May to capture the peak bloom. Sand gilia patches were mapped either using global positioning system (GPS), or hand-mapped on aerial photos, and digitized. Seaside bird's beak was included in surveys, and In accordance with the vegetation sampling protocol, density of populations was recorded as a cover class.

Low = 0-50 plants per 10,000 square foot (sqft)
Medium = 51-100 plants per 10,000 sqft
High = 101-500 plants per 10,000 sqft
Very High = > 500 plants per 10,000 sqft

Monterey spineflower survey was conducted between mid-May and mid-June to capture peak densities. Monterey spineflower patches were mapped, and the density of plants, recorded as an estimated percent cover class was recorded for each patch. Note, that this is a departure from the Vegetation Sampling Protocol. For a prostrate species that forms low growing mats, percent of ground cover is a more accurate field survey measure of plant abundance than number of plants, and is easier to assess. Individual plants are difficult to count for this species, when the plants have formed extensive mats during their peak bloom period. Monterey spineflower density classes (as percent cover) were as follows:

Low = 0-5 percent
Medium = 6-25 percent
High = 26-50 percent
Very High = >50 percent

2.3 Site 39- Baseline Monitoring- Results and Discussion

The data are presented for each of the 14 soil remediation sites that required vegetation surveys to complete the baseline data. Each site is associated with a range, or Historical Area (HA) number. Data was collected at the following HA's:

Shrub transect data was collected at: HA-26, HA-28, HA-29, HA-36, HA-37, HA-39/40, HA-43, and HA-48. HA-34 was on the list for shrub surveys, but because of presence of munitions, and unstable terrain, no transects were installed. Instead visual observations and a species list were made to characterize the site's vegetation.

HMP annual plant surveys for sand gilia, Monterey spineflower, and Seaside bird's beak were conducted at sites: HA-18, HA-22, HA-27, HA-27A, HA-28, HA-29, HA-33, HA-34, HA-36, HA-37, and HA-39/40.

Photographs 2-1 through 2-14 show a representative view of each of the HA sites covered in this report. Figures 2-2 through 2-15 show maps of the locations of each site, and locations of transects and HMP annuals found during 2008 surveys.

2.3.1 HMP Annual Plant Data

Neither sand gilia nor Seaside bird's beak was found at any of the sites surveyed. Monterey spineflower was identified at the following sites: HA-18, HA-22, HA-28, HA-33, HA-37, and HA-39/40.

Table 2-1 shows HA sites where Monterey spineflower was found and the density or the population. (based on percent cover classes shown above in Section 2.2).

The locations of Monterey spineflower within, or adjacent to, remediation areas are shown in the Figures referred to in column 5 of Table 2-1.

2.3.2 Site 39 - Shrub Transect Baseline Monitoring Data

2.3.2.1 Shrub Transect Survey

Percent cover data for vegetation transects at HA sites covered in this report are presented in Tables 2-2 through 2-14, and represent the undisturbed condition of vegetation in the vicinity of each remediation area. Transects were placed in the areas surrounding the remediation areas if the remediation area is highly degraded, or within vegetation in the remediation area itself if not significantly different from the surrounding areas. Species lists were compiled for each site, based on plants observed within 20 feet on either side of the transects, and including the species found on the range itself. Species found on the range itself were generally a subset of those in the surrounding undisturbed habitat.

The transect data and species lists provided in this report describe and quantify species abundance in habitat surrounding the disturbed range areas. These data are intended to provide reference data for the disturbed range areas that will be subject to future soil remediation, and which may require site restoration.

2.3.2.2 Remediation Site Descriptions

In addition to reference data, summary descriptions of each HA remediation site that was surveyed in 2008 are provided below to characterize the actual conditions within the boundary of each remediation site. In contrast to the surrounding areas represented in the transect data, many (but not all) of these HA sites are low-quality, moderately to highly disturbed habitat, with a high percentage of bare ground and/or non-native species. Habitat quality has already been mapped for all the HA sites. Photographs 2-1 through 2-14 show views of each HA site where vegetation data was collected for this 2008 report.

HA-18 – 1.6 acre remediation area - Fourteen small areas require soil remediation. The area is composed of disturbed stands of mature CMC, with shaggy bark manzanita as the dominant species, and much sparser occurrences of other associates such as Monterey Ceanothus, black sage, sticky monkey flower, coyote brush, mock heather, and poison oak. Some sandmat manzanita is also present, as well as disturbed open areas, a man-made berm covered with ice plant, and scattered coast live oaks. Photographs 2-1 and 2-2 show views of this site. No sand gilia or Seaside bird's beak was found at the site. Although the open areas are dominated by non-native weedy species, Monterey spineflower is also present in low densities in some of these openings (Figure 2-2).

HA-22 – 0.2 acre remediation area - There are five small target box areas which require soil remediation. The surrounding area, which is part of a region that burned in 2005, is composed of high quality habitat that is early seral stage CMC. Shaggy bark manzanita, sandmat manzanita, and chamise are all present, along with 6 other shrub species, and a high number of herbaceous native species. Non-native species are in very low abundance. No sand gilia or Seaside bird's beak was found at the site in 2008. Monterey spineflower was present in low to medium densities in openings in the chaparral (Figure 2-3). Photograph 2-3 shows a view of this site.

