2000 Annual Monitoring Report
Biological Baseline Studies and Follow-up Monitoring
Former Fort Ord
Monterey County, California

Prepared for

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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 after ordnance and explosive (OE) removal activities have been completed. The HMP identifies species and habitats of concern on the installation and specifies mitigation measures to monitor the successful regeneration of species and habitat following removal of OE. As part of the mitigation, follow-up monitoring would be conducted for a period of 5 years following OE removal to document effects of remediation.

Since the inception of the OE removal program the Army has elected to augment the monitoring program, where feasible to include the collection of baseline data prior to OE removal. Baseline data has been collected to provide additional information on pre-existing species composition and distribution of herbaceous annual special-status species referred to herein as HMP herbaceous species. Additionally, base closure and reuse activities conducted on the former Fort Ord are required to follow specific protocols approved by the United States Fish and Wildlife Service (USFWS) as detailed in the Biological and Conference Opinion (BO) on the Closure and Reuse of Fort Ord, Monterey County, California (*USFWS, 1999*) and identified in memoranda (*Willison, 1998*), requesting reinitiation of formal consultation with the USFWS pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended. The BO identifies additional species and habitats of concern not addressed in the April 11, 1997 biological and conference opinion that could potentially be impacted during remediation, predisposal, and reuse activities. The BO also outlines mitigation measures intended to document conditions and monitor the successful regeneration of species and habitat following remediation, predisposal, and reuse activities.

This report was prepared to address the Army's habitat monitoring requirements as identified in the HMP and BO for OE removal and groundwater remediation. As data accumulate for groundwater and OE remedial sites, these data may be used to refine methods to minimize adverse effects on HMP species.

1.1 Habitats and Species Considered for Habitat Monitoring

Sensitive habitats occurring on OE removal and groundwater remediation sites include central maritime chaparral and wetland habitats. These communities provide habitat for many of the special-status plants and animals identified in the HMP. Baseline and follow-up surveys are conducted on OE removal sites to characterize central maritime chaparral in terms of shrub species composition, cover dominance, and to characterize the location and extent of special-status animal and herbaceous plant populations. Surveys are conducted on groundwater remediation sites to characterize the location and extent of HMP herbaceous species potentially disturbed during remedial activities. Similarly, surveys in vernal pools and ponds (waterbodies) are conducted to characterize percent vegetative cover and occurrence of special-status fauna. Environmental parameters such as surface area, water depth, pH, and turbidity are also recorded for each waterbody.

Follow-up monitoring in these habitats is required to document community regeneration in order to meet HMP success criteria. Success criteria for central maritime chaparral are defined in the HMP as "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." Success criteria for herbaceous HMP species state that if, after five years, population sizes and densities are observed to vary over time within a range similar to that estimated for these species in 1992 (the first year baseline conditions were surveyed), the effort would be considered successful. 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.

Through an examination of aerial photographs of former Fort Ord and field observations, three associations, or successional stages of central maritime chaparral habitat have been identified that could be separated by fire or disturbance history. These stages include mature chaparral, intermediate-age chaparral, and disturbed chaparral. Mature chaparral is composed of fully mature to senescent stands of shrubs that are of an estimated age greater than fifteen years and are generally between six and fifteen feet in height. Mature stands have very little open ground and almost no herbaceous layer. Intermediate-age stands are estimated to be five to fifteen years old and generally range from three to six feet in height. Intermediate-age stands generally exhibit more open ground and herbaceous plant cover and generally include a more diverse species composition. Disturbed chaparral habitat, as defined in this report, include areas that were subject to regular disturbance. This habitat type is generally located in range fans with cleared rows along firing lines that are interspersed with patches of chaparral species. Disturbed stands were observed to be transitional in species composition and cover between intermediate-age chaparral and mature chaparral.

HMP species associated with terrestrial OE removal and groundwater remediation sites are identified on Table 1 and include sand gilia (*Gilia tenuiflora arenaria*), Monterey spineflower (*Chorizanthe p. pungens*), Contra Costa goldfields (*Lasthenia conjugens*), 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 goldenbush (*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 californiense*), and California linderiella (*Linderiella occidentalis*). Although California linderiella currently is not state or federally listed, surveys are being continued in the event other listed species are encountered, and because the HMP retains monitoring requirements for this species. Additional species of concern were identified in the Wetland Restoration Plan for Unexploded Ordnance Removal Activities at Former Fort Ord (WRP) (*USACE, 1997b*) as being associated with wetland habitat and having the potential to occur at former Fort Ord including southwestern pond turtle (*Clemmys marmorata pallida*) and tricolored blackbird (*Agelaius tricolor*).

1.2 Previous Baseline Studies and Monitoring at Unexploded Ordnance Removal Sites 1994-1999

The locations of OE removal and groundwater remediation sites where baseline studies and monitoring have been conducted through 1999 are shown on Plate 1. All of these sites are in areas proposed to become habitat reserves and either support maritime chaparral and/or wetland habitats known to contain or potentially containing HMP species. Table 2 summarizes monitoring activities conducted at OE and Remedial Investigation (RI) sites from 1994

through 2000. 2000 monitoring activities are included in Table 2 as a comparison to earlier monitoring activities.

1.3 2000 Vegetation Monitoring and Surveys

Monitoring activities conducted in 2000 include baseline and follow-up sampling at several terrestrial OE removal and wetland sites and characterization of HMP annuals at the University of California Natural Reserve System (UC/NRS), Fort Ord Natural Reserve (FONR). HLA biologists conducted baseline chaparral surveys in the 2000 Burn Area, at four RI sites, and at one OE site. Baseline surveys for HMP herbaceous species were conducted in the 2000 Burn Area, Multiple Range Area (MRA) West (formerly the1997 Chaparral Monitoring Polygon) and MRA North (formerly the 1999 Chaparral Monitoring Polygon) sites. HLA and Bureau of Land Management (BLM) conducted terrestrial follow-up monitoring at four OE removal sites. Follow-up surveys for HMP herbaceous species were conducted at three of these sites. Follow-up monitoring for Contra Costa goldfields was conducted at one OE site supporting Contra Costa goldfields. Baseline wetland surveys were conducted at one waterbody and follow-up wetland monitoring was conducted at three waterbodies. At the UC/NRS - FONR, the size and extent of HMP annual plant populations occurring along roads utilized for groundwater sampling were estimated.

1.3.1 Central Maritime Chaparral Monitoring

Chaparral monitoring was conducted by HLA and BLM biologists. BLM conducted follow-up chaparral monitoring at three OE removal sites, including 10A, 10B, and 19. HLA conducted follow-up chaparral monitoring at OE Site 11. HLA assessed baseline chaparral habitat conditions in the 2000 Burn Area and at RI Ranges 18, 19, 21, 24, 25, and 26. This assessment included baseline surveys conducted in 2000 at the 2000 Burn Area and at Ranges 21, 24, 25, and 26. The 2000 Burn Area encompasses approximately 400-acres of habitat reserve lands located in the northwest corner of the MRA. The easternmost portion of MRA North overlaps the 2000 Burn Area boundary. Additional baseline chaparral data utilized in the characterization of habitat at the 2000 Burn Area was collected in 1999 as part of the MRA North Chaparral Monitoring Program (*USACE, 1999*). This data has been incorporated into the overall baseline chaparral data for the 2000 Burn Area. Baseline surveys were not conducted for Ranges 18 and 19 in 2000 as baseline chaparral surveys previously conducted in 1999 as part of MRA North Chaparral Monitoring Program included habitat reserve areas within Ranges 18 and 19. Additional baseline data collected in MRA West in 1997 was used to identify baseline conditions in Range 19. Baseline chaparral surveys conducted at Ranges 21, 24, 25, and 26 were also supplemented with baseline data collected in 1997 as part of the MRA West Chaparral Monitoring program (*USACE, 1997c*).

1.3.2 HMP Herbaceous Annual Species

HLA conducted baseline surveys for HMP herbaceous annual species in MRA North, MRA West, and the 2000 Burn Area in April 2000. HMP herbaceous species surveyed include sand gilia, Monterey spineflower, and seaside bird's-beak. Populations identified during the 2000 monitoring event in MRA North and West and the 2000 Burn Area represent baseline data for these species. Follow-up monitoring for HMP herbaceous species was conducted by BLM at OE Sites 10A, 10B, and 19. Follow-up monitoring data collected in 1999 by BLM for HMP herbaceous species at the above sites is also included in this report. Federal, state, and California Native Plant Society (CNPS) listing status for all three species are included in Table 1.

