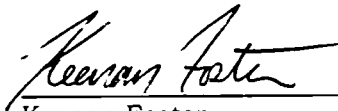


**1998 Annual Monitoring Report
Biological Baseline Studies and
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Sites on Former Fort Ord
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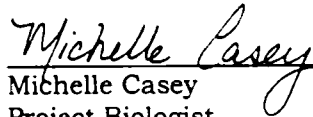
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Biological Baseline Studies and
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DISTRIBUTION

1.0 INTRODUCTION

To maintain compliance with habitat management and monitoring requirements presented in the *Installation-Wide Multi-Species Habitat Management Plan for Former Fort Ord, California* (HMP) (USACE, 1997a), biological resources are monitored before and after ordnance and explosives (OE) removal activities have been completed. The HMP identifies species and habitats of concern on the installation and specifies measures to document baseline conditions prior to OE removal and monitor the successful regeneration of species and habitat following OE removal. Habitat monitoring efforts include collecting baseline data prior to OE removal and conducting follow-up monitoring for a period of 5 years following OE removal to document recovery of sensitive plant communities and species following removal actions.

This report was prepared to address the Army's habitat monitoring requirements as identified in the HMP for OE removal actions. As annual data accumulate OE sites that have similar characteristics (successional stage, aspect, slope and soil type) are expected to exhibit trends in species composition and distribution. These findings may be useful to refine the vegetation removal methods (mechanical and burning) and OE removal methods to minimize adverse effects on the chaparral community in general and HMP species in particular.

1.1 Habitats and Species Considered for Habitat Monitoring

Sensitive habitats occurring on OE removal sites include central maritime chaparral and wetland habitats. These communities provide ecological conditions necessary for many of the special-status plants and animals identified in the HMP. Baseline surveys are conducted to characterize central maritime chaparral in terms of shrub species composition and cover dominance, and to characterize the location and extent of special-status animal and

herbaceous plant populations. Similarly, surveys in wetland habitats are conducted to characterize vernal pools and ponds in terms of size, and environmental parameters such as water depth, pH, and turbidity, the occurrence of special-status animals, and percent vegetative cover. Follow-up surveys and monitoring are being conducted to document habitat and HMP species regeneration in order to meet HMP success criteria. Success criteria for central maritime chaparral are defined in the HMP as follows "restored habitat will consist of naturally regenerating maritime chaparral that is managed using controlled burning and other techniques that maximize habitat value for HMP species." The success of restored or regenerated wetlands affected by OE removal will be gauged by comparing the functioning value of the habitat defined in terms of the percentage of native species and occurrence of special-status species before and after remediation.

HMP species associated with terrestrial OE removal sites are identified on Table 1 and include sand gilia (*Gilia tenuiflora arenaria*), Monterey spineflower (*Chorizanthe p. pungens*), coast wallflower (*Erysimum ammophilum*), seaside bird's beak (*Cordylanthus rigidus littoralis*), Monterey manzanita (*Arctostaphylos montereyensis*), Monterey ceanothus (*Ceanothus cuneatus rigidus*), Hooker's manzanita (*Arctostaphylos h. hookeri*), Eastwood's ericameria (*Ericameria fasciculata*), sandmat manzanita (*Arctostaphylos pumila*), and California black legless lizard (*Anniella pulchra nigra*). HMP species associated with wetlands include California red-legged frog (*Rana aurora draytoni*), California tiger salamander (*Ambystoma tigrinum californiense*), and California linderiella (*Linderiella occidentalis*). Although California linderiella and black legless lizard currently have no federal regulatory status, surveys are being continued in the event other listed species are encountered, and because these taxa have not been removed from the HMP.

2.0 BACKGROUND

The locations of OE removal sites where baseline studies and monitoring have been conducted to date are shown on Plate 1. All these sites are in areas proposed as habitat reserves and either support maritime chaparral and/or wetland habitats known to contain or potentially containing HMP species. Following is a summary of monitoring activities conducted from 1994 through 1997.

2.1 Previous Baseline Studies and Monitoring at Unexploded Ordnance Removal Sites 1994-1997

2.1.1 1994

Initial baseline studies were conducted by Jones & Stokes Associates (JSA) for habitat potentially affected by OE removal activities under contract to the U.S. Army Corps of Engineers (USACE). Baseline data were collected and the results were presented in the Fort Ord 1994 Annual Monitoring Report for Biological Baseline Studies at Unexploded Ordnance Sites (*USACE, 1994a*). Monitoring was initiated as part of a five-year plan required by the HMP to monitor the regeneration of vegetation and special-status species populations. Chaparral sites surveyed in 1994 included OE Sites 10A (formerly 10 West), Blackline, and 19. Herbaceous monitoring was initiated at Sites 12 and 10B (formerly 10 East). Water bodies investigated in 1994 include 01, 02, 04, 05, 16, 17, 35, 36, 37, Mudhen Lake West, and Mudhen Lake East.

2.1.2 1995

In 1995 JSA monitored sites disturbed by OE removal after the initial baseline studies of 1994 in the winter of 1995. Wetlands wildlife surveys were also conducted. Results are summarized in the 1995 Annual Biological Monitoring Report for Unexploded Ordnance Removal Sites at Former Fort Ord (*USACE, 1995b*). All water bodies included in the 1994 baseline study were surveyed for wetland wildlife species in accordance with United States Fish and Wildlife Service (USFWS) fairy shrimp survey protocol. Areas monitored or surveyed included:

- Follow-up monitoring at Site 12 (sand gilia population identified in 1994)
- Follow-up herbaceous monitoring Site 10B (to relocate and flag the existing sand gilia population)
- Follow-up monitoring at Water Bodies 5, 16, 17, and Mudhen Lakes East and West (Site 21)
- Baseline monitoring at Water Bodies 11, 36, and 37.

2.1.3 1996

In 1996, Harding and Lawson Associates (HLA) conducted terrestrial monitoring and JSA performed wetlands monitoring. JSA continued to monitor wetland vegetation and to conduct surveys for fairy shrimp and any special-status species in water bodies initially surveyed in the 1994 baseline study. HLA conducted herbaceous surveys and monitoring of maritime chaparral habitats. In July 1996, the USACE exercised an option for additional monitoring sites and HLA began follow-up monitoring efforts at Site 10A. Areas monitored and surveyed included:

- HLA conducted baseline surveys at Sites 10B, 11, and 16
- HLA conducted follow-up monitoring at Site 10A
- HLA conducted third year follow-up monitoring for herbaceous HMP species at Site 12
- JSA conducted the third year of monitoring at 12 water bodies including 1, 2, 4, 5, 11, 16, 17, 35, 36, and 37.