HA-26 – 16 acre remediation area - This 16-acre area is composed mainly of ruderal habitat, and highly disturbed stands of CMC, with shaggy bark manzanita as the dominant species and chamise as sub-dominant. Jubata (pampas) grass (*Cortaderia jubata)* is dominant in about 50 percent of the area. Other shrub species present in the stands include Monterey and dwarf Ceanothus, and black sage, and coyote brush. Within about two-thirds of the area, both diversity and cover of native shrub and herbaceous species is low. Approximately 30 percent of the site is predominantly disturbed ruderal grassland, with a mixture of bare ground, non-native and native herbaceous species. No sand gilia or Seaside bird's beak have been found at the site. Monterey

spineflower was not found on the remediation area in 2008 surveys, but was found in are area 300-feet down the range, southwest of the remediation area boundary. A similar species, the diffuse spineflower (*Chorizanthe diffusa)* was found through out the range and remediation area. Previous surveys in 2000 (USACE, 2001) identified Monterey spineflower at medium density throughout the site. Photograph 2-4 shows a view of HA-26.

HA-27 – 0.7 acre remediation area - The area is composed of a combination of low quality, disturbed stands of CMC dominated by jubata grass, and moderately disturbed stands of higher quality CMC. There is about 50 percent cover of jubata grass in the most disturbed areas of the site, which make up about 50 percent of the site's area. These areas are low-quality habitat in terms of diversity and native shrub cover. The less disturbed area of the site, approximately 40 percent of the range is composed of moderate to high quality CMC, represented mainly by shaggy bark manzanita, sandmat manzanita, Ceanothus species, black sage and coyote brush. Photograph 2-5 shows a view of this site.

The entire site has very low herbaceous cover, much less than one percent for both native and non-native forbs and annual grasses.

No sand gilia, Seaside bird's beak or Monterey spineflower have been found at the site.

HA-27A – 0.63 acre remediation area - This is a small site that is a combination of a disturbed/ ruderal grassland area and disturbed CMC. Forty percent of the site is bare ground, and 60 percent is disturbed CMC. The adjacent area to the south is ruderal grassland area with about 50 percent bare ground, about 10 percent cover of jubata grass, and a high percentage of non-native herbaceous cover. Shrubs in the CMC area in the north part of the remediation area include Monterey manzanita, shaggy bark manzanita, chamise, and black sage. Within the CMC, herbaceous cover is less than one percent. Photograph 2-6 shows a view of this site. No sand gilia, Seaside bird's beak or Monterey spineflower were found within the site.

HA-28 – 4 acre remediation area - This site consists mostly of steep-sloped terrain covered with low-stature, high diversity stand of CMC, with Monterey manzanita, chamise, sandmat manzanita, shaggy bark manzanita, black sage, and Monterey Ceanothus about equally represented. There is about 15-20 percent bare ground, and herbaceous cover is very low on this slope.

Approximately 20 percent of the site consists of upland vernal pond habitat at the base of the slope. It consists of both shrub (coyote brush) and herbaceous components including *Juncus* (rush), horseweed (*Conyza canadensis*), golden rod (*Solidago* sp), and other native perennials and annual forbs and grasses.

No sand gilia or Seaside bird's beak have been found at the site. Monterey spineflower was found in 2008 surveys in a small 0.4 acre sandy area where eroded sediment from the slope accumulates (Figure 2-7).

HA-29– 1 acre remediation area - About half this small site consists of a degraded area dominated by jubata grass, and the other half is composed of a dense stand of high quality CMC. The degraded portion consists of about 60-70 percent bare ground with a very low cover of herbaceous species.

The half-acre CMC area consists primarily of sandmat manzanita, and shaggy bark manzanita, with a small percentage of black sage, chamise, silk tassel, and Monterey Ceanothus. Photograph 2-7 shows a view of this site.

No sand gilia, Seaside bird's beak, or Monterey spineflower have been found at the site.

HA-33– 0.1 acre remediation area - This remediation site is very small, and is located within a heavily-disturbed, graded area that is 90 percent bare ground. In the near vicinity, the habitat is heavily dominated by ice plant and other non-native species, and disturbed CMC habitat. Access routes into the site contain Monterey spineflower which is shown on Figure 2-9. Photograph 2-8 shows a view of this site. No sand gilia or Seaside bird's beak has been identified at the site.

HA-34– 7.9 acre remediation area - This site is a large area within a steep-sloped drainage that consists of mostly coastal scrub, grasslands, and scattered coast live oak in the lower three-quarters of the range, and maritime chaparral in the upper one quarter. The upper one quarter could not be surveyed using transect methods because of the steepness and unevenness of the terrain, presence of deep erosion gullies, combined with the risk of munitions.

The maritime chaparral portion is about 2-3 acres in size and varying in maturity of the stands. Species shrub composition was estimated visually as 30 to 40 percent Monterey manzanita, 40 percent chamise, and smaller percentages of shaggy-barked manzanita, Monterey Ceanothus, coast live oak, Hooker's manzanita, coyote brush, and toyon. Herbaceous cover included short-stemmed sedge, rush rose, deer weed, Horkelia, white yarrow, and golden yarrow. Photograph 2-9 shows a view of this site.

No sand gilia, Seaside bird's beak, or Monterey spineflower have been identified at the site.