Follow-up monitoring was also conducted at the Contra Costa goldfields populations on OE site

proposed locations of extraction wells and refined to address habitat issues between well locations. Periodic monitoring has been conducted during construction to assess impacts and to ensure compliance with recommendations outlined in biological clearance forms. These recommendations identify measures to minimize impacts to habitat along the pipeline route. Construction activities, including erosion control measures have not yet been completed, and therefore no additional monitoring or evaluation has been conducted.

2.0 METHODS

Methods used to collect data on HMP species and habitat in the 2000 monitoring year are described in Protocol for Conducting Vegetation Sampling at Fort Ord in Compliance with the Installation-Wide Multispecies Habitat Management Plan (HMP Sampling Protocol) (*USACE, 1995a*). Reports from previous monitoring years (*USACE, 1994, 1995b, 1996a, 1996b, 1997c, 1998, 1999*) and the *WRP (USACE, 1997b*) were reviewed for purposes of in sampling methods. Methods for chaparral monitoring include line-intercept sampling along permanent transects to characterize chaparral shrub cover. Supplemental quadrat sampling is also conducted along line-intercept transects that are observed to support a high percentage of common herbaceous vegetation (areas visually estimated at greater than 20 percent cover by herbaceous species). Focused surveys are conducted in suitable habitat to map the distribution and quantify the abundance of HMP herbaceous annual species. Monitoring activities at wetland sites include conducting wetland vegetation sampling (vegetative cover by species), special-status wildlife surveys, and collecting physical and hydrological data. Chaparral and wetland sites addressed during the 2000 biological monitoring surveys are shown on Plate 2. All biological monitoring work conducted in unremediated OE sites was accomplished with escort by an OE specialist.

2.1 Central Maritime Chaparral

HLA and BLM conducted chaparral monitoring at five OE removal sites and at six RI sites located in habitat reserve lands in the MRA. Between November and December 2000, HLA collected baseline data in central maritime chaparral habitat in the 2000 Burn Area and at RI Sites: Ranges 21, 24, 25, and 26. Habitat characterization of Ranges 21, 24, 25, and 26 was supplemented by baseline data collected in 1997 as part of the MRA West Chaparral Monitoring Polygon. Habitat characterization conducted for RI sites: Ranges 18 and 19 utilized baseline data collected within these ranges in 1999 as part of the MRA North Chaparral Monitoring Polygon. MRA West data collected in 1997 was also used for Range 19. Baseline data was not collected for Ranges 18 and 19 in 2000. BLM conducted follow-up monitoring at OE sites 10A, 10B, and 19. Between November and December 2000, follow-up monitoring was conducted by HLA at OE Site 11. Plates 3 through 9 display line-intercept sampling transect locations at chaparral monitoring sites. Methods specific to each site are presented below:

2.1.1 OE Sites

OE Site 9: OE Site 9 is less than 10 acres in size. Only two transects were placed at this site. Based upon field observations, these transects were determined to have been placed in intermediate-age chaparral habitat. It was also determined during field surveys that OE Site 9 is comprised of a single stage of intermediate-age chaparral habitat. Supplemental quadrat sampling for common herbaceous species was not conducted at OE Site 9 as no transects displayed greater than 20 percent cover by herbaceous vegetation. Transect locations are identified in Plate 3.

OE Site 10A: Follow-up chaparral monitoring data was collected by BLM at nineteen transect sites. Transects were evaluated based upon the vegetation removal method used at the site (burned or clipped). Transects in burned areas include: 5, 6, 7, 8, 9, 10, and 19. Transects in clipped areas include: 1, 2, 3, 11, 12, 13, 16, 17, and 18. Data collected from three transects (transects 4, 14, and 15) were not used in this evaluation. Previous reports (*USACE, 1998*) identified these transects as occurring in "transitional grids" and considered them as

more accurately representing a transitional area between coast live oak woodland and central maritime chaparral. Supplemental quadrat sampling for common herbaceous species was not conducted by BLM at OE site 10A. Transect locations are identified in Plate 4.

OE Site 10B: Follow-up chaparral monitoring was conducted by BLM at twelve of the fifteen transect locations. Monitoring was not conducted along three transects (Transects 3, 4, and 5) that are located in undisturbed areas. Transects were evaluated based upon the vegetation removal method used at the site (burned or clipped). Transects in burned areas include: 1, 6, 7, 8, 9, 10-2, 11, 12, 13, 14, and 15. Transects in clipped areas include: 2 and 12. Supplemental quadrat sampling for common herbaceous species was not conducted by BLM at OE site 10B. Transect locations are identified in Plate 5.

OE Site 11: Follow-up chaparral monitoring was conducted by HLA at five of eight transect sites including: Transects 1, 2, 3, 5, and 8. Sampling was not conducted along three transects (Transects 4, 6, and 7). Transects 4 and 7 are located in undisturbed areas and Transect 6 is located outside the boundary of OE Site 11. Supplemental quadrat sampling for common herbaceous species was conducted along three transects (Transects 3, 5 and 8) where cover by herbaceous vegetation exceeded 20 percent. Transect locations are identified in Plate 6.

OE Site 19: Follow-up chaparral monitoring was conducted by BLM at eight transect sites. Supplemental quadrat sampling for common herbaceous species was not conducted at OE Site 19 as no transects displayed greater than 20 percent cover by herbaceous vegetation. Transect locations are identified in Plate 7.

2.1.2 Remedial Investigation Sites

Range 18: Baseline chaparral surveys were conducted along six transects located in Range 18 in 1999 as part of the MRA North Chaparral Monitoring program. Based upon the report prepared previously (*USACE, 1999*), baseline transect data collected for this site were separated into two successional stages of chaparral including mature and disturbed habitat. Four transects were established in disturbed chaparral habitat and two transects in mature chaparral habitat. Supplemental quadrat sampling for common herbaceous species was not conducted at Range 18 as no transects displayed greater than 20 percent cover by herbaceous vegetation. Transect locations are identified in Plate 8.

Range 19: Baseline chaparral surveys were conducted along six transects located in Range 18 in 1999 as part of the MRA North Chaparral Monitoring program. Based upon the report prepared previously (*USACE, 1999*), baseline transect data collected for this site were separated into two successional stages of chaparral including mature and disturbed habitat. Nine transects were established in disturbed chaparral habitat and four transects in mature chaparral habitat. Supplemental quadrat sampling for common herbaceous species was not conducted at Range 19 as no transects displayed greater than 20 percent cover by herbaceous vegetation. Transect locations are identified in Plate 8.

Range 21: Baseline chaparral surveys were conducted along seven transects located in Range 21 (five in 2000 and two in 1997). Based upon field observations and previous reports (*USACE, 1997c*), all seven transects have been identified as occurring in intermediate-age chaparral habit. Supplemental quadrat sampling for common herbaceous species was not conducted at Range 21 as no transects displayed greater than 20 percent cover by herbaceous vegetation. Transect locations are identified in Plate 8.

Range 24: Baseline chaparral surveys were conducted along seven transects located in Range 24 (six in 2000 and one in 1997). Based upon field observations and previous reports

(*USACE, 1997c*), these transects were separated into mature and disturbed chaparral habitat with six transects located in mature habitat and one located in disturbed habitat. Supplemental quadrat sampling for common herbaceous species was not conducted at Range 24 as no transects displayed greater than 20 percent cover by herbaceous vegetation. Transect locations are identified in Plate 8.

Range 25: Baseline chaparral surveys were conducted along nine transects located in Range 25 (seven in 2000 and two in 1997). Based upon field observations and previous reports (*USACE, 1997c*), the nine transects were separated into mature and disturbed chaparral habitats. Eight transects are located in mature habitat and one is located in disturbed habitat. Supplemental quadrat sampling for common herbaceous species was not conducted at Range 25 as no transects displayed greater than 20 percent cover by herbaceous vegetation. Transect locations are identified in Plate 8.

Range 26: Baseline chaparral surveys were conducted along seven transects located in Range 26 (three in 2000 and four in 1997). Based upon field observations and previous reports (*USACE, 1997c*), these transects were separated into mature and intermediate-age chaparral habitats. Four transects were placed into mature chaparral habit and three transects into the intermediate-age chaparral habitat. Supplemental quadrat sampling for common herbaceous species was not conducted at Range 26 as no transects displayed greater than 20 percent cover by herbaceous vegetation. Transect locations are identified in Plate 8.