2.1.4 1997 Vegetation Monitoring and Surveys

In spring 1997, a focused baseline survey for sand gilia and spineflower was conducted at Site 10A to complete the collection of baseline information for this site. No follow up monitoring was conducted at this time at other

OE sites, because no OE removal actions had occurred.

In March 1997, USACE contracted HLA to conduct wetland monitoring. Three water bodies were identified at this time as requiring baseline monitoring. Baseline herbaceous vegetation surveys were conducted at water bodies located at Site 10B (Machine Gun Flat Subarea) and at Range 37 of the Natural Resource Management Area (NRMA). A third water body, at Range 40A, was scheduled for baseline monitoring but not included because it was dry at the time of the surveys. The locations of the ponds included in the wetland monitoring are shown on Plate 1. Wetland monitoring conducted in 1997 focused on assessing the potential occurrence of California red-legged frog, characterizing wetland vegetation, and describing the physical and biological characteristics of each pond surveyed.

In July 1997 Chaparral Monitoring Polygon (CMP) was identified for baseline monitoring. The area encompasses 670.3 acres and is located on the western edge of habitat reserve lands in the NMRA. This polygon is indicated on Plate 1 and includes portions of HMP parcel numbers F1.4, F1.5 and the State route (SR) 68 Corridor. Line-intercept sampling was conducted at this site in August 1997. Herbaceous surveys were not conducted in August 1997 because the growth and flowering periods of annual HMP species such as sand gilia and spineflower were past the season for definitive population surveys and positive identification.

2.2 1998 Vegetation Monitoring and Surveys

1998 monitoring activities included conducting baseline monitoring at 10 waterbodies and both baseline and follow-up monitoring at chaparral OE sites. Wetland monitoring was conducted beginning in December 1997 at approximately one month intervals. These water bodies include numbers 3, 38, 39, 40, 41, 42, 43, and 44. Chaparral monitoring was conducted

by both Directorate of Environmental and Natural Resources (DENR) and Harding Lawson Associates biologists. The DENR conducted herbaceous HMP species sampling at OE Sites 10A, 10B, 16, 19, and 48 in the spring and early summer of 1998. Monitoring the population of sand gilia at Site 12 was abandoned after it was determined that this population was not in close enough proximity to be affected by OE removed action. The DENR biologist also collected baseline vegetation data for OE Sites 53 and 54. HLA conducted follow-up monitoring at Sites 10A, 10B and 11. OE sampling and or removal had been conducted at Sites 10A, 10B and 11. Transect endpoints at Sites 10A, 10B, 11, 16, 53, and 54 were located using a Global Positioning System (GPS) unit (Trimble Pro-XR).

Ten water bodies were identified as requiring baseline monitoring. All of the water bodies are seasonally inundated pools, and are therefore a habitat of concern as described in the HMP. The 10 sites included in the 1998 baseline monitoring are Pools 3, 38 through 45, and Machine Gun Flats at OE Site 10B. The location of these pools is shown on Plate 2. Baseline data was collected at all but one of the 10 pools; no data was collected for Pool 45 because there was no evidence of a pool or other wetland habitat in the vicinity of the mapped location of this site. In addition, complete baseline data was not required at Machine Gun Flats because baseline data were collected for this pool during 1997 baseline monitoring. Baseline monitoring conducted at Machine Gun Flats in 1998 included special-status wildlife surveys and hydrological surveys. Additionally, monitoring transect endpoints were located using GPS during the January monitoring event. During this event because of the high rainfall amount, only the upper transect endpoints were visible and were located with GPS. Baseline monitoring conducted at all other pools in 1998 included characterizing wetland vegetation, assessing the potential occurrence of special-status fauna identified in the HMP, and collecting data on the physical characteristics of each pool.

3.0 METHODS

Methods used to collect data on HMP species and habitat in the 1997 monitoring year are described in *Protocol for Conducting Vegetation Sampling at For Ord in Compliance with the Installation-Wide Multispecies Habitat Management Plan (HMP Sampling Protocol)* (USACE, 1995a). Reports from previous monitoring years (USACE, 1994, 1995b, 1996, and 1997c) and the wetland restoration plan (USACE, 1997b) were reviewed to maintain consistency in sampling methods. Methods include line-intercept sampling along permanent transects to characterize chaparral shrub cover, quadrat sampling in areas with a high percentage of herbaceous vegetation (areas visually estimated at greater than 20 percent cover), and focused surveys in suitable habitat to map the distribution of herbaceous HMP plant species. Monitoring activities at wetland sites included wetland vegetation sampling (vegetative cover by species), special-status wildlife surveys, and collection of physical and hydrological data. Chaparral and wetland sites addressed during the 1998 biological monitoring surveys are shown on Plate 2. Biological monitoring work accomplished in the Inland Firing Ranges or Natural Resource Management Area (NRMA) was accomplished with escort by an OE avoidance specialist.

3.1 Central Maritime Chaparral Habitat Monitoring

Baseline line-intercept data was collected in central maritime chaparral habitat at Sites 53 and 54 on August 21 and September 11, 1998 in advance of vegetation removal and OE clearance. Data collection at Sites 10A, 10B, and 11 was conducted between July 9 and November 5, 1998. Monitoring procedures were conducted to accommodate site-specific conditions. At Sites 10A and 10B transect data were evaluated based on original seral stage, vegetation removal method and whether or not OE sampling had occurred in the transect. There were no observed separate treatments or seral stages evident at Sites 11, 53, and 54. Transect data for each of these sites was combined to develop average cover by species for that particular site. Plates 3 through 8 display transect locations at 1998 chaparral

monitoring sites. Site-specific methods and conditions are described below:

- **Site 10A:** As described in the 1996 Annual Monitoring Report (USACE, 1996) follow-up monitoring was conducted inside sampling grids where UXO removal activities had been performed. Each transect was located in sample grids as close as possible to a known baseline (1994) sampling transect. All transects were aligned from the southwest corner to the northeast corner of a sample grid and were 138 to 147 feet in length. Where warranted herbaceous sampling was conducted. Quadrat sampling was conducted in 6 clipped (Transects 1, 3, 12, 13, 17, and 18), 6 burned (Transects 5, 7, 8, 9, 10, and 19), and 3 transitional (Transects 4, 14, and 15) grids. Although all the grids that have been sampled for OE in chaparral habitat would now be considered seral stages of chaparral, for the purposes of this report, "transitional" grids are those grids that occur in habitat designated as seral in the 1994 Monitoring Report. Seral habitat as designated in the 1994 Monitoring Report is considered to more accurately represent a transitional area between coast live oak woodland and central maritime chaparral. Site 10A had been partially burned in 1995 to remove vegetation and facilitate OE removal. Vegetation in the unburned areas was cut by hand prior to OE removal. In the hand-cut sample grids (clipped grids) low growing vegetation was cut at the ground level and taller plants were retained to varying degrees. Baseline sampling conducted at Site 10A in 1994 sampled two stages of chaparral habitat, seral and mature. Data collected during follow-up sampling in 1996 and 1998 were analyzed based on vegetation stage (seral or mature) with the affected mature chaparral sub-divided based on vegetation removal method (clipped versus burned).
- **Site 10B:** At Site 10B during baseline sampling in 1996, 15 transects were established in locations that were anticipated to correspond with future

sample grids. Utilizing this approach limited placement of transects but was useful for the collection of follow-up data from the same transects after UXO removal occurred. Site 10B was partially burned in 1997. OE sampling was conducted on this site in 1997 and 1998, however not all the originally established sample grids had been sampled for OE at the time of data collection. As a result, several of the baseline transects did not occur in sample grids. This combination of partial burning and incomplete OE sampling led to four types of field conditions:

- Transects occurring in burned areas where OE sampling had been conducted, transects in clipped grids where OE had been sampled
- Transects in burned areas where no sampling had occurred
- Transects in unburned and unsampled areas.

Sampling was not conducted along transects in undisturbed, unsampled areas (this includes Transects 3, 4, and 5). Data were collected along transects in burned areas where no OE sampling had occurred (Transects 6, 7, 8, and 11) in order to compare with data collected along transects in locations where both OE removal and burning had occurred (Transects 1, 9, 10-2, and 14). Data were collected along transects in clipped sample grids (Transects 2 and 12). Herbaceous monitoring was conducted along transects in areas that had greater than 20 percent cover contributed by herbaceous species. Herbaceous sampling was not conducted in clipped grids as cover contributed by herbaceous species was observed to be less than 20 percent.

- Site 11: A complete OE removal action has been conducted at Site 11. Vegetation had been cut and placed in linear rows over the site. Seven baseline transects had been installed during baseline monitoring that incorporated the range of observed habitat variation. Most of the transect endpoints had been removed during OE removal. New transect endpoints were established in approximately the same locations in these

instances. Two transects (Transects 4 and 7) occurred outside an adjacent sampled area. A new transect (Transect 8) was established inside the sampled area to collect data that was representative of Transects 4 and 7.

- Site 53: Baseline conditions were sampled at OE Site 53. Five 100-foot by 100-foot sample grids were installed at this site. Two of these grids contained central maritime chaparral habitat. One transect was established in each grid containing chaparral habitat. Herbaceous sampling was not warranted or conducted as cover by herbaceous species was observed to be less than 20 percent.
- Site 54: Baseline conditions were sampled at OE Site 54. Transects were established in sample grids inside a tentative 24 acre burn polygon. This polygon is the western side of OE Site 54 and is not anticipated to represent the entire OE site. A total of four transects were established in sample grids occurring in chaparral habitat. More transects may be installed if the boundaries of the site expand. Herbaceous sampling was not warranted or conducted at this site, as cover by herbaceous species was observed to be less than 20 percent.

3.1.1 Line-Intercept Sampling

To determine the shrub composition, cover, and abundance, a measuring tape was extended the length of the transect over the woody canopy. Cover was recorded for the distance that each species intercepted the tape. Intercept distance for each species was recorded separately to include foliar overlap. Additional species observed within 10 meters of the transect were also noted. Intercept distances of each species were combined and this total was divided by the length of the transect, multiplied by 100 to obtain percent cover. Cumulative intercept distances for all cover types (i.e., shrubs, bare ground, and vegetated ground) were combined for each seral stage or vegetation removal method and divided by the total length of transects sampled and multiplied by 100 to provide a numerical estimate of average cover by species or cover type.

Transect locations for baseline and follow-up sampling were located using GPS equipment. Transect locations are indicated on Plates 3 through 8. Four- or five-foot, lightweight t-posts were installed at endpoints and photographs were taken to record location and condition of the sampling transect. Transect numbers were etched into aluminum tags that were attached to both endpoints. Most transects were 50 meters (approximately 164 feet) in length. In some cases, transect length was limited by tall, impenetrable brush or steep terrain. In most cases at follow-up monitoring sites, old transect endpoints had been removed during OE sampling. At these locations, new transect endpoints were installed as close as possible to the original location.

For baseline sampling at Sites 53 and 54, transects were established in sample grids in chaparral habitat. Transects were strategically placed to incorporate areas of varying slope, aspect and species composition. Methods to determine adequate sample size for each variation of chaparral habitat type (or seral stage) was not conducted at OE Sites 53 and 54. The limited number and habitat present in sampling grids precluded this method. If these sites expand in size, sample size will be determined by calculating a running total of average cover for the dominant and/or HMP species if present. This total will be graphed versus a running total of combined transect length. An adequate sample size will be considered reached when incorporating an additional transect to the combined data effected a change of less than 10 percent in average cover.

3.1.2 Quadrat Sampling

Quadrat sampling was used to characterize the herbaceous component of chaparral habitat. Quadrat sampling was conducted along transects that contained greater than 20 percent (visually estimated) cover contributed by herbaceous plant species. Quadrat sampling was conducted along the line intercept tape at 10 meter intervals. Sampling was conducted along the transects by placing a 0.25-meter square quadrat at the starting point and at 10-meter intervals alternating from the right to left side of the transect. Plant species present within the quadrat were identified, percent

cover was estimated for each species, and data were recorded.

3.2 Herbaceous Species Monitoring

The DENR biologist conducted spring field surveys for sand gilia, Monterey spineflower and seaside bird's beak to identify the location and extent of populations on OE Sites 10A, 10B, 19, 16, and 48. Before surveys were conducted, aerial photographs of the site were inspected to identify potentially suitable habitat. Areas were surveyed by traversing suitable habitat along transects of opportunity. Identified populations were mapped on aerial photographs and population size was directly counted or estimated. Information regarding population locations of herbaceous HMP species on OE Site 54 was received from the Bureau of Land Management (BLM).

3.3 Wetland Monitoring

Baseline wetland monitoring was conducted at nine Pools: 3, 38 through 44, and Machine Gun Flats. A tenth pool (Pool 45) was identified as requiring baseline monitoring but was not monitored because there was no evidence of a pool or wetland habitat in the vicinity of the mapped location of the site. Baseline monitoring at Machine Gun Flats was initiated in 1997, but was not completed (as described in the *1997 Annual Habitat Monitoring Report, HLA, 1997*). No monitoring data had been collected at the remaining eight sites prior to the 1997-1998 surveys.

The purpose of the wetland monitoring was to collect baseline data on wetland-associated HMP wildlife species and wetland vegetation prior to OE removal activities. As required by the HMP, monitoring focused on characterizing wetland vegetation (percent cover by species), determining the presence or absence of special-status species identified in the HMP (California red-legged frog, California tiger salamander, California linderiella), and describing the physical characteristics of each pool.