HA-36 – 0.5 acre remediation area - This is a small site that is almost entirely located within a one to two acre heavily disturbed area that is about 90 percent bare mineral soil. Vegetation cover within the remediation area is about 5 percent.

Surrounding undisturbed stands of CMC are composed of mostly shaggy-barked manzanita and chamise with other typical CMC components. Photograph 2-10 shows a view of this site.

No sand gilia, Seaside bird's beak, or Monterey spineflower have been identified at the site.

HA-37– 6.2 acre remediation area - Sixty percent of the area is composed of low quality previously graded land with 15 percent cover of jubata grass, 5-10 percent native shrub cover, 70 percent bare ground, and 5 percent herbaceous cover. Although several native species are represented in this area, cover is very low. The other 40 percent of the site has disturbed stands of CMC mixed with grasslands with 70 percent herbaceous cover that is a mixture of native and non-native species. Approximately one acre of the west side of the site consists of high quality CMC habitat that is represented by 12 different shrub species. Photograph 2-11 shows a view of this site.

No sand gilia or Seaside bird's beak have been found at the site. Monterey spineflower was identified in one very small spot shown on Figure 2-12, and is expected to be present in the surrounding intact habitat.

HA-39/40 - 2.4 acre remediation area - This area is composed of 4 disjunct areas which are located in the upland zone of a vernal pond. Two acres are located on a slope to the south of the vernal pond covered with coastal scrub and grassland, with about 15 percent cover of coyote bush, poison oak, and bush lupines. The grassland component is a mixture of non-native annual grasses, and native and non-native forbs. The 3 other smaller areas are located around the north and east edges of the vernal pond, and are composed of ruderal grassland with a wet meadow component. Annual grass species dominate, with patches of *Juncus, Carex*, and other wetland species. Photograph 2-12 shows several views of this site.

No sand gilia or Seaside bird's beak was found in the remediation area, though sand gilia is known to occupy CMC habitat in the surrounding area (see Figure 4-3). Monterey spineflower occupies areas within the grasslands very close to the remediation area (see Figure 4-4). The area of spineflower within the remediation area is approximately 20 square feet. Due to the proximity of the remediation area to sand gilia and Monterey spineflower populations, it is possible these plants could be impacted during remediation activities.

HA-44 - 1.8 acre remediation area - This area has been previously burned in 2005, and quality and diversity of the recovering vegetation is high, though total cover is still less than 50 percent. A total of 11 shrubs species were identified in transects through the area. The crown-sprouting species, shaggy-barked manzanita and chamise are dominant in cover, as well as both *Ceanothus* species (Monterey Ceanothus, and dwarf Ceanothus). Sandmat manzanita is present, but

individuals are still small and do not yet contribute much cover. Photograph 2-13 shows a view of this site.

The area also had significant ground disturbance during the removal of large target items in 2006, which contributes to the high percentage of relatively bare ground.

Sand gilia, Seaside bird's beak, and Monterey spineflower have all been identified during 2006 surveys of the site, and all were present in this 2008 survey.

HA-48 - 0.05 acre remediation area - There are several plots 20ft square in size that are designated as remediation areas on this range. This area has been previously been surveyed extensively for shrub vegetation cover, and HMP species presence and abundance. One additional transect was placed in 2008 to characterize vegetation cover in this part of the range. The site burned in 2005, and shrub vegetation cover is still relatively low throughout the site. The range consists of high quality, high diversity CMC habitat, with several areas of grasslands. The grasslands are also high quality habitat consisting mostly of non-native annual grass species, but providing habitat for Monterey spineflower and other HMP annual species. Photograph 2-14 shows a view of this site.

Sand gilia, Seaside bird's beak, and Monterey spineflower have all been mapped on the site during 2005 surveys, in the year following the burn (USACE, 2005). Monterey spineflower was identified in the area in this current 2008 survey.

3.0 CTP Pilot Project Biological Monitoring Survey- Year 1

3.1 CTP Pilot Project Vegetation Monitoring Survey - Introduction

The first of three years of follow-up monitoring was conducted at the University of California's Fort Ord Natural Reserve (FONR), at the site of the 2007-2008 pilot study designed to address ongoing groundwater remediation of a carbon tetrachloride plume. The study was conducted from June 2007 through February 2008. The project consisted of installation of 25 wells for injection of remediation media, and extraction and monitoring of water samples over a several month period. Location of the wells and access routes within the study area is shown in Figure 3-1. Several views of the site and well locations are shown in Photographs 3-1 through 3-8.

All above-ground equipment was dismantled and removed from the site during the months of July and August to minimize impacts to sensitive plant populations, and was complete by the end of August 2008. Wellheads were capped and locked, and all piping dismantled by hand and removed from the site. A Conex storage unit was removed, and all project-related equipment and debris was collected up and removed from the site.

Results of the baseline vegetation survey conducted in the spring and summer of 2007 were published in the *2007 Annual Biological Monitoring Report* (USACE, 2008). HMP species found on the site during the baseline survey included two annual plant species, the Federally Endangered sand gilia (*Gilia tenuiflora arenaria*), and Federally Threatened Monterey spineflower (*Chorizanthe pungens pungens*); and two HMP-listed shrub species: sandmat manzanita (*Arctostaphylos pumila*) and Monterey Ceanothus (*Ceanothus rigidus rigidus*).