2.1.3 2000 Burn Area

A total of 79 transects were placed in the 2000 Burn Area (12 in 1999 and 67 in 2000). Based upon examination of aerial photographs, previous reports (*USACE, 1999*), and field observations, these transects were separated into mature, intermediate-age, and disturbed chaparral habitats. To adequately represent these seral stages, 35 transects were established in mature chaparral habitat, 33 transects were established in intermediate age chaparral habitat, and 1[illegible] transects were established in disturbed chaparral habitat. Supplemental quadrat sampling for common herbaceous species was not conducted in the 2000 Burn Area as no transects displayed greater than 20 percent cover by herbaceous vegetation. Transect locations are identified in Plate 9.

2.1.4 Line-Intercept Sampling

Shrub composition, cover, and abundance were sampled along the length of a measuring tape that was extended above, below, or through the woody canopy. 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 and multiplied by 100 to obtain individual species percent cover. Cumulative intercept distances for all cover types (i.e., shrubs, bare ground, and vegetated ground) were combined and divided by the total length of transects sampled and multiplied by 100 to provide a numerical estimate of cover by species or cover type for each OE site or successional stage.

Sample size for each variation of chaparral habitat type (or seral stage, i.e. disturbed, intermediate-age, or mature) was established by accumulating a running total of cover for the dominant and/or HMP species if present. This total was graphed versus a running total of the combined transect length. An adequate sample size was considered reached when incorporating additional transects to the combined data effects a change of less than 10 percent in cover.

Transect locations, for baseline and follow-up sampling were located using Global Positioning System (GPS) equipment. Transect locations are indicated on Plates 3 through 9. 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 marked on 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 OE concerns. 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.

2.1.5 Quadrat Sampling

Quadrat sampling was used to characterize the herbaceous component of chaparral habitat. Quadrat sampling was conducted along transects with 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.

2.2 HMP Herbaceous Annual Species Surveys

Follow-up monitoring for HMP herbaceous species was conducted by BLM at OE sites 10A, 10B, and 19. Baseline surveys for HMP herbaceous species were conducted by HLA in the MRA. Follow-up monitoring for Contra Costa goldfields populations was conducted by HLA at OE Site 10B. Follow-up monitoring was also conducted by HLA for HMP herbaceous species at the UC/NRS-FONR. Follow-up monitoring for HMP herbaceous species was not conducted in 2000 at OE Site 11 because the blooming period had passed in previously identified population locations. However, this site will be monitored earlier in the growing season in 2001 to ensure an accurate characterization of population conditions.

Surveys were conducted at monitoring sites to either relocate previously recorded populations or to identify new ones. Prior to conducting surveys for HMP herbaceous species, aerial photographs or maps showing previously recorded populations were reviewed to identify suitable or potential habitat. Surveys were conducted by inspecting areas of known or potential habitat by walking transects of opportunity at approximately 25-foot intervals. Observed populations were located using GPS. The locations of recorded HMP herbaceous species populations are indicated on Plates 4, 5, 7, and 10 through 14.

2.2.1 OE Sites

BLM conducted follow-up surveys in 2000 for HMP herbaceous species at OE sites 10A, 10B, and 19. Population sizes for all three species were estimated and the boundaries mapped using GPS. BLM also conducted follow-up surveys for these species in 1999. Again, populations for all three species were estimated and boundaries delineated using GPS. This data was not received in time for inclusion in the 1999 report but are presented here.

In April 2000, HLA conducted baseline surveys for HMP herbaceous species at OE SEA-15, which is located between MRA West and the western boundary of the MRA. Population totals for sand gilia and seaside bird's-beak were estimated by direct counts. Direct counts were not taken for Monterey spineflower. Instead of direct counts, density estimates were identified based upon spot sampling. Density estimates for Monterey spineflower were assigned density levels as follows:

- Low-density populations are estimated to contain between 1 – 500 individuals per acre.

- Medium-density populations are estimated to contain between 501 – 5000 individuals per acre.
- High-density populations are estimated to contain more that 5000 individuals per acre.

2.2.2 Multiple Range Area

Between April and May 2000, HLA conducted baseline surveys for HMP herbaceous species at the 2000 Burn Area and MRA North and West. Population totals for sand gilia and seaside bird's-beak were estimated by direct counts. Direct counts were not taken for Monterey spineflower. Instead of direct counts, density estimates were identified based upon spot sampling.

2.2.3 Contra Costa Goldfields

Follow-up monitoring was conducted on May 8, 2000 at the two Contra Costa goldfields populations located on OE Site 10B: one at MGF and the other at the "mima mound area". Suitable habitat in these areas was surveyed to identify previously unknown outlying aggregations and to establish the boundary of known populations. Methods used to monitor populations of Contra Costa goldfields included techniques to delineate the area of occupied habitat, identify the number of individual plants and estimate percent vegetative cover by dominants and associates.

Surveys over the grassland habitat for outlying populations at both locations involved systematically walking across the area. Areas surveyed included portions of the grassland that contained wetland indicator species with contributing cover estimated to be greater than 25 percent. Particular scrutiny was given to topographically low areas that displayed species associated with areas supporting Contra Costa goldfields.

Occupied habitat areas were surveyed using GPS. Occupied habitat at both of the locations was subdivided into several smaller sub-populations. Outer edges of goldfields sub-population boundaries were delineated with flagging. Sub-populations and outlying individuals were located using GPS.

Population sizes were estimated by direct counts and or by sub-sampling larger populations and calculating densities on a per acre basis. Direct counts were accomplished by subdividing sub-populations into parallel "lanes", where applicable, each approximately 10-feet wide and marked by two measuring tapes. Goldfields individuals observed in the lanes were tallied. Sampling of larger sub-populations was done using a random quadrat method to estimate density. Quadrats measuring 0.25-meter square were randomly placed in each sub-population area and goldfields individuals were counted. The number of quadrats utilized varied depending on the size of the sub-population. Between 7 and 51 quadrats were used in each sub-population during sampling. In general, 10 to 20 percent of the area in each sub-population was sampled. Population estimates were then calculated for each sub-population using the sampled density.

Species composition in habitat occupied by Contra Costa goldfields was inventoried and cover by dominants was visually estimated. Species generally found in close association with the goldfields were noted.

2.2.4 UC/NRS-FONR

HLA conducted follow-up surveys between April and May 2000 for Monterey spineflower and sand gilia at the UC/NRS-FONR in accordance with the biological opinion (*USFWS, 1999*) regarding activities included in the ongoing remedial investigations at UC/NRS-FONR, located adjacent to the former Fritzsche Airfield. HLA implemented mitigation measures to address potential impacts to HMP herbaceous species associated with quarterly groundwater monitoring, well development, and other activities associated with groundwater remediation at UC/NRS-FONR. Activities

conducted within UC/NRS-FONR property have to follow specific protocols that were approved by USFWS as detailed in the BO (*USFWS, 1999*) and memoranda referenced in section 1.0.

The following is a list of activities conducted to fulfill the intent of the BO.

- A route along existing roads within the UC/NRS property was identified to allow HLA staff access to existing wells and potential areas of future well development. These roads are currently in use by HLA staff to conduct quarterly groundwater monitoring and other associated groundwater remediation activities. These roads are also currently in use by agencies such as the Marina Water District and University of California Santa Cruz (UCSC).

- Surveys were conducted at existing well sites and along the approved access route. Areas supporting sand gilia and Monterey spineflower were identified and flagged. Population totals were then estimated within each identified area by direct counts.

Populations were located using landmarks on aerial photographs and hand mapped. Populations were later delineated using GPS.

2.3 Wetland Monitoring

Baseline wetland monitoring was conducted at waterbody 52. Follow-up monitoring was conducted at three waterbodies: 42, 43 and Machine Gun Flats. However, during the first series of monitoring events in January it was determined that no disturbances associated with OE removal occurred at Waterbody 43. For this reason, follow-up monitoring of waterbody 43 was discontinued. Baseline monitoring was conducted to collect baseline data on wetland-associated special-status fauna identified in the HMP, wetland vegetation, and physical characteristics prior to OE removal activities. Follow-up monitoring was conducted to evaluate whether OE removal activities affected baseline conditions previously observed at these waterbodies. The WRP (*USACE, 1997b*) identifies level of effort for monitoring depending on the degree of disturbance sustained during OE removal. According to protocols identified in the WRP, disturbance associated with OE removal at these waterbodies was not significant enough to warrant follow-up monitoring of the physical characteristics of these waterbodies. However, measurements were recorded during wildlife surveys to identify factors that could potentially affect the continuing presence or absence of special-status fauna, specifically California linderiella and potentially other fairy shrimp species.