Surveys were conducted during four monitoring events: December 1997, and January, February, and April 1998. Each pool was surveyed once during each monitoring event. Methods used to gather baseline data on

wetland-associated HMP wildlife species and wetland vegetation were developed in accordance with guidelines specified in the HMP and are described briefly in the sections below.

3.3.1 Wetland Vegetation Sampling

Wetland vegetation sampling was conducted at seven of the nine pools monitored in 1998: 3, 38, 39, 40, 42, 43, and 44. Wetland vegetation sampling was not required at Machine Gun Flats because baseline vegetation sampling had been conducted in 1997. Wetland vegetation sampling was not conducted at Pool 41 because high rainfall in 1998 resulted in apparently abnormal flooding, and vegetation within the pool and at the pool edges consisted primarily of submerged upland vegetation.

Herbaceous sampling was conducted using a modified quadrat method identified in HMP Sampling Protocol (USACE, 1995). The primary modification of the sampling protocol presented in the above referenced document is the interval between quadrats. The original protocols were developed for vegetation sampling in chaparral habitat. Due to high variability of herbaceous species composition and cover over short distances in wetland habitats monitored in 1998, quadrats were placed at shorter intervals (approximately every 10 feet instead of every 10 meters) to capture abrupt vegetation changes that were evident in the field.

One to two transects were placed at each pool (depending on size and habitat), and transects ranged in length from 47 to 239 feet. The number, location, and length of transects were selected to provide data representative of the transitional and emergent habitats at each site. Five-foot lightweight t-posts were installed at endpoints and photographs were taken to record location and condition of the sampling transect. Transect endpoints were located using GPS unit. Sampling was conducted along the transects by placing a 0.25-meter square quadrat at the starting point and at approximate 10-foot intervals alternating from the right to left side of the transect. Plant species present within the quadrat were identified, percent cover was estimated for each species, and data were recorded.

3.3.2 Fauna

Wetland-associated HMP wildlife species that could be affected by OE removal activities and that currently require post-OE removal monitoring include California linderiella and other fairy shrimp species, California tiger salamander, and California red-legged frog. Baseline monitoring was conducted at all nine pools, and included surveys for these wildlife species and other potentially occurring special-status species including southwestern pond turtle (*Clemmys marmorata pallida*) and tricolored blackbird (*Agelaius tricolor*). All vertebrate species observed during wildlife surveys were recorded in field logs.

Surveys for California linderiella and other fairy shrimp species were conducted at each pond once each month, in December (1997), January, February, and April. Surveys were conducted to determine presence/absence; in addition, when fairy shrimp were observed their relative abundance was estimated. To assess the presence/absence of California linderiella and other fairy shrimp, representative portions of each pool were sampled using a dipnet and samples were examined for presence of fairy shrimp. Specimens were examined with a field magnifying lens to identify genus. Samples were collected systematically from each pool until habitat was adequately represented. To estimate relative abundance, 20 or 40 random samples were collected from throughout the pool (depending on pool size) and the total number of linderiella in all 20 (or 40) samples tallied. Relative abundance was defined as follows:

- Low abundance: 1 to 10 linderiella
- Moderate abundance: 11 to 100 linderiella
- High abundance: 101 to 300 linderiella
- Very high abundance: more than 300 linderiella.

Surveys to determine presence/absence of California tiger salamander were conducted in April at each pond. To assess the presence/absence of California tiger salamander, representative portions of each pool were sampled using a dipnet and samples were examined for presence of California tiger

salamander larvae. Samples were collected systematically from each pool until habitat was adequately represented.

Surveys to determine the presence/absence of suitable habitat for California red-legged frog were conducted during all visits (December, January, February, and April). Habitat features such as duration of ponding and presence of submergent and emergent vegetation and adequate upland estivation habitat were noted. Surveys to assess the presence/absence of adult California red-legged frog were conducted by slowly walking the perimeter of each pool, and moving back and forth between open water and wetland vegetation at the edge of the pool looking for evidence of adult frogs.

3.3.3 Physical Characteristics

Physical data collected at all nine wetland sites included water pH and turbidity measurements, water depth, duration of ponding, and the surface area of each pool (measured using GPS).

Turbidity and pH data were collected at least twice during the during vegetation surveys, no sooner than 24 hours after a storm event. Data were collected prior to other survey activities which might affect the accuracy of turbidity and pH measurements (e.g., vegetation sampling or dipnetting). Turbidity was measured using a portable turbidimeter, and pH was measured using a portable field pH meter. Both the turbidimeter and pH meter were calibrated daily prior to data collection.

Maximum water depth was measured during each monitoring event using a 6-foot aluminum depth gauge. The area of maximum depth was estimated by wading toward the center of each pool until the apparent maximum depth was identified. Wading throughout *the pools* was minimized to avoid disturbance to the vernal pool habitat.

The area of ponding was measured during each monitoring event (December, January, February, and April). The perimeter of the area of ponding was staked using 12-inch wooden stakes during the December monitoring event. These stakes were used as a reference for standardizing measurement of area during future monitoring events. During the December monitoring event the area of all pools except 38, 41, and Machine Gun Flats was also measured using GPS. (GPS data were not collected at Pools 38, 41, or Machine Gun Flats because inclement weather interfered with operation of the GPS unit.) GPS measurements were collected again in January at all pools. Area measurements in February and April are based on visual estimates of the percent increase or decrease in total area as compared to the area staked in December.

The duration of ponding was not recorded during the 1998 surveys. All water bodies ponded water from the time of the first survey in December (1997) through the last site visit in May 1998.

4.0 RESULTS

4.1 Central Maritime Chaparral Habitat Monitoring

Results of line-intercept and quadrat sampling of central maritime chaparral habitat are summarized below and presented graphically in Figures 6 through 20. The Baseline Biological Report for Fort Ord (USACE, 1992), describes Fort Ord as supporting two weakly differentiated chaparral types that occur on different soil (Sand Hill Formation versus Aromas Formation). The chaparral on Sites 10A, 10B, 11, and 54 occur on the Aromas Formation. Chaparral habitat occurring on Site 53 occurs both on Sand Hill soils (*Oceano series*) and Aromas Formation. HMP shrub species observed during monitoring at OE sites include Monterey manzanita, Hooker's manzanita, Eastwood's ericameria, Monterey ceanothus, and sandmat manzanita. Figures 1 through 5 display photographs of representative habitat sampled during monitoring events.