3.2 CTP Pilot Project Vegetation Monitoring Survey - Methods

For consistency with past surveys, the methods used for the current survey were the same as those used for vegetation surveys at FONR completed previously by HydroGeologic, Inc. with Denise Duffy and Associates; and Shaw Environmental, Inc. (e.g. USACE, 2007; USACE, 2008).

Sand gilia populations were surveyed during mid-April through mid-May to capture the peak bloom. Sand gilia patches were mapped using GPS, and the total number of plants recorded for each patch.

The Monterey spineflower survey was conducted between mid-May and mid-June to capture peak densities, as measured by percent ground cover. Monterey spineflower areas were mapped to show both overall distribution over the study site, and also distribution of the patches in density classes greater than Very Sparse.

Monterey Spineflower density classes (consistent with previous FONR surveys) were as follows:

Very Sparse = <3 percent
Sparse = 3-25 percent
Medium Low = 26-50 percent
Medium = 51-75 percent
Medium-High = 76-97 percent
High = 98-100 percent

Invasive annual grass areas were mapped by hand onto aerial photo maps in the field, and later digitized into Geographic Information System. The following density cover classes were used for annual grasses:

Very Low = <3 percent
Low = 3-25 percent
Medium = 26-50 percent
High = 51-75 percent
Very High = >75 percent

Areas of sandmat manzanita (*Arctostaphylos pumila)* impacted by access to wells (initially reported in the *2007 Annual Biological Monitoring Report* [USACE, 2008]) were re-visited and assessed for their condition.

3.3 CTP Project Pilot Project Vegetation Monitoring Survey - Results and Discussion

3.3.1 Sand Gilia Survey - Results and Discussion

The locations of sand gilia surveyed in Spring 2008 are shown in Figure 3-2. This map shows location and area of gilia patches, and total number of plants per patch. The term "patch" refers to the location of a close grouping of plants, which are likely to be germinating from local seed bank. Numbers per patch ranged from two to 19 plants.

Total area of sand gilia in 2008 (2007) = 0.01 acres (0.075 acres)
Total number of plants in 2008 (2007) = 61 (528)

Total number of plants observed in the survey area, 61, was very low compared to 528 counted last year, and plants were found in fewer locations. In particular, the two densest patches of gilia, numbering 138 and 150 last year, had zero and one respectively in 2008. This location is shown in Photograph 3-1.

Wells and access routes were not located in areas with sand gilia, and no populations since the last year's survey in April/May 2008 are known to have been impacted by physical disturbance related to the project's activities. Sand gilia numbers were much lower in the two mapped areas

to the north-east and south-east of the perimeter road (on the East side of the fuel break) which were both outside the work boundaries. The sand gilia locations within the work boundaries received very little to no impacts from work activity. The areas were off limits to all foot traffic during the bloom period, and at most received minimal foot-traffic during work operations during the dry season.

Since gilia numbers were equally low in areas both inside and outside the work areas, the most likely cause of lower plant abundance is the season's rainfall pattern. Past Fort Ord studies indicate that sand gilia germinate poorly in dry years compared to high rainfall years, and can sometimes show a zero germination rate in dry years (Fox et al., 2006). The 2007/2008 season was the second consecutive lower-than-average rainfall year, with an average of 14.8 inches, or approximately 75 percent of normal, and almost no rainfall after February (National Weather Service Climatological Station, Naval Post Graduate School, Monterey, California). Abundance of sand gilia and other annual plants at many sites, including this site and other sites on Fort Ord, was much sparser than in previous years.

As is true for all plant monitoring programs, climate variations should be taken into consideration in the interpretation of all data comparisons, and continued monitoring over several years is necessary to provide an accurate picture of the sand gilia population at this site.

This report summarizes results of the first year of follow-up monitoring. An additional two years of monitoring will be conducted to continue documenting the HMP annual plant populations within this study area. These results will be compared to earlier data, including the 2007 baseline data, to assess the possible project impacts.

3.3.2 Monterey Spineflower Survey - Results and Discussion

The total distribution of Monterey spineflower is shown in Figure 3-3, and total acreage was 1.75 acres, compared to 2.17 acres identified in 2007. The spineflower distribution observed in 2008 was found in all areas mapped in 2007, but covered 0.42 acres less area.

Almost 95 percent of the mapped spineflower area was in the Very Sparse (0-3 percent) density category. The other 5 percent of the area consisted of small patches of higher density, exceeding 3 percent in percent cover, as shown in Figure 3-4.

Approximate 2008 acreage for each density class is shown below, with the 2007 data shown in parentheses for comparison.

Total area occupied by Monterey spineflower = 1.75 acres (2.17)
Area at Very Sparse density (0-3 percent) = 1.66 acres (1.94)
Area at Sparse density (3-25 percent) = 0.05 acres (0.15)
Area at Medium-Low density (26-50 percent) = 0.04 acres (0.05)

Area at Medium density (51-75 percent) = none (0.03)

No areas were mapped that had greater than medium density.

Overall cover of Monterey spineflower was about 0.5 acres less in 2008 than the previous year. However, it was present in almost all areas where it had previously been found, included the site of well installations. Photograph 3-5 shows a view of well number IW-02 that was placed along a route with medium spineflower density.