Special-status fauna surveys were conducted during four monitoring events between January and June. Vegetation surveys at baseline and follow-up waterbodies were conducted in June. Methods used to gather baseline and follow-up data on special-status fauna, physical characteristics and wetland vegetation were developed in accordance with guidelines specified in the HMP and WRP and are described briefly in the sections below.

2.3.1 Wetland Vegetation Sampling

Wetland vegetation sampling was conducted at all three waterbodies during the June monitoring event. Wetland vegetation sampling focused on characterizing emergent and transitional herbaceous species.

Sampling was conducted using a modified quadrat method following HMP Sampling Protocol (*USACE, 1995a*). 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 2000, most quadrats were placed at shorter intervals

(ranging from ten to twenty feet instead of every ten meters) to capture abrupt vegetation changes, including intermittent patches of bare ground and open water that were evident in the field.

Monitoring transects were established at waterbodies 42, 52, and MGF. One to nine transects were established at each waterbody based on size and variability of habitat. Transect length ranged from 50 to 241 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 endpoint locations were mapped using a GPS unit. Sampling was conducted along each transect by placing a 0.25-meter square quadrat at the starting point and at 10 to 20-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.

2.3.2 Fauna

Wildlife monitoring was conducted at all three waterbodies, and included surveys for wildlife species identified in the HMP and other potentially occurring special-status species identified in the WRP. All vertebrate species observed during wildlife surveys were recorded in field logs.

Surveys for California linderiella and other fairy shrimp species were conducted at waterbodies 42 and MGF once each month in January, February, March, and June. Surveys were not conducted at waterbody 52 during the June event due to the absence of water, but were conducted during the January, February, and March monitoring events.

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 waterbody were sampled using a dipnet and samples were examined for presence of fairy shrimp species. Specimens were examined with a field-magnifying lens to identify genus. Samples were collected systematically from each waterbody until habitat was adequately represented. To estimate relative abundance, between 10 and 20 samples were collected from throughout each waterbody (depending on the size and complexity of each waterbody) and the total number of linderiella in all 10 to 20 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 January, February, March, and June at each waterbody except Waterbody 52. Waterbody 52 was not surveyed for California tiger salamander in June due to the absence of water. To assess the presence/absence of California tiger salamander, representative portions of each waterbody were sampled using a dipnet and samples were examined for presence of California tiger salamander larvae. Samples were collected systematically from each waterbody until habitat was adequately represented. In addition to the dipnet surveys for larvae, upland habitat was surveyed for the presence of adult California tiger salamander. Upland surveys consisted of walking transects from the edge of the waterbody into upland habitat and looking underneath downed tree branches and rocks, and in burrow entrances and soil fissures under tree canopies where there were suitable upland refugia.

Surveys to determine the presence/absence of suitable habitat for California red-legged frog were conducted during all visits (January through June) at waterbodies 42 and MGF. Surveys were not conducted in June at Waterbody 52 due to the absence of water. 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 on the perimeter of each waterbody, moving back and forth between open water and wetland vegetation at the edge of the waterbody, searching for evidence of adult frogs.

Surveys to determine the presence/absence of tricolored blackbird and southwestern pond turtle were conducted during all surveys with one exception. Surveys were not conducted for southwestern pond turtle at Waterbody 52 during the June survey due to the absence of water. Surveys were performed on the perimeter each waterbody, searching for evidence of either species.

2.3.3 Physical Characteristics

Physical data were collected at all three waterbodies. The degree of disturbance was not significant enough to require the collection of physical data at the follow-up waterbodies as identified in Table 3 of the WRP. Table 3 indicates that only those waterbodies in which OE removal activities have resulted in excavations greater than four feet deep or have been identified as having soil conditions other than a thick deep clay horizon are required to have hydrological monitoring. Although not specifically required in the WRP, physical data were collected at waterbodies 42 and MGF. Physical data collected at waterbodies 42, 52, and MGF included pH and turbidity measurements, water depth, duration of ponding, and the surface area of each waterbody. Disturbance to the wetland habitat was minimized by restricting the amount of wading in each waterbody to only what was necessary for dipnet sampling and measurements of physical characteristics.

Turbidity and pH measurements were collected prior to other survey activities that could affect data accuracy (e.g., gathering depth measurements, vegetation sampling, and/or dipnetting). Turbidity was measured using a portable turbidimeter, and pH was measured using a portable field pH meter. The pH meter and turbidimeter were calibrated prior to data collection. Turbidity and pH were collected during the wildlife surveys, no sooner than 24 hours after a storm event, as required by protocol indicated in the WRP. Turbidity and pH were collected once during the March monitoring event at all three waterbodies.

Maximum water depth was measured during each monitoring event. The area of maximum depth was estimated by wading toward the center of the waterbody until the apparent maximum depth was found. The distance between the water surface and the bottom of the waterbody was measured and recorded in field forms.

The area of ponding was measured at all three waterbodies. The perimeter of the area of ponding was measured using a GPS unit. Waterbodies 42 and MGF were measured during all four monitoring events (January, February, March, and June). Waterbody 52 was not measured during the June monitoring event due to the absence of water.

The duration of ponding was not recorded at waterbodies 42 and MGF during the 2000 follow-up surveys as they both retained water past the final survey date. However, ponding observed during monitoring events was recorded and is presented in the results section of this report.

3.0 RESULTS

The following section presents data collected during monitoring in 2000.

3.1 Central Chaparral Habitat Monitoring

Results of the line-intercept and quadrat sampling of central maritime chaparral are summarized below. Results of chaparral vegetation sampling are presented in terms of dominant and/or HMP species. Tables 3 through 24 present data collected at monitoring sites. Figures 1 through 4 photographically depict representative habitats sampled during monitoring surveys. Figures 5 through 26 graphically display vegetative cover by species. Non-native plant species are indicated in Tables 3 through 24 and Figures 5 through 26 by an asterisk.

3.1.1 OE Sites

OE Site 9: Results of line-intercept sampling for OE Site 9 are presented in Table 3 and in Figure 5. Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling include chamise (*Adenostoma fasciculatum*) at 45.35 percent cover, Hooker's manzanita (14.85 percent), shaggy-barked manzanita (*Arctostaphylos t. tomentosa*) at 10.35 percent cover, sticky monkey flower (*Mimulus aurantiacus*) at 7.44 percent cover, and coyote brush (*Baccharis pilularis*) at 6.49 percent cover. Bare ground was estimated at 10.01 percent cover. Cover contributed by herbaceous vegetation was estimated at 0.46 percent. HMP shrub species encountered at OE Site 9 and their respective cover are as follows: Hooker's manzanita (14.84 percent).

OE Site 10A: Results of line-intercept sampling for OE Site 10A are presented in Table 4 (burned areas) and Table 5 (clipped areas). These results are presented graphically in Figure 6 (burned areas) and Figure 7 (clipped areas).

Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in burned areas include rush rose (*Helianthemum scoparium*) at 28.28 percent cover, shaggy-barked manzanita (10.41 percent), Monterey ceanothus (9.37 percent), and chamise (7.68 percent). Bare ground was estimated to be 11.36 percent cover. Cover contributed by herbaceous vegetation was estimated at 27.84 percent. Exotic species encountered at OE Site 10A in burned areas and their estimated cover are as follows: hottentog fig (*Carpobrotus edulis*) at 1.59 percent, cut-leaved fireweed (*Erechtites glomerata*) at 0.49 percent, and pampas grass (*Cortaderia jubata*) at 0.29 percent. HMP shrub species encountered at OE Site 10A and their respective cover in burned areas are as follows: Monterey ceanothus (9.37 percent), Hooker's manzanita (2.26 percent), Toro manzanita (0.86 percent) and Eastwood's goldenbush (0.06 percent).

Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in clipped areas include shaggy-barked manzanita with 11.92 percent cover, rush rose with 8.4 percent cover, chamise with 5.64 percent cover, Toro manzanita with 4.46 percent cover, and chaparral pea (*Pickeringia montana*) with 4.23 percent cover. Bare ground was estimated to 13.22 percent cover. Cover contributed by herbaceous vegetation was estimated at 35.68 percent. Exotic species encountered at OE Site 10A in clipped areas and their estimated cover are as follows: hottentog fig (2.8 percent), cut-leaved fireweed (3.31 percent), and pampas grass (0.85 percent). HMP shrub species encountered at OE Site 10A and their respective cover in clipped areas are as follows: Toro manzanita (4.46 percent), Hooker's manzanita (1.66 percent), Monterey ceanothus (0.48 percent), and Eastwood's goldenbush (0.19 percent).

OE Site 10B: Results of line-intercept sampling for OE Site 10B are presented in Table 6 (burned areas) and Table 7 (clipped areas). These results are presented graphically in Figure 8 (burned areas) and Figure 9 (clipped areas). Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in burned areas include rush rose (27.59 percent), dwarf ceanothus (*Ceanothus dentatus*) at 16.9 percent cover, shaggy-barked manzanita (15.81 percent), and deerweed (*Lotus scoparius*) at 9.99 percent cover. Bare ground was estimated at 8.09 percent cover. Cover contributed by herbaceous vegetation was estimated to be 19.25 percent. Exotic species encountered at OE Site 10B in burned areas and their estimated cover are as follows: hottentog fig (1.5 percent). HMP shrub species encountered at OE Site 10B and their respective cover in burned areas are as follows: Monterey ceanothus (3.72 percent, Eastwood's goldenbush (0.17 percent), and Toro manzanita (0.04 percent).

Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in clipped areas include Toro manzanita (59.17 percent) and shaggy-barked manzanita (20.7 percent). Bare ground was estimated be to 23.61 percent cover. Cover contributed by herbaceous vegetation was estimated at 1.06 percent. HMP shrub species encountered at OE Site 10B and their respective cover in clipped areas are as follows: Toro manzanita (59.17 percent).

OE Site 11: Results of line-intercept sampling for OE Site 11 are presented in Table 8 and in Figure 10. Composition and cover contributed by herbaceous species is presented in Table 9 and in Figure 10. Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling include chamise (22.29 percent), sticky monkey flower (18.62 percent), shaggy-barked manzanita (7.82 percent), and Toro manzanita (5.91 percent). Bare ground was estimated at 18.37 percent. Exotic species encountered at OE Site 11and their estimated covers are as follows: cut-leaved fireweed (2.23 percent). HMP shrub species sampled at OE Site 11 and their respective cover are as follows: Toro manzanita (5.91 percent) and Monterey ceanothus (0.82 percent).

Cover contributed by herbaceous vegetation at OE Site 11 was estimated using line-intercept sampling at approximately 21.27 percent. No dominant herbaceous species (individually contributing greater than 2 percent cover) were encountered during the survey. However, unidentifiable annual grasses provided an estimated 9.84 percent cover and dead vegetation provided an estimated 11.89 percent cover. These figures may not accurately represent species composition and cover as sampling at this site was performed in late fall after the growing and flowering season for herbaceous species had ended. Additionally, several rain events had rendered the skeletal remains for many species unidentifiable. Of the 21 herbaceous species encountered, 18 were identified as native.

OE Site 19: Results of line-intercept sampling for OE Site 19 are presented in Table 10 and in Figure 12. Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling include shaggy-barked manzanita (27.76 percent), rush rose (24.82 percent), deerweed (20.7 percent), Toro manzanita (13.58 percent), chamise (13.29 percent), Monterey ceanothus (7.14 percent), dwarf ceanothus (6.8 percent), and sticky monkey flower (4.02 percent). Coast live oak (*Quercus a. agrifolia*) was estimated at 7.74 percent and bare ground was estimated at 5.30 percent. Cover contributed by herbaceous vegetation was estimated at 2.93 percent. Exotic species encountered at OE Site 19 include hottentog fig, which was estimated at 0.67 percent cover. HMP shrub species encountered at OE Site 19 and their respective cover in burned areas are as follows: Toro manzanita (13.58 percent), and Monterey ceanothus (7.14 percent).

3.1.2 Remedial Investigation Sites

Range 18: Results of line-intercept sampling for Range 18 are presented in Table 11 (disturbed habitat) and Table 12 (mature habitat). These results are also presented in Figure 13 (disturbed habitat) and Figure 14 (mature habitat). Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in disturbed habitat include: shaggy-barked manzanita (50.87 percent), chamise (13.79 percent), sticky monkey flower (12.72 percent), black sage (*Salvia mellifera*) at 9.61 percent, poison oak (*Toxicodendron diversilobum*) at 9.16 percent and dwarf ceanothus (4 percent). Observed cover by coast live oak was estimated at 5.32 percent and bare ground was estimated at 5.30 percent. Cover contributed by herbaceous vegetation was estimated at 5.56 percent. Exotic species observed in disturbed habitat include hottentog fig, estimated at 1.42 percent. HMP shrub species observed and their respective cover in disturbed habitat are as follows: Monterey ceanothus (3.69 percent) and Eastwood's goldenbush (0.25 percent).

Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in mature habitat include: sandmat manzanita (35.94 percent), shaggy-barked manzanita (18.53 percent), chamise (18.07 percent), sticky monkey flower (14.83 percent), and Monterey ceanothus (4.71 percent). Bare ground was estimated at 12.23 percent. Cover contributed by herbaceous vegetation was estimated at 8.12 percent. HMP shrub species encountered and their respective cover in mature habitat are as follows: sandmat manzanita (35.93 percent), and Monterey ceanothus (4.71 percent).

Range 19: Results of line-intercept sampling for Range 19 are presented in Table 13 (disturbed habitat) and Table 14 (mature habitat). These results are also presented in Figure 15 (disturbed habitat) and Figure 16 (mature habitat). Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in disturbed habitat include: shaggy-barked manzanita (60.91 percent), chamise (23.57 percent), and sandmat manzanita (15.52 percent). Bare ground was estimated at 6.96 percent. Cover contributed by herbaceous vegetation was estimated at 5.56 percent. Exotic species encountered at in disturbed habitat at Range 19 include hottentog fig, estimated at 0.23 percent. HMP shrub species encountered and their respective cover in disturbed habitat are as follows: sandmat manzanita (15.52 percent), Monterey ceanothus (0.63 percent), and Eastwood's goldenbush (0.08 percent).

Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in mature habitat include: shaggy-barked manzanita (68.29 percent), sandmat manzanita (16.97 percent), chamise (5.73 percent), and black sage (5.63 percent). Bare ground was estimated at 5.81 percent. HMP shrub species encountered and their respective cover in mature habitat are as follows: sandmat manzanita (16.97 percent), Monterey ceanothus (3.02 percent), and Eastwood's goldenbush (0.13 percent).

Range 21: Results of line-intercept sampling for Range 21 are presented in Table 15 and in Figure 17. Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling include: and sandmat manzanita (36.05 percent), shaggy-barked manzanita (26.92 percent), chamise (13.86 percent), and sticky monkey flower (4.26 percent). Bare ground was estimated at 17.89 percent. Cover contributed by herbaceous vegetation was estimated at 0.73 percent. HMP shrub species encountered and their respective cover are as follows: sandmat manzanita (36.05 percent), Eastwood's goldenbush (0.33 percent), and Monterey ceanothus (0.04 percent).

Range 24: Results of line-intercept sampling for Range 24 are presented in Table 16 (disturbed habitat) and Table 17 (mature habitat). These results are also presented in

Figure 18 (disturbed habitat) and Figure 19 (mature habitat). Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in disturbed habitat include: chamise (54.86 percent), shaggy-barked manzanita (30.69 percent), toyon (*Heteromeles arbutifolia*) at 11.13 percent, sticky monkey flower (8.36 percent), black sage (8.06 percent), and Monterey ceanothus (5.1 percent). Bare ground was estimated at 9.47 percent. Cover contributed by herbaceous vegetation was estimated at 0.12 percent. HMP shrub species observed include Monterey ceanothus, estimated at 5.1 percent cover in disturbed habitat.

Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in mature habitat include shaggy-barked manzanita (68.17 percent), chamise (25.17 percent), and sandmat manzanita (12.39 percent). Bare ground was estimated at 6.91 percent. Cover contributed by herbaceous vegetation was estimated at 1.03 percent. HMP shrub species observed and their respective cover in mature habitat are as follows: sandmat manzanita (12.39 percent), Monterey ceanothus (0.81 percent), and Eastwood's goldenbush (0.30 percent).