4.1.1 Site 10A

Results of line-intercept sampling (intercept distances and percent cover by cover type [i.e., shrub species, bare, and vegetated ground]) are presented in Tables 2 (clipped grids), 3 (burned grids), and 4 (transitional grids). These results are graphically presented in Figures 6 (clipped), 7 (burned), and 8 (transitional). Dominant shrub species (species contributing greater than 5 percent cover) vary by habitat type and vegetation removal method. In clipped grids clear dominants include chamise (*Adenostoma fasciculatum*) at 9.27 percent, Monterey manzanita at 14.03 percent and shaggy-bark manzanita (*Arctostaphylos tomentosa*) at 16.58 percent. Burned grids are dominated by chamise at 7.53 percent, shaggy-bark manzanita at 12.16 percent, rush rose (*Helianthemum scoparium*) at 19.04 percent, and deer brush (*Lotus scoparius*) at 6.35 percent. Transitional grids are dominated by coast live oak (*Quercus agrifolia*) at 14.75 percent, rush rose at 12.34 percent and deer brush at 9.41 percent. HMP shrub species encountered at Site 10A in clipped grids and

their average cover are as follows: Monterey manzanita (14.03 percent), Hooker's manzanita (2.11 percent), Monterey ceanothus (0.92 percent), sandmat manzanita (0.57 percent) and Eastwood's ericameria (0.22 percent). HMP shrub species encountered at Site 10A in burned grids and their average cover are as follows: Monterey manzanita (0.16 percent), Hooker's manzanita (1.22 percent), Monterey ceanothus (1.94 percent), and Eastwood's ericameria (0.05 percent). Monterey manzanita (3.78 percent) was the only HMP shrub species encountered at Site 10A in seral grids.

A significant portion of cover at Site 10A was contributed by herbaceous vegetation. Results of quadrat sampling are presented in Tables 5 (clipped grids), 6 (burned grids), and 7 (seral grids). These results are graphically presented in Figures 9 (clipped), 10 (burned), and 11 (transitional). Species diversity and average cover were estimated to be greater in burned and transitional grids. Average cover contributed by herbaceous vegetation (sampled in quadrats) was calculated to be 28.4 percent in clipped grids, 40.83 percent in burned grids and 60.18 percent in transitional grids. In clipped grids, of the 51 species encountered during herbaceous sampling, 14 are non-native and contribute 22.84 percent of total cover. In burned grids, of the 38 species encountered, 12 are non-native and contribute 28.37 percent of total cover. In transition grids, of the 29 species encountered, 10 are non-native and contribute 38.86 percent of the total cover.

4.1.2 Site 10B

Central maritime chaparral species composition on Site 10B varied depending on disturbance type. Both burned and clipped areas are dominated by stump-sprouting shaggy-bark manzanita and chamise. However, burned areas had greater percent cover by rush rose and other herbaceous seral species. Results of line-intercept sampling (intercept distances and percent cover by cover type [i.e., shrub species, bare, and vegetated ground]) are presented in Tables 8 (clipped grids), 9 (burned grids with OE sampling), and 10 (burned areas with no OE sampling). These results are graphically

presented in Figures 12 (clipped), 13 (burned grids with OE sampling), and 14 (burned areas with no OE sampling).

Dominant shrub species vary between clipped and burned grids. In clipped grids, Monterey manzanita (12.42 percent cover) and shaggy-bark manzanita (23.11 percent cover) dominate. In burned grids chamise varies between 1.44 to 7.53 percent cover, shaggy-bark ranges between 12.16 to 16.22 percent cover, and rush rose ranges from 16.05 to 19.04 percent cover. HMP shrub species encountered at Site 10B and their average cover are as follows: Monterey manzanita (clipped grids 12.4 percent; burned grids with OE sampling 0.15 percent; burned grids with no OE sampling 1.98 percent), Hooker's manzanita (clipped grids 2.1 percent; burned grids with OE sampling 0 percent; burned grids with no OE sampling 0.02 percent), Monterey ceanothus (clipped grids 0 percent; burned grids with OE sampling 0.87 percent; burned areas with no OE sampling 1.01 percent), and Eastwood's ericameria (clipped grids 0 percent; burned grids with OE sampling 0.05 percent; burned grids with no OE sampling 0 percent).

Cover contributed by herbaceous vegetation at Site 10B is displayed in Tables 11 (burned areas with OE sampling) and 12 (burned areas with no OE sampling). Results are graphically displayed in Figures 15 (burned with OE sampling) and 16 (burned with no OE sampling). Cover estimated with the quadrat method was similar in areas sampled and not sampled for OE. Average cover contributed by herbaceous species was estimated to be 33 percent in burned grids with OE sampling and 30.02 percent in burned areas with no OE sampling. In burned grids with OE sampling, 21 species were recorded in herbaceous sampling; of these 3 are non-native herbs or grasses and contribute 1.66 percent to the total cover. In burned areas that were not OE sampled, 37 species were encountered; 8 are non-native and contribute 8.42 percent of the total cover.

4.1.3 Site 11

Vegetation on OE Site 11 had been cut and placed in rows during OE sampling. The dominant shrub cover was contributed by chamise (*Adenostoma fasciculatum*), at

9.11 percent cover and sticky monkey flower (*Mimulus aurantiacus*) at 8.66 percent cover, Monterey manzanita at 5.52 percent cover and shaggy-bark manzanita at 5.30 percent cover. Intercept distances for Site 11 are presented in Table 13 and graphically represented in Figure 17. HMP shrub species encountered at Site 11 and their average cover are as follows: Monterey manzanita (5.52 percent), and Monterey ceanothus (0.08 percent). Cover contributed by herbaceous vegetation at Site 11 was as calculated using the quadrat method at 52.43 percent. 34 species were observed during herbaceous sampling and of these, 11 are non-native contribute 20.17 percent to overall cover.

4.1.4 Site 53

Chaparral on OE Site 53 is dominated by yerba santa (*Eriodictyon californicum*) (22.80 percent cover), coyote brush (*Baccharis pilularis*) (37.85 percent cover), while manzanita and ceanothus species combined contribute 28.02 percent to overall cover. HMP shrub species sampled at Site 53 and their average cover were as follows: Monterey manzanita (8.35 percent) and Monterey ceanothus (0.89 percent). Cover contributed by herbaceous species was calculated to be 16.54 percent.

4.1.5 Site 54

Chaparral on OE Site 54 is dominated by chamise (18.77 percent cover), shaggy-bark manzanita (25.57 percent cover) and by Monterey ceanothus (15.82 percent cover) and cropleaf ceanothus (*Ceanothus dentatus*) (12.92 percent cover) coast live oak (11.03 percent cover) and coyote brush (6.41 percent cover). HMP shrub species sampled at Site 54 and their average cover are as follows: Monterey manzanita (1.45 percent), Hooker's manzanita (1.95 percent), sandmat manzanita (0.28 percent), and Monterey ceanothus (15.82 percent). Cover contributed by herbaceous species was calculated to be 1.78 percent.