The area where no spineflower was present in 2008 was along the mowed fuel break area which, due to low vegetation cover and distance from shrub cover, appeared to be drier than other areas. As with sand gilia, the 2008 low rainfall year may have been a cause of lower-than-average germination and growth of spineflower, and a decrease in the areas where spineflower was previously observed in 2008. Well installation work was unlikely to be the cause of spineflower absence in these areas. This report summarizes results of the first year of follow-up monitoring. The next two years of follow-up monitoring will provide a broader picture of the populations that will level out the variation due to different rainfall patterns in the last two years. Annual weather variations should be taken into consideration in the interpretation of all annual plant monitoring data.

3.3.3 Annual Grass Survey - Results and Discussion

Grass location and densities are shown in Figure 3-5.

The following numbers indicate the acreage occupied by annual grass at each density class, with the 2007 acreages in parentheses for comparison:

Area at Very Low density (0-5 percent) = 1.38 acres (0.35)
Area at Low density (6-25 percent) = 0.57 acres (0.6)
Area at Medium density (26-50 percent) = 1.19 acres (1.41)
Area at High density (>50 percent) = 4.07 acres (4.34)

Total annual grass cover was almost identical between 2008 and the baseline of 2007. Most of the site, more than 50 percent, was occupied by annual grasses at high density. Photograph 3-4 shows a view of the burned chaparral area (from a small 2006 burn), where annual grasses invaded due to the burn. There was some work-related disturbance in this area, but high density grasses have been present since the burn occurred, due to proximity to the grassy perimeter.

The main difference between 2008 and 2007 was in the distribution of grass cover at less than 5 percent. Most of the well access routes within mowed fuel breaks adjacent to the fence line bordering the northwest and southwest sides of the site had been predominantly in the High density class in 2007. In 2008, the annual grass plant community along several of these routes,

which were compacted by repetitive use, had not yet regenerated. Photographs 3-2 and 3-3 show two of these routes adjacent to the boundary fence line.

There were no locations where well access has resulted in higher density of grasses in 2008.

These wells will continue to be monitored in the future to determine whether there is significant invasion of non-native annual grasses in these areas, particularly if they seem to obscure available ground for Monterey spineflower, where spineflower is currently present.

Annual Fusilade® treatment will be considered for well locations and access routes if it is determined through continued monitoring that there is a significant increase in grass invasion.

3.3.4 Other HMP species occurring on CTP Site

Other species encountered during the annual survey included:

Monterey Ceanothus (*Ceanothus rigidus rigidus*) – In the 2007, cages with live *Ceanothus* plants were marked with red-colored flagging for avoidance during pilot study activities. Work activities did not impact any *Ceanothus* plants in 2008.

Sandmat manzanita - Sandmat manzanita stands occurred in several areas of the study site. There were two well locations where the only access was through sandmat populations. IW-07, IW-02, and MW-01 were located within low-growing stands of sandmat manzanita. In 2007, heavy-duty synthetic matting was laid down over the vehicle access routes to these areas to minimize undue damage to shrub roots, and to minimize the soil disturbance and burial of the seed bank. Several sandmat plants were flattened near the road entrance to the aisle where matting was placed on the ground, comprising an estimated 74 sqft. Sand mat plants that were impacted by access to these wells had not yet shown new growth or recovery during the 2008 surveys. Sand mat manzanita is a slow growing species and it may take several years before plants begin to show recovery and regrowth in the impacted area. Photograph 3-7 shows a view of this access area in 2008.

Black Legless Lizard – No black legless lizard encounters occurred during 2008. Since no sub-surface work occurred during this phase of the project, encounters would not be expected.

Other Site Impacts – In 2006 area approximately 24 foot by 42 foot (1,008 sqft) of coastal sage scrub was cut near IW-01 and IW-07 to access wells that were located within a stand of shrubs. The area is shown in Photograph 3-8. Shrubs were cut to a height of about 4 inches. Shrubs cut were California sage brush (*Artemesia californica*), and black sage (*Salvia mellifera*), coffeeberry (*Rhamnus californica*), monkey flower (*Mimulus aurantiacus*) and poison oak (*Toxicodendron diversilobum*). None of these are HMP special-status species, no protection or mitigations are required for these species or for this vegetation type. In addition, no HMP annual

species were found within the cut shrub stand during the 2007 baseline survey. In 2008, shrubs began crown-sprouting. All these species are known to resprout from the root-crown after cutting, and it is expected that the area will revegetate toward baseline conditions within the next few years.

3.3.5 CTP Study – Mitigation Measures for Protection of the CTS, BLL, Sand Gilia and Monterey spineflower

As the CTP study site is located within a habitat reserve area, mitigation measures were implemented to avoid and reduce impacts as much as possible during the work. The following measures were implemented to comply with the HMP and the 2005 Biological Opinion (as amended) that refers to the protection of California Tiger Salamander (CTS).

Project work during 2008 consisted of periodic sampling of well water. During this phase there was minimal disturbance to habitat, or vegetation. Activities were conducted almost exclusively on foot. Dismantling of equipment was initiated in late July 2008 (dry season) to minimize impacts to CTS and HMP annual plants. Mitigation measure that applied in 2008 included the following:

- The most active phase of the project in 2008 was the dismantling of equipment. This was conducted during the summer months to minimize impacts during bloom season for sand gilia and Monterey spineflower.
- Equipment staging, and vehicle turnaround areas were kept to those established in the previous year to minimize ground impacts.
- A biologist was available on site on a regular basis to monitor site activities and following of the mitigation measures.
- Almost all piping for the pilot study was placed aboveground, so there was minimal digging of trenches or holes. Two 6 to 12-inch deep trenches were dug across the perimeter road bed, so that pipes would not be damaged by vehicle traffic.