Range 25: Results of line-intercept sampling for Range 25 are presented in Table 18 (disturbed habitat) and Table 19 (mature habitat). These results are also presented in Figure 19 (disturbed habitat) and Figure 20 (mature habitat). Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in disturbed habitat include sandmat manzanita (61.96 percent), and shaggy-barked manzanita (11.42 percent). Bare ground was estimated at 25.42 percent. Cover contributed by herbaceous vegetation was estimated at 1.89 percent. Exotic species observed in disturbed habitat include pampas grass, estimated at 0.06 percent. HMP shrub species observed include sandmat manzanita, estimated at 61.96 percent cover.

Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in mature habitat include shaggy-barked manzanita (65.38 percent), and chamise (32.5 percent). Bare ground was estimated at 8.81 percent. Cover contributed by herbaceous vegetation was estimated at 1.02 percent. Exotic species observed in disturbed habitat include pampas grass, estimated at 0.49 percent cover. HMP shrub species observed and their respective cover in mature habitat are as follows: sandmat manzanita (3.4 percent), and Monterey ceanothus (2.13 percent).

Range 26: Results of line-intercept sampling for Range 26 are presented in Table 20 (intermediate-age habitat) and Table 21 (mature habitat). These results are also presented in Figure 22 (intermediate-age habitat) and Figure 23 (mature habitat). Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in disturbed habitat include: dwarf ceanothus (38.36 percent), shaggy-barked manzanita (44.14 percent), chamise (15.03 percent), black sage (9.6 percent), and Monterey ceanothus (4.65 percent). Cover by coast live oak was estimated at 4.45 percent and bare ground was estimated at 10.7 percent. Cover contributed by herbaceous vegetation was estimated at 1.2 percent. Exotic species observed in disturbed habitat include pampas grass, estimated at 1.3 percent cover. HMP shrub species observed in disturbed habitat include Monterey ceanothus, estimated at 4.65 percent cover.

Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in mature habitat include: shaggy-barked manzanita (53.48 percent), dwarf ceanothus (26.37 percent), chamise (17.36 percent), Monterey ceanothus (10.28 percent), rush rose (9.25 percent), black sage (6.62 percent), and pitcher sage (*Lepechinia scoparium*) at 5.26 percent. Bare ground was estimated at 7.93 percent. Cover contributed by herbaceous vegetation was estimated at 2.31 percent. Exotic species observed in disturbed habitat include pampas grass, estimated at 7.33

percent cover. HMP shrub species observed in mature habitat include Monterey ceanothus, estimated at 10.28 percent cover.

3.1.3 2000 Burn Area

Results of line-intercept sampling for the 2000 Burn Area are presented in Table 22 (disturbed habitat), Table 23 (intermediate-age habitat), and Table 24 (mature habitat). These results are also presented in Figure 23 (disturbed habitat), Figure 24 (intermediate-age habitat), and Figure 25 (mature habitat). Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in disturbed habitat include sandmat manzanita (50.39 percent), shaggy-barked manzanita (21.8 percent), chamise (12.15 percent), and Monterey ceanothus (7.55 percent). Bare ground was estimated at 11.08 percent. Cover contributed by herbaceous vegetation was estimated at 2.48 percent. HMP shrub species observed in disturbed habitat include sandmat manzanita (50.39 percent), and Monterey ceanothus (7.55 percent).

Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in intermediate-age habitat include shaggy-barked manzanita (31.55 percent), sandmat manzanita (27.73 percent), chamise (16.56 percent), Monterey ceanothus (8.83 percent), black sage (5.62 percent), and dwarf ceanothus (4.27 percent). Bare ground was estimated at 13.38 percent. Cover contributed by herbaceous vegetation was estimated at 2.48 percent. Exotic species observed in disturbed habitat include hottentot fig, estimated at 0.12 percent cover. HMP shrub species observed in mature habitat include sandmat manzanita (27.73 percent), Monterey ceanothus (4.27 percent), and Eastwood's goldenbush (0.03 percent).

Dominant shrub species (contributing greater than 4 percent absolute cover) observed during sampling in mature habitat include shaggy-barked manzanita (63.42 percent), chamise (16.26 percent), and sandmat manzanita (7.34 percent). Bare ground was estimated at 9.03 percent. Cover contributed by herbaceous vegetation was estimated at 0.61 percent. HMP shrub species observed include sandmat manzanita (7.34 percent), Monterey ceanothus (3.95 percent), and Eastwood's goldenbush (0.01 percent).

3.2 HMP Herbaceous Annual Species Surveys

Focused surveys for HMP herbaceous species were conducted by BLM in 1999 and 2000 at OE sites 10A, 10B, and 19. HLA conducted focused surveys for HMP herbaceous species in the 2000 Burn Area, MRA North and West, and at the UC/NRS-FONR. HLA also conducted surveys for Contra Costa goldfields populations at OE 10B. The following sections summarize results of HMP herbaceous species monitoring at the above described population locations.

3.2.1 OE Sites

OE Site 10A: Populations of sand gilia, Monterey spineflower, and seaside bird's-beak were not recorded at OE Site 10A in 1999. Plate 4 displays the size and extent of sand gilia and Monterey spineflower populations observed in 2000 at OE Site 10A. Six small populations (population size between 1 - 100 each) of Monterey spineflower were observed on this site. A larger population of Monterey spineflower, population size between 501 – 5000, was also observed on this site. Two populations of sand gilia were observed on OE Site 10A. Population sizes ranged between 1-100 individuals in the smaller population and between 501 – 5000 for the larger population. Populations of seaside bird's-beak were not observed at this site in 2000.

OE Site 10B: Plate 10 displays the size and extent of sand gilia and Monterey spineflower populations observed in 2000 at OE site 10B. Two small populations (population size of between 1 - 100) of sand gilia were observed in the southern portion of OE Site 10B. A population of Monterey spineflower, ranging in

size between 101 and 500 individuals, was also observed in the southern portion of OE Site 10B. Populations of seaside bird's-beak were not observed at this site in 1999.

Plate 5 displays the size and extent of sand gilia, Monterey spineflower, and seaside bird's-beak observed in 1999 at this site. Twelve populations of sand gilia were observed at OE site 10A. The total number of individuals observed in all six populations of sand gilia is estimated to range between 510 – 6,100 individuals. Nine populations of Monterey spineflower were observed at OE Site 10A. The total number of individuals observed in all nine populations of Monterey spineflower is estimated to range between 1,000 – 10,700 individuals. Nine populations of seaside bird's beak were observed at OE Site 10B. The total number of individuals observed in all nine populations of seaside bird's-beak is estimated to range between 5,200 – 51,000 individuals. This includes an extensive population of seaside bird's-beak with a population estimated between 5,200 – 50,000 individuals located in the southeast corner of the site, adjacent to Barloy Canyon Road.

OE Site 19: Plate 7 displays the size and extent of HMP herbaceous species observed at this site. One small population of Monterey spineflower was observed just outside the northern boundary of OE-19. Between 1 – 100 individuals are estimated to occur in this solitary population of Monterey spineflower.

3.2.2 Multiple Range Area

Plate 14 depicts the size and extent of populations for Monterey spineflower in the 2000 Burn Area, MRA North, MRA West, and at OE SEA-15, located in the MRA. Initial surveys for Monterey spineflower revealed that sufficient populations existed in high numbers to preclude counting populations on an individual basis. Instead, population densities were used to estimate population sizes for Monterey spineflower. Since low-density populations are defined as containing between 1 – 500 individuals per acre, the entire survey area is estimated to contain low-density spineflower unless otherwise noted.

Five large areas of medium-density spineflower were noted in the survey area. Five of these sites are associated with disturbance areas around Ranges 19, 26, 47, and 48. One area of high-density spineflower is associated with Range 45. Several "rings" of medium and high-density spineflower were discovered in the transitional areas between grassland and central maritime chaparral throughout the survey area. Four smaller areas where Monterey spineflower was absent are identified on the map. One of the areas is located in front of Range 46. Range 46 was planted with grassland species after lead remediation of the soils. The remaining areas are associated with Ranges 43, 44, and 18.

Estimates for seaside bird's-beak and sand gilia were obtained by through a direct count of observed individuals. Populations of seaside bird's-beak populations were concentrated in the 2000 Burn Area and OE Site 15. Sand gilia populations were concentrated in the 2000 Burn Area. A few isolated populations of both species were surveyed in MRA West. Population sizes for both species are displayed on Plate 14.