4.2 Herbaceous Species Monitoring

Herbaceous HMP species observed on sites sampled during 1998 surveys include sand gilia, Monterey spineflower, and Seaside

bird's-beak. Plates 3, 4, 6 and 8 indicate the location and distribution of herbaceous HMP plant species observed during the 1998 monitoring surveys. OE Sites surveyed include 10A, 10B, 16, 19, 48, 53 and 54. Bureau of Land Management (BLM) personnel conducted surveys for herbaceous HMP species at Site 54. Vegetation on OE Site 53 was removed by cutting in fall 1998. Monterey spineflower was not observed in clearance grids on Site 53 and surveys for sand gilia were not conducted, as it was too late in the flowering season for definitive surveys for this species.

Site 10A

Surveys for herbaceous HMP species were conducted at OE Site 10A in the first week of July 1998. Herbaceous HMP species observed on Site 10A include one population of Monterey spineflower and two populations of sand gilia. Monterey spineflower was observed on a sandy road in the central portion of the site. Two previously mapped populations of sand gilia were field checked. A population which was recorded in 1997 composed of six individuals could not be located. A second population consisting of approximately 200 individuals was observed. Plate 3 displays locations and sizes of herbaceous HMP species populations on Site 10A.

Habitat adjacent to these populations consists of coast live oak (*Quercus a. agrifolia*) woodland grading into central maritime chaparral. Common herbaceous associates include diffuse spineflower (*Chorizanthe diffusa*), Monterey spineflower, valley lessingia (*Lessingia glandulifera pectinata*), virgate eriastrum (*Eriastrum virgatum*), rough navarretia (*Navarretia atractyloides*), smooth cat's-ear (*Hypochaeris glabra*), and common filago (*Filago gallica*).

Site 10B

Surveys for herbaceous HMP species were conducted at OE Site 10B on June 30, 1998. Herbaceous HMP species observed on Site 10B include one large population of Monterey spineflower, one large extensive population of seaside bird's beak and four populations of sand gilia.

Monterey spineflower

Monterey spineflower was observed in low densities over a wide area in the southwestern corner of the site. Monterey spineflower was typically observed in at low densities in areas with loose sand on at the edges of coast live oak woodland and grassland or in openings in coastal scrub and chaparral. Common associates observed with Monterey spineflower include virgate eriastrum, needle-leaved navarretia (*Navarretia intertexta*), smooth cat's-ear, ripgut grass, wild oat, California croton (*Croton californicus*), filaree (*Erodium* spp.), valley lessingia, rough navarretia, and common filago.

Sand gilia

Three of the sand gilia populations are found in the same area as the Monterey spineflower, two of these populations contained 50 individuals each while the other contained 20 individuals. A relatively large widespread population of sand gilia was observed in the south eastern portion of Site 10B. This population was estimated to contain between 1,000 to 5,000 individuals. Sand gilia observations on Site 10B included two populations consisting of 50 individuals each and a third consisting of 20. Of these populations, one was described in the 1995 monitoring report (*USACE, 1995b*) and two were identified in the 1996 Annual Monitoring Report. The third was a previously unrecorded population. These populations were observed in coast live oak woodland, transitional or in central maritime chaparral habitats. Common herbaceous or suffrutescent associates include rush rose (*Helianthemum scoparium*), wedge-leaved horkelia (*Horkelia c. cuneata*), golden yarrow (*Eriophyllum confertiflorum*), virgate eriastrum, rough navarretia, Monterey spineflower, Seaside bird's-beak, Valley lessingia, virgate eriastrum, rough navarretia, smooth cat's-ear, and common filago. Plate 3 indicates the location and number of individuals in each sand gilia populations observed on Site 10B.

Seaside bird's beak

The extent of the population on Site 10B is indicated on Plate 4 and consists of several hundred, possibly thousands of individuals. This population is primarily associated with coast live oak woodland, grassland, and coastal scrub habitats on depositional soil in the

southern portion of the site. Scattered individuals occur immediately adjacent to Barloy Canyon Road along most of the eastern edge of Site 10B. Common associates include coast live oak, black sage, chamise, mock heather (*Ericameria ericoides*), golden yarrow, Monterey manzanita, sticky monkey flower, poison oak (*Toxicodendron diversilobum*), slender wild oat, ripgut grass, field mustard (*Hirschfeldia incana*), and telegraph weed (*Heterotheca grandiflora*). Seaside bird's beak was observed along the southern portion of Site 10B. Two density categories were identified. On the west side of the site, bird's beak was observed in separate clusters at densities of 10 to 30 individuals in a 100 square meter area. On the east side of Site 10B, bird's beak occurs as several clusters at densities between 50 and 60 individuals in an area of 100 m².

Site 16

Surveys for herbaceous HMP species were conducted at OE Site 16 June 4, 1998. No sand gilia or seaside bird's beak were recorded in suitable habitat areas. Three populations of low density (estimated as ranging from tens to hundreds of individuals per acre) Monterey spineflower were observed and mapped. Plate 6 displays the locations of these populations.

Sites 19, 48 and 53

Surveys for herbaceous HMP species were conducted at these sites in June 1998. No herbaceous HMP species were recorded in suitable habitat at any of these sites.

Site 54

Surveys for herbaceous HMP species were conducted at these sites by BLM. One population of Monterey spineflower was identified adjacent to Watkins Gate Road. Plate 8 displays the locations of this population. No other herbaceous HMP species were observed in suitable habitat at this site.

4.3 Wetland Monitoring

Results of the wetland monitoring are discussed below.

4.3.1 Wetland Vegetation Sampling

A total of eleven transects were placed at seven wetland monitoring sites in 1998. Data for

Pool 3 was divided into Pool 3-East and Pool 3-West because these two pools were discontinuous and dissimilar in both vegetation and faunal communities. Transects ranged from 47 to 239 feet long. Transect lengths, number of quadrats and total area sampled on each transect are summarized in Table 19. The relative percent cover by species for each pool is summarized in Tables 20 through 27. Plates 9 through 13 indicate transect and photopoint locations and the maximum measured boundary of each pool. Figures 30 through 37 present graphic representations of the species composition at each pool sampled during the 1998 monitoring period. Non-native plant species are indicated in Tables 20 through 27 and Figures 30 through 37 by an asterisk. Plant species observed during 1998 wetland monitoring are listed in Table 17.

Thirty-nine plant species were recorded at Pool 3-East. Dominants, present at greater than 10 percent of the combined average cover, included needle spikerush (*Eleocharis a. acicularis*), and common spikerush (*Eleocharis macrostachya*). Brown-headed rush (*Juncus phaeocephalus*), iris-leaved rush (*Juncus xiphioides*), and coyote thistle (*Eryngium aristulatum*) were present between 6.9 and 8.9 percent of the combined average cover. Most of the other plant species were present at 1 percent or less of the combined average cover. Cover by non-native species was calculated to be 7.14 percent of the total combined average cover at Pool 3-East.