4.0 2008 Burn Units 18 and 22 – Baseline Vegetation Survey

4.1 2008 Burn Units 18 and 22 - Introduction

A baseline vegetation monitoring survey was conducted on Burn Units 18 and 22 in the spring of 2008. These areas were selected for a prescribed burn to remove vegetation in support of a removal of munitions and explosives of concern. The burn was conducted in December of 2008. A previous survey for HMP annual plant species, sand gilia, Monterey spineflower, and Seaside bird's beak was conducted in 1992 by Jones and Stokes.

The area of the two burn units combined is 209 acres. Prior to the burn, the sites consisted primarily of intermediate-aged maritime chaparral on sandy soils in gently rolling terrain. The two dominant shrub species throughout the sites were sandmat manzanita and shaggy-barked manzanita. Other significant habitat types on the sites include a wetland /vernal pond within Burn Unit 22 with associated grassland uplands, and scattered patches of coastal sage scrub and coast live oak.

The 2008 vegetation monitoring consisted of a transect survey to characterize the site's shrub diversity and abundance, and surveys for three HMP annual plant species: the Federally Endangered sand gilia (*Gilia tenuiflora arenaria*), Federally Threatened Monterey spineflower (*Chorizanthe pungens pungens*) and the California Endangered Seaside bird's beak (*Cordylanthus rigidus littoralis*).

Photographs 4-1 through 4-7 show several views of the site, and transect sampling locations in the spring of 2008 prior to the burn. Figure 4-1 shows the location this site.

4.2 2008 Burn Units 18 and 22 - Methods

Vegetation sampling was conducted in accordance with the Fort Ord Vegetation Monitoring Protocol (USACE, 2006a) with exceptions as noted below.

Shrub transect sampling: The line-intercept vegetation sampling method used followed the *Protocol for Conducting Vegetation Monitoring in Compliance with the Installation-wide Multispecies HMP at Former Fort Ord* (USACE, 2006b). The transect methods are the same as those used in previous shrub surveys on former Fort Ord.

Line intercept sampling was conducted along thirty-six transects each approximately 50m in length. Cover for each shrub or perennial species, bare ground, or herbaceous cover was measured as the distance (in cm) covered by each species along the length of the transect. Percent cover for each species was then estimated as the relative distance covered by each species along the transect.

Line transects were placed to represent a variety of different locations, chaparral stand-ages, species diversity and disturbance levels within the Burn Units.

Additional species occurring within 10m of the transect were also noted to provide additional species diversity data for each location

HMP Annuals Sampling: Sand gilia populations were surveyed during mid-April through mid-May to capture the peak bloom. Sand gilia patches were mapped either using GPS, or hand-mapped on aerial photos, and digitized. In accordance with the vegetation sampling protocol, density of populations was recorded as a cover class.

Low = 0-50 plants per 10,000 sqft
Medium = 51-100 plants per 10,000 sqft
High = 101-500 plants per 10,000 sqft
Very High = > 500 plants per 10,000 sqft

Monterey spineflower survey was conducted between mid-May and mid-June to capture peak densities. Monterey spineflower patches were mapped, and the density of plants, recorded as an estimated percent cover class was recorded for each patch. Note, that this is a departure from the Vegetation Sampling Protocol. As a prostrate species that forms low growing mats, cover is a more accurate field survey measure of plant abundance. Individual plants are difficult to count for this species. Monterey spineflower density classes (as percent cover) were as follows:

Low = 0-5 percent
Medium = 6-25 percent
High = 26-50 percent
Very High = >50 percent

4.3 2008 Burn Units 18 and 22 - Results and Discussion

4.3.1 Shrub Transect Survey

Location of vegetation transects in the 2008 Burn Units 18 and 22 is shown in Figure 4-2, and the percent cover data for these vegetation transects are summarized in Table 4-1. Seventeen shrub species were encountered overall in all transects.

The data summary below describes the species dominance, both in percent cover and in extent of occurrence over the site. Shaggy-barked manzanita (*Arctostaphylos t. tomentosa*), was one of two co-dominant species, and over all thirty-six transects, ranged from 0.8 to 70 percent cover, averaging 26.6 percent cover over all transects, and occurring in 92 percent of the transects. Sandmat manzanita, (*Arctostaphylos pumila)*, occurred at about equal dominance, with a range of 0.4 to 76.2 percent; an average of 32.0 percent, and presence in 97 percent of transects). The third most common species was chamise (*Adenostoma fasciculatum*), ranging from 0.2 to

64.8 percent cover, averaging 18.2 percent cover over all transects, and occurring in 94 percent of transects.