At least one area had high concentrations for all three species. Populations estimated in excess of 5,000 sand gilia individuals, 7,000 seaside bird's-beak individuals, and a high-density population of Monterey spineflower were noted adjacent to a meadow at the outer edge of Range 42.

3.2.3 Contra Costa Goldfields

Plates 11 and 12 display the size and extent of Contra Costa goldfields populations at MGF and the mima mounds at OE Site 10B. Figures 27 through 29 photographically depict representative individuals from Machine Gun Flats at OE Site 10B. The population at MGF was observed to comprise approximately 14,573 individuals in an area of approximately 2,312

square feet. The population at the mima mounds comprises approximately 147,734 individuals in an area of approximately 4,753 square feet.

Plants were observed to be generally associated with topographically low-lying habitat, transitional between areas that were dominated by obligate wetland species and areas dominated by upland species. Both sites exhibited an uneven mounded topography with intervening low areas that impound water for varying lengths of time. The mima mound area had much more pronounced elevational differences between saturated and upland areas than the population at MGF. In general goldfields observed at the mima mound area were observed to be more associated with obligate wetland species than the population at MFG.

Machine Gun Flats

The Contra Costa goldfields population at MGF was observed to be associated with wet meadow/vernal pool species typical of the habitat on former Fort Ord. Plant species observed to be closely associated with Contra Costa goldfields include: coyote thistle (*Eryngium vaseyi*), brown-headed rush (*Juncus phaeocephalus*), annual hair-grass (*Deschampsia danthonioides*), maritime beard-grass (*Polypogon maritimus*), smooth lasthenia (*Lasthenia glaberrima*), cut-leaved plantain (*Plantago coronopus*), Hickman's popcornflower (*Plagiobothrys chorisianus hickmanii*) and dwarf brodiaea (*Brodiaea terrestris*). Other species observed but not as closely associated include: slender woolly-heads (*Psilocarphus tenellus*), silvery hair-grass, small quaking grass (*Briza minor*), annual fescues (*Vulpia* spp.), soft chess, clovers (*Trifolium* spp), grass poly (*Lythrum hyssopifolium*), smooth cat's ear (*Hypochaeris glabra*), and coast tarweed (*Hemizonia corymbosa*).

Overall vegetative cover (absolute) in goldfields populations at MGF was estimated to be greater than 100 percent. The ranges of cover contributed by Contra Costa goldfields and dominant associates in addition to their wetland indicator status (*Reed, 1988*) are indicated below:

Associate	Range of Cover	Wetland Indicator Status
Contra Costa goldfields	2 to 10 percent	FACW
coyote thistle	5 to 20 percent	FACW
brown-headed rush	5 to 10 percent	FACW
annual hair-grass	10 to 20 percent	FACW
maritime beard-grass	2 to 10 percent	OBL
smooth lasthenia	5 to 20 percent	FACW
cut-leaved plantain	5 to 20 percent	FAC
Hickman's popcornflower	5 to 20 percent	OBL
Dwarf brodiaea	2 to 5 percent	NI

Wetland indicator categories are defined as:

OBL- Obligate wetland species estimated to be found in wetlands 99 percent of the time

FACW- Facultative wetland species estimated to be found in wetlands 67 to 99 percent of the time

FAC- Facultative wetland species estimated to be found in wetlands as often as not found in wetlands (34 to 66 percent of the time)

NI- Not included in the national list of indicator species

Mima Mounds

The Contra Costa goldfields population at the

mima mounds was observed to also be associated with vernal pool species. Dominant plant species observed to be closely associated with Contra Costa goldfields include: needle spike-rush (*Eleocharis a. acicularis*), pale spikerush (*Eleocharis macrostachya*), common toad rush (*Juncus b. bufonius*), brown-headed rush, annual hair-grass, maritime beard-grass, Mediterranean barley (*Hordeum marinum gussonianum*), smooth lasthenia, Howell's quillrush (*Isoetes howellii*), Hickman's popcornflower and dwarf brodiaea. Other species observed but not as closely associated include: thyme-leaf pogogyne (*Pogogyne serpylloides*), slender woolly-heads, silvery hair-grass, small quaking grass, Italian ryegrass (*Lolium multiflorum*), annual fescues, soft chess, clovers, grass poly, smooth cat's ear, and coast tarweed.

Overall vegetative cover in goldfields populations at the mima mounds was estimated at 50 percent. This relatively low cover estimate is attributed to the observation that the bottoms of many of the waterbodies supporting sub-populations were largely unvegetated and contained only widely scattered species. However, some of these waterbodies were densely vegetated. Cover differences in these waterbodies is likely attributable to duration of ponding. Areas that ponded longer and rapidly dried in the spring would have less vegetative cover than areas with shorter periods of ponding. The ranges of relative cover contributed by Contra Costa goldfields and dominant associates in addition to their wetland indicator status are indicated below:

Associate	Range of Cover	Wetland Indicator Status
Contra Costa goldfields	2 to 5 percent	FACW
Needle spike-rush	5 to 20 percent	OBL
pale spike-rush	2 to 5 percent	OBL
common toad rush	2 to 5 percent	FACW
brown-headed rush	5 to 10 percent	FACW
annual hair-grass	20 to 50 percent	FACW
maritime beard-grass	2 to 10 percent	OBL
Mediterranean barley	5 to 20 percent	FAC
Howell's quillrush	5 to 20 percent	OBL
smooth lasthenia	5 to 20 percent	FACW
Hickman's popcornflower	5 to 20 percent	OBL
dwarf brodiaea	2 to 5 percent	NI

3.2.4 UC/NRS-FONR

Plate 13 displays the general size and extent of sand gilia and Monterey spineflower populations along access routes at the UC/NRS-FONR. Surveys were conducted at all well sites and along approximately 5.5 miles of identified access routes. Coverage by sand gilia populations is approximately 1,028 linear feet with an estimated population total of 2,474 individuals. Coverage by Monterey spineflower populations is approximately 2,794 linear feet with an estimated population total of 8,541 individuals.

3.3 Wetland Monitoring

A summary of wetland survey dates is presented in Table 25. Results of the wetland monitoring are discussed below.

3.3.1 Wetland Vegetation Sampling

A total of 11 transects were placed at three wetland monitoring sites in 2000. Transects ranged in length from 50 to 241 feet long. Transect lengths, number of quadrats and total area sampled on each transect are summarized in Table 26. The relative percent cover by species for each waterbody is summarized in Tables 27 through 29. Plates 15 through 17 indicate transect and photo point locations and the maximum measured boundary of each waterbody. Figures 30 through 32 present graphic representations of the species composition at each waterbody sampled during the 2000 monitoring period. Non-native plant species are indicated in Tables 27 through 29 and Figures 30 through 32 by an asterisk. Figures 33 through 35 photographically depict typical habitat sampled during monitoring events. Plant species observed during 2000 wetland monitoring are listed in Table 30.

Waterbody 42

Species composition and estimated cover at Waterbody 42 are presented in Table 27 and graphically in Figure 30. Plate 15 displays transect locations associated with this waterbody. Thirty-one plant species were recorded at Waterbody 42. Dominant plant species, present at greater than 10 percent of the combined average cover, include needle spike-rush, coast eryngo (*Eryngium armatum*), and brown-headed rush. Silvery hair-grass, California oatgrass (*Danthonia californica*), annual hair-grass, capped grass (*Juncus capitatus*), grass poly, and maritime beard-grass were present between 2.1 and 9.1 percent of the combined average cover. Most other plant species were present at 1 percent or less of the combined average cover. Of the 31 species observed during sampling 21 of these are native.

Waterbody 52

Species composition and estimated cover at Waterbody 52 are presented in Table 28 and graphically in Figure 31. Plate 16 displays transect locations associated with this waterbody. Thirty-nine plant species were recorded at Waterbody 52. Dominant plant species, present at greater than 10 percent of the combined average cover, include pale spike-rush, alkali mallow (*Malvella leprosa*), and maritime beard-grass. Common cudweed (*Gnaphalium luteo-album*), common toad rush, salt rush (*Juncus lesueurii*), smooth lasthenia, grass poly, Lemmon's canary grass, sheep sorrel, bugle hedge nettle (*Stachys a. ajugoides*), tomcat clover (*Trifolium willdenovi*) were present between 2.2 and 6.6 percent of the combined average cover. Most other plant species were present at 1 percent or less of the combined average cover. Of the 39 species observed during sampling 30 of these are native.