Sixteen plant species were recorded at Pool 3-West. Dominants, present at greater than 10 percent of the combined average cover, included common spikerush. Cut-leaf plantain (*Plantago coronopus*), coyote thistle, and water star-wort (*Callitriche heterophylla*) were present between 4.3 and 7.1 percent of the combined average cover. Most of the other plant species were present at 1 percent or less of the combined average cover. Cover by non-native species was calculated to be 8.09 percent of the total combined average cover at Pool 3-West.

Twenty-one plant species were recorded at Pool 38. Dominants, present between 2 and 8 percent of the combined average cover included brown-headed rush, iris-leaved rush, common spikerush, and cut-leaved plantain. No plants were present at greater than

10 percent of the combined average cover. Most of the other plant species were present at 1 percent or less of the combined average cover. Cover by non-native species was calculated to be 4.57 percent of the total combined average cover at Pool 38.

Twenty-two plant species were recorded at Pool 39. Dominants, present between 3 and 8 percent of the combined average cover included common spikerush, cut-leaved plantain, Italian ryegrass (*Lolium multiflorum*), broadleaf filaree (*Erodium botrys*), riggut (*Bromus diandrus*), and water star-wort. No plants were present at greater than 10 percent of the combined average cover. Other plant species were present at 3 percent or less of the combined average cover. Cover by non-native species was calculated to be 26.37 percent of the total combined average cover at Pool 39.

Twenty plant species were recorded at Pool 40. Dominants, present at greater than 10 percent of the combined average cover, included iris-leaved rush, common spikerush, and cut-leaved plantain. Fescue (*Vulpia* sp.), needle spikerush, and California oatgrass (*Danthonia californica*) were present between 2.1 and 4.4 percent of the combined average cover. Other plant species were present at 1 percent or less of the combined average cover. Cover by non-native species was calculated to be 11.65 percent of the total combined average cover at Pool 40.

Nineteen plant species were recorded at Pool 42. Dominants, present at greater than 10 percent of the combined average cover, included needle spikerush, brown-headed rush, coyote thistle, and California oatgrass were present between 5.0 and 6.4 percent of the combined average cover. Other plant species were present at 1 percent or less of the combined average cover. Cover by non-native species was calculated to be 1.43 percent of the total combined average cover at Pool 42.

Twenty-one plant species were recorded at Pool 43. Dominants, present at greater than 10 percent of the combined average cover, included flowering quillwort (*Lilaea scilloides*). Water star-wort, needle spikerush, stonewort

(*Tolypella* sp.) and California oatgrass were present between 4.1 and 8.1 percent of the combined average cover. Other plant species were present at 1 percent or less of the combined average cover. Cover by non-native species was calculated to be 1.01 percent of the total combined average cover at Pool 43.

Twenty-six plant species were recorded at Pool 44. Dominants, present between 8 and 10 percent of the combined average cover, included needle spikerush, coyote thistle, toad rush, flowering quillwort, and water star-wort. Beach evening primrose (*Camissonia ovata*) and hyssop-leaved loose strife (*Lythrum hyssopifolium*) were present at 4.4 and 3.3 percent of the combined average cover, respectively. Most other plant species were present at 1 percent or less of the combined average cover. Cover by non-native species was calculated to be 4.1 percent of the total combined average cover at Pool 44.

4.3.2 Fauna

California linderiella were observed at all pools except 38 and 40. California linderiella were observed in the most ponds and in the greatest numbers in January. The greatest abundance of linderiella was recorded at Machine Gun Flats in January; Pool 3-West also had a high abundance in January. The abundance of linderiella dropped significantly in all pools in February. The only pool with linderiella observed during every monitoring event was Machine Gun Flats.

Neither California tiger salamander nor red-legged frog were observed at any pool. Pacific treefrog (*Hyla regilla*) adults and larvae were observed in all pools, and bullfrog (*Rana catesbeiana*) adults were observed in Machine Gun Flats. Other vertebrate fauna observed during the surveys are listed in Table 18.

4.3.3 Physical Characteristics

The physical parameters measured during the 1998 wetland monitoring include water depth, area of ponding, turbidity, and pH, and are summarized in Table 28. The maximum water depth and area of ponding was observed in February and April, with very little change

recorded between these 2 monitoring events. Plates 9 through 13 indicate the maximum measured boundary of each pool measured using GPS in January, 1998. Turbidity measurements were lowest in January; Pool 38 showed consistently high turbidity and Pools 41, 42 and 44 were notably clear. PH measurements ranged from 7.25 at Machine Gun Flats to 9.72 at Pool 43.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 Central Maritime Chaparral Habitat Monitoring

Data collected for this 1998 Annual Monitoring Report represent baseline data collection from Sites 53 and 54, first-year of follow-up monitoring at Sites 10B and 11 and the second year of follow-up monitoring at Site 10A. Follow-up monitoring conducted at Sites 10A, 10B and 11 provides first- and second-year data collection following OE removal activities on Fort Ord. This year's monitoring represents the first opportunity to compare the recovery of chaparral habitats following burning or clipping. The location of transects at Site 10B additionally provide the opportunity to compare chaparral recovery in areas that were burned but not OE sampled to areas that were burned and OE sampling was conducted.

5.2 Herbaceous Species Monitoring

Sand gilia, and seaside bird's-beak populations were observed at similar densities and extent as during previous monitoring events. Monterey spineflower populations were found to be less extensive than previously presented. It appears that populations of Monterey spineflower on the southern portion of Site 10A and at scattered locations on Site 10B had been * originally recorded (by others) as *C. p pungens*; upon further review this year, these populations were identified as *C. diffusa*. In the previous years monitoring HLA biologists had been assumed that earlier taxonomic determinations had been correct. The result is that the areal extent of *C. p pungens* on these sites is less than originally mapped.

At Sites 10A and 10B two forms of gilia were observed and mapped as HMP species. One form was large, upright and had stamens that were somewhat exerted from the floral tube. The other form was small and had stamens that were mostly included in the floral tube. The large form with exerted stamens could meet the taxonomic criteria for a closely related species slender gilia (*Gilia t. tenuiflora*). Some of the previously mapped populations of sand gilia on these sites may be slender gilia.

These two forms occur in populations located in close proximity to each other and some individuals display features which are intermediate between the two forms. The population of sand gilia observed at Site 10A, during the 1998 surveys was the large form with exerted stamens. At Site 10A, the large population of individuals consisting of 1,000 to 5,000 individuals was the small form with mostly included stamens. The population of 50 individuals located farthest to the south also was the small form with mostly included stamens. The remaining populations at Site 10B were the large form with exerted stamens.