Other chaparral species most commonly occurring in the transects were black sage (*Salvia mellifera*), ranging from 0.2 to 17.4 percent; average = 7.5 percent, occurring in 31 percent of transects), and Monterey Ceanothus (*Ceanothus cuneatus rigidus)*, ranging from 0.2 to 24.4 percent; average = 6.4 percent, occurring in 58.3 percent of transects). Twelve other chaparral species occurred with less frequency between transects, or with lower percent cover, averaging less than one percent cover over all transects. The rare HMP-listed shrub, Eastwood's golden bush (*Ericameria fasciculatum)*, which was found in only one transect (T12). This species was not seen in any of the other transect areas except for the vicinity of T12, where it had a patchy, low density cover. Bare ground averaged about 21.5 percent over all transects. Percent cover of annual herbaceous species was very low, at less than 2 percent overall.

These baseline data should be used for comparison with future monitoring data after work completion, to determine whether plant diversity and cover naturally proceed toward these baseline conditions, as the vegetation grows back.

4.3.2 Sand Gilia Survey - Results and Discussion

The location and acreage of sand gilia are shown in Figure 4-3. The numbers below show estimated abundance of sand gilia on the site. The estimated abundance was derived by summing the estimated numbers of plants in each density class as follows:

Number of plants per density class = (Median number of plants per density class) X (Number of acres X 4.36). One acre = 43,560 sqft.

Area of Sand Gilia:

Area of Low density (0-50 plants per 10,000 sqft) = 35.4 acres
Area of Medium density (51-100 plants per 10,000 sqft) = 7.2 acres
Area of High density (101-500 plants per 10,000 sqft) = 4.7 acres
Area of Very high density (>500 plants per 10,000 sqft) = 0 acres

Total area of sand gilia = 47.3 acres or about 23 percent of the site.

Abundance of Sand Gilia:

Estimated total number of plants in each density class:
Low = 3540
Medium = 2160
High = 4700
Very high = 0

Total estimated number of plants = 10 400

Sand gilia were found mainly within more recently disturbed stands of maritime chaparral with open space between shrubs, and in other open, sandy locations, particularly low-lying areas that drain surrounding slopes. The highest densities were found along a low-lying sandy draw in Burn Unit 18 where water drains from slopes to the north and south.

4.3.3 Monterey Spineflower Survey - Results and Discussion

Location and acreage of Monterey spineflower by density class are shown in Figure 4-4. More than 58 percent of the mapped spineflower area was in the Low (0-5 percent) density class. About 11 percent was in the Medium class, while about 30 percent was in the High class. No areas were mapped with greater than 50 percent cover of spineflower. Approximate acreage per density class is shown below.

Area of Monterey Spineflower:

Area at Low density (0-5 percent cover) = 41 acres
Area at Medium density (6-25 percent cover) = 8.2 acres
Area at High density (26-50 percent cover) = 21 acres
Area at Very high density (>50 percent cover) = 0 acres

Total area of Monterey spineflower = 70.2 acres or about 34 percent of the site

Monterey spineflower were found in very similar habitat to sand gilia, but in more extensive populations. The highest densities were found in the same low-lying sandy draw in Burn Unit 18, as well as in other low areas receiving drainage from adjacent slopes.

4.3.4 Seaside Bird's Beak Survey - Results and Discussion

Location and acreage of Seaside bird's beak by density class are shown in Figure 4-5. More than 58 percent of the mapped spineflower area was in the Low (0-5 percent) density class. About 11 percent was in the Medium class, while about 30 percent was in the High class. No areas were mapped with greater than 50 percent cover of spineflower. Approximate acreage per density class is shown below.

Area of Seaside bird's beak:

Area at Low density (0-50 plants per 10,000 sqft) = 8.9 acres
Area at Medium density (51-100 plants per 10,000 sqft) = 0.5 acres
Area at High density (101-500 plants per 10,000 sqft) = 0.7acres
Area at Very high density (>500 plants per 10,000 sqft) = 0 acres

Total area of Seaside bird's beak = 10.1 acres or about 5 percent of the site

Abundance of Seaside Bird's Beak:

Estimated total number of plants in each density class:
Low = 970
Medium = 164
High = 763
Very high = 0

Total estimated number of plants = 1897

Seaside bird's beak was found in similar habitat to sand gilia and Monterey spineflower, but in fewer, more localized locations.

4.3.5 Annual Grasses Survey - Results and Discussion

Non-native annual grass locations and densities on Burn Units 18 and 22 in 2008 are shown on Figure 4-6. More than 75 percent of the site had annual grass density ranging from 0 to 5 percent. Areas containing Medium to High density of annual grass were generally pre-existing grassland before the burn, or areas adjacent to pre-existing grassland.

Area at Zero to Low Density (0-5 percent) = 0 acres
Area at Medium Density (6-25 percent) = 7.8 acres
Area at High Density (26-50 percent) = 32.2 acres
Area at Very High Density (>50 percent) = 2.9 acres

Total area of non-native annual grasses = 42.9 acres or about 20 percent of the site

Grassland dominated areas were located in and around the wetland of Burn Unit 22, and in other low-lying areas or draws, as in Unit 18, where the ground is likely seasonally too moist to support shrub cover. Other grassy areas were located along roads and fuel breaks, and disturbed areas.

Annual grasses should continue to be monitored along with the HMP annuals in years of those surveys, especially within the first five years before shrubs establish, to document the extent of possible encroachment post-burn. Spread or increase of annual grasses within the site is common after disturbances such as burns, and annual grasses tend to compete aggressively with native annual plants such as sand gilia and Monterey spineflower, and have the potential to reduce habitat quality for these protected species.

5.0 2008 Burn Unit 3 - Baseline Vegetation Survey of Fuel Breaks

5.1 2008 Burn Unit 3 - Introduction

Additional HMP annual plant survey was needed to complete the baseline survey for the fuel breaks surrounding Burn Unit 3. The parcel is slated for a prescribed burn to support MEC clearance when the weather conditions meet the fire prescription. A 200-foot fuel break consisting of mowed vegetation was established in early summer 2008 to prepare the site for a future burn (Figure 5-1). Shrub transect data has already been collected within this fuel break (USACE, 2008). This section presents the additional HMP annual plant data required to complete the site baseline survey within the 200-foot fuel break area.

5.2 2008 Burn Unit 3 - Methods

The methods for HMP annual plant survey are consistent with the Fort Ord Vegetation Monitoring Protocol (USACE, 2006b), with the following exception for Monterey spineflower surveys. Monterey spineflower patches were mapped, and the density of plants, recorded as an estimated percent cover class was recorded for each patch. As a prostrate species that forms low growing mats later in the growing season, cover is a more accurate field survey measure of plant abundance. Individual plants are difficult to count for this species at the mat-forming stage.

Monterey spineflower density classes (as percent cover) were as follows:

Low density = 0-5 percent cover)
Medium density = 6-25 percent cover)
High density = 26-50 percent cover)
Very High density = >50 percent cover)

5.3 2008 Burn Unit 3 - Results and Discussion

Monterey spineflower and Seaside bird's beak were both found during surveys of the site. Location and area of Monterey spineflower by density class are shown in Figure 5-2, and of Seaside bird's beak in Figure 5-3. No sand gilia was found during site survey.

Area of Monterey Spineflower:

Approximate acreage per density class is shown below. More than 52 percent of the mapped spineflower area was in the Low (0-5 percent) density class. About 8 percent was in the Medium class, 27 percent was in the High class, and 12.7 percent was in the Very High class.

Area at Low density (0-5 percent cover) = 5.7 acres
Area at Medium density (6-25 percent cover) = 0.9 acres

Area at High density (26-50 percent cover) = 3.0 acres
Area at Very High density (>50 percent cover) = 1.4 acres

Total area of Monterey spineflower = 11.0 acres or 7 percent of the site.

Most of the site is covered in dense, intermediate-aged to mature stands of maritime chaparral, with little open area for species like Monterey spineflower. Monterey spineflower were found in a few areas that with more openings between shrubs than the rest of the site. These areas comprised less than 8 percent of the acreage of the site.

Area of Seaside Bird's Beak:

Seaside bird's beak occupied only one small area of 0.5 acre, in the Low density class (0-50 plants per 10,000 sqft)

Total area of Seaside Bird's beak = 0.5 acre or 0.3 percent of the site.

Abundance of Seaside Bird's Beak:

Total Number of Seaside Bird's beak plants = 58

Seaside bird's beak often inhabits the same habitat type as Monterey spineflower. On this site however, it occupied only a small part of the area as the Monterey spineflower, comprising only 0.3 percent of the site.

These baseline data will be used for comparison with future monitoring data after work completion, to determine whether HMP plant diversity and cover within the 200-foot fuel break areas proceeds toward these baseline conditions, as the fuel break vegetation recovers from the site treatments, that will include mowing of vegetation and possible burning.

6.0 Yadon's Piperia

The Fort Ord land parcel designated by the number E29b.3.1 will be transferred to the City of Monterey. This parcel is one of two areas on former Fort Ord that host populations of the Endangered Yadon's Piperia (*Piperia yadonii*).

A survey was conducted in June 2008 to map the location and count Yadon's piperia abundance.

Figure 6-1 shows the location of the site, and the area of Yadon's Piperia. Photograph 6-1 shows Yadon's Piperia under Monterey pines. A total of 34 plants was found within an area of 0.2 acres.

7.0 Other Biological Support Activities in 2008

7.1 HMP Species Reports

7.1.1 California Tiger Salamander encounters

In 2008, there were no CTS encounters by Shaw on Fort Ord.

7.1.2 Black Legless Lizard (BLL) encounters

In 2008, there were 2 BLL encounters on Operable Unit 1 development land to the north of the University of California's Fort Ord Natural Reserve, during trenching to install pipes for support of the groundwater remediation. The BLL were live and apparently uninjured when found. The individuals were relocated to an adjacent safe area with 20 feet of the trench area.

7.1.3 Employee Education

New Shaw employees and sub-contracting workers receive natural resources training specific to Fort Ord prior to starting work. Training includes at the least the following topics:

- Recognition of sensitive HMP species, including CTS, BLL, sand gilia, Monterey spineflower, sandmat manzanita and Monterey Ceanothus among other species
- Specific guidance for CTS protection, such as covering holes where possible, placing escape ramps in trenches where needed, and instructions for reporting HMP animal species encountered
- Instructions to minimize all work impacts and work footprints, avoid areas flagged for sensitive species wherever possible
- Instructions to restrict vehicle movement and parking to roads, staging areas, and other designated work areas where at all possible
- Reduce soil disturbances in sensitive habitat particularly areas containing seedbank or live individuals of HMP-listed plant species

In 2008, there were no new workers requiring training.

8.0 References

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