5.3 Vegetation Removal Method

The method of vegetation removal is expected to influence community composition by affecting recruitment and species interactions in successional stages. Presented in this section are generalizations that are supported by qualitative evaluation of data collected to date.

The most evident trend observed during chaparral habitat monitoring is related to the vegetation clearing method. Clearing vegetation by cutting and chipping followed by leaving the debris onsite appears to reduce germination by some shrub and most herbaceous species. This method of vegetation removal clearly influences the change in species composition over time. Several observations bear noting and these include:

- Seedlings of HMP shrub species were rarely observed in clipped grids but were common in burned grids. (clipping appears to reduce or at least not encourage reproduction from seed)
- Cover by herbaceous vegetation was generally lower in clipped grids compared to burned grids
- Clipped grids had a higher proportion of bare unvegetated ground than burned grids

Note: Monterey spineflower had not been reported for 10b before 1998 - JH

- Species diversity was generally lower in clipped grids compared to burned grids
- Species which occur early in chaparral succession, but which may also occur in mature stands such as sticky monkey flower and rush rose showed differing abundance in clipped versus burned grids (cover by sticky monkey flower in clipped grids was higher than in burned grids; the opposite trend was observed for rush rose (cover was higher in burned grids versus clipped grids))
- Brush piles placed in windrows (OE Site 11) appear to interfere with chaparral regeneration by occupying habitat and shading the understory
- Burning appears to increase the rate of colonization of weed species such as iceplant and Pampas grass.

The majority of remaining shrubby vegetation in clipped grids at OE sites 10A, 10B and 11 was observed to be dominated by burl-forming chamise and shaggy-bark manzanita and by trimmed Monterey manzanita. Seedlings were observed to be uncommon in clipped grids. Shrub cover in burned grids was also observed to be from burl-formers such as chamise and shaggy-bark manzanita. However, numerous shrub seedlings were observed to be fairly abundant in burned grids. Seedlings observed in burned grids included Monterey ceanothus, tooth-leaved ceanothus, Monterey manzanita, shaggy-bark manzanita, and chamise. The presence of these seedlings indicates potential regeneration of the species following OE removal.

Cover by HMP shrub species (all of which reproduce by seed) in burned grids is primarily contributed by young seedlings. This contrasts with the cover contributed by HMP species in clipped grids which is largely from mature plants that were selectively pruned to facilitate OE removal. It appears, based on data collected to date, that regeneration of seed reproducing HMP species in clipped grids will not occur until the next fire cycle.

No significant differences were noted between burned and OE sampled areas and burned areas with no OE sampling. Cover data collected on Site 10B was comparable from both of these

areas. The cover contributed by dominant species were similar between these two treatments. Areas that were burned and not sampled for OE were observed to have a larger number of herbaceous species encountered during quadrat sampling. However, no definite trend in species composition is apparent from the available data.

Other factors likely to influence chaparral regeneration that are difficult to quantify at this time include fire intensity and seasonal timing of the burn. Fire is known to denature or neutralize germination inhibitors in the soil or duff layers and converts dead vegetative material to minerals on the seed bed. Seasonality of the burning may change species composition of early successional stages (fire during the optimal season [late summer to fall] will remove chemical inhibitors, reduce competition, and break seed dormancy at appropriate time of the year for seedling establishment and when available resources are at a maximum).

Information obtained during monitoring contributes to the knowledge base for central maritime chaparral. This information can improve the ability to predict the effects of OE and vegetation removal methods on central maritime chaparral habitat. As data accumulate from OE sites of similar vegetation removal methods, timing (burning), age, aspect, slope, and soil type may be used to refine the timing and methods of UXO removal to minimize adverse effects on the chaparral community in general and HMP species in particular.

5.4 Weed Species

Large aggregations of noxious weed species such as Hottentot fig (*Carpobrotus edulis*) and Pampas grass (*Cortaderia jubata*) are present along several roads and firebreaks at Sites 10A, 10B, and 11. These areas represent a seed source allowing colonization by these weeds in disturbed areas following ordnance removal. Both pampas grass and hottentot fig were recorded along monitoring transects in chaparral habitat at Site 10A, 10B and 11. At Sites 10A and 10B burned areas were observed to show greater establishment of iceplant and Pampas grass than clipped areas. BLM is in the process of hand removing these species at these

sites. There was evidence of these species being removed along many of the monitoring transects at both these sites. As a result, data collected may not reflect the extent of colonization by these species.

5.5 Wetland Monitoring

The findings presented here represent the first year of wetland monitoring (i.e., baseline data) at Pools 3 and 38-44, and complete the baseline monitoring begun in 1997 for Machine Gun Flats. Complete baseline data was collected at all pools except Pool 41. Additional monitoring required at this site includes vegetation sampling, which could not be conducted in 1998 due to high rainfall and flooding of the site. No additional baseline data is required for sites other than Pool 41. The location of Pool 45 was not confirmed; baseline monitoring will be required at this site if the location is identified.

6.0 REFERENCES

United States Army Corps of Engineers, Sacramento District. 1992. *Flora and Fauna Baseline Survey of Fort Ord, California*. With technical assistance from Jones and Stokes Associates (JSA-90-214). Sacramento, California. December.

_____, 1994. *Fort Ord 1994 Annual Monitoring Report for Biological Baseline Studies at Unexploded Ordnance Sites*. With technical assistance from Jones and Stokes Associates, Sacramento, California. January.

_____, 1995a. *Protocol for Conducting Vegetation Sampling at Fort Ord in Compliance with the Installation-Wide Multispecies Habitat Management Plan*. With technical assistance from Jones and Stokes Associates, Sacramento, California. September 1995.

_____, 1995b. *1995 Annual Biological Monitoring Report for Unexploded Ordnance Removal Sites at Former Fort Ord*. With technical assistance from Jones and Stokes Associates, Sacramento, California. September.

_____, 1996. *1996 Annual Monitoring Report Biological Baseline Studies and Follow-up Monitoring at Unexploded Ordnance Sites 10 East, 10 West, 11, 12, and 16*. Presidio of Monterey Annex. With technical assistance from Harding Lawson Associates, Novato, California. December.

_____, 1997a. *Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California*. With technical assistance from Jones and Stokes Associates (JSA 95-130), Sacramento, California. April.

_____, 1997b. *Wetland Restoration Plan for Unexploded Ordnance Removal Activities at Former Fort Ord*. With technical assistance from Jones and Stokes Associates, Sacramento, California. May.

_____, 1997c. *1997 Annual Habitat Monitoring Report, Former Fort Ord Monterey, California*. With technical assistance from Harding Lawson Associates, Novato, California. December.