Machine Gun Flats

Species composition and estimated cover at MGF are presented in Table 29 and in Figure 32. Plate 17 displays transect locations associated with this waterbody. Thirty-three plant species were recorded at MGF. Dominant plant species, present at greater than 10 percent of the combined average cover, include pale spike-rush, salt rush, brown-headed rush, beardless ryegrass, and long-leaved pondweed (*Potamogeton nodosus*). Needle spike-rush comprised approximately 8.6 percent of the combined average cover. Most of the other plant species were present at 1 percent or less of the combined average cover. Of the 33 species observed during sampling 14 of these are native.

3.3.2 Fauna

California linderiella were observed during follow-up monitoring at waterbodies 42 and MGF, and baseline surveys at Waterbody 52. No fairy shrimp species listed as threatened or endangered were observed during 2000 surveys. California linderiella were observed in Waterbody 42 in Februaryand March. Linderiella had been previously observed in

Waterbody 42 during baseline surveys in 1998. Recorded abundance of California linderiella in Waterbody 42 was very high (more than 300 individuals) during the February follow-up monitoring event and high (101 to 300 individuals) during the March event. Recorded abundance in MGF was very high (more than 300 individuals) during the February and March follow-up monitoring events. California linderiella were observed in moderate abundance (11 to 100 individuals) in Waterbody 52 during the February and March baseline surveys. Table 31 presents a summary of California linderiella data collected in 2000.

California tiger salamander was observed in Waterbody 42 during the June follow-up monitoring event. California tiger salamander (juveniles or adults) were not previously observed during the 1998 baseline surveys. Thirteen juveniles were observed in the northeast portion of Waterbody 42 underneath a closed canopy of coast live oaks that frame this section of the waterbody. Refer to Figures 36 and 37 for representative photographs of observed tiger salamander larvae. This area of the waterbody was the only section that contained water during the June follow-up monitoring event. The area of ponding was measured to be approximately 300 square feet and the depth was approximately 8 inches deep. Refer to Figure 38 for a representative photograph of the area of ponding. Water most likely remained in this area of the waterbody for two reasons, it is the deepest section (when the waterbody is full) and the rate of evapotranspiration is reduced by the shade effect of the closed oak canopy. Although the air temperature was measured at approximately 90° Fahrenheit, the water temperature under the oak canopy was measured at 72° Fahrenheit. California tiger salamander were not observed in waterbodies 52 and MGF during baseline surveys and follow-up monitoring, respectively.

California red-legged frog were not observed during baseline surveys at Waterbody 52. In addition, California red-legged frog were not observed during follow-up monitoring at waterbodies 42 and MGF. Pacific treefrog (*Hyla regilla*) adults and larvae were observed in all waterbodies. Adult bullfrogs were observed in abundance in Machine Gun Flats.

Southwestern pond turtle and tricolored blackbird were not observed at any of the waterbodies during baseline and follow-up monitoring. Other vertebrate fauna observed during the surveys are listed in Table 33.

3.3.3 Physical Characteristics

The physical parameters measured during the 2000 wetland monitoring include water depth, area of ponding, turbidity, and pH, and are summarized in Table 34. The maximum water depth and area of ponding at all three waterbodies was observed in March. Turbidity measurements were collected in March for all three waterbodies. Turbidity measurements for Waterbody 42 showed a turbidity reading of 2.42 in the main ponded area. Turbidity under the oak canopy was not measured, however water in this area was observed to be significantly darker than the rest of the waterbody. This is most likely attributable to the leaching of tannic acids from the coast live oak leaves that line the bottom of this area of the waterbody. Turbidity measurements for Waterbody 52 showed a turbidity reading of 45.7 and MGF showed a turbidity reading of 28.1. Measurements for pH ranged from 5.64 at MGF to 5.91 at Waterbody 42.

Waterbodies 42, and MGF ponded water from the time of the first survey in January through the last site visit in June. However, only the portion of Waterbody 42 under the oak canopy retained water to this date. Waterbody 52 ponded water from the first survey in January through the time of the third survey in March. This waterbody dried out sometime between the third survey conducted March 13 and the fourth survey event conducted on June 15.

4.0 DISCUSSION

4.1 Central Maritime Chaparral Habitat Monitoring

4.1.1 OE Sites

OE Site 9: Data collected in 2000 represents baseline conditions for chaparral habitat at this site. This is a small site of less than ten acres. Vegetation communities found at OE Site 9 consist of coast live oak woodland and central maritime chaparral habitat. One shrub species, chamise, dominates chaparral habitat at this site. Estimated cover for chamise alone was 45 percent of total species cover. Two manzanita species, Hooker's and shaggy-barked manzanita, dominate the remaining cover.

OE Site 10A: The data collected by BLM in 2000 represents the fourth year of follow-up monitoring at this site. Baseline surveys at this site were conducted in 1994. This site has been subject to several episodes of vegetation clearance between 1995 and 1998. Site 10A was partially burned in 1995. OE sampling and removal grids not burned were manually clipped from 1995 through 1997. Later in 1997, a majority of Site 10A burned again, including most of the clipped grids. Follow-up monitoring transect data collected in clipped grids after 1997, may be more accurately described as burned grids. Future monitoring events will be tailored to address the multiple methods of removal.

Cover provided by shrub and perennial species increased to approximately 60 percent in 2000. Shrub and perennial species in provided approximately 89 percent of overall cover in baseline data collected for mature chaparral at this site in 1994. Burl-sprouting species such as shaggy-barked manzanita and chamise provided approximately 18 percent of overall species cover in 2000 as compared to approximately 46 percent of cover in 1994. HMP seed reproducers such as Toro manzanita, Hooker's manzanita and Monterey ceanothus provided 33 percent of overall cover in baseline data collected for this site in 1994. Differences in cover by these species in 2000 varied depending upon the clearance method used. The three HMP shrub species provided approximately 13 percent of cover in burned grids, as compared to approximately 7 percent of cover in clipped grids. This difference is due to significant differences in cover provided by Monterey ceanothus. Monterey ceanothus provided approximately 9 percent cover in burned grids but provided less than 1 percent of the overall species cover in clipped area. Coverage by Monterey ceanothus was less than 1 percent in 1994. Cover by bare ground decreased to approximately 12 percent in 2000. Bare ground accounted for approximately 22 percent of overall cover in 1994. Herbaceous quadrat sampling was not performed in 2000 so an analysis of herbaceous species is not possible. No herbaceous species cover was noted the 1994 baseline data for this site. Exotic species such as hottentot fig, pampas grass, and cut-leaved fireweed accounted for less than 5 percent of overall species coverage.

This site appears to be regenerating naturally, given its clearance history. Overall coverage by chaparral shrub species is increasing while coverage by herbaceous species is decreasing. Species diversity remains high at this site with little cover being provided by undesirable weed species. Coverage by rush rose seems high this year (approximately 28 percent of overall species cover) while coverage by two HMP shrub species, Hooker's and Toro manzanita, were observed to be lower at this site as compared to baseline data collected in 1994. Both trends will continue to be monitored during future surveys.

OE Site 10B: This represents the third year of follow-up monitoring on OE Site 10B. Baseline

surveys for this site were completed in 1996. A portion of OE Site 10B burned and an additional portion was manually cleared in 1997. Vegetative cover on OE Site 10B varied depending on disturbance type.

Analysis of clipped areas is limited by the small number of transects (2) available for sampling. Species composition in clipped areas do not appear to be consistent with that of naturally regenerating chaparral habitat. Taller shrubs left standing following manual clearing continue to dominate vegetative cover in clipped areas. Species diversity was much smaller in clipped areas than in burned areas of this site. The low diversity of species in clipped areas is consistent with expectations as allelopathic chemicals in the soil and the physical and shade barrier presented by duff and chipped material would prevent germination of some seed species. There were two notable changes in species composition in 2000. Species cover by Hooker's manzanita decreased from 20 percent in 1999 to less than two percent in 2000. Cover by Toro manzanita increased from 38 percent in 1999 to 59 percent in 2000. If no errors in species identification occurred for these species, no plausible reason can be given for the drastic change in the overall cover for these two species.

Cover by chaparral shrub species and perennial species increased to 94 percent in burned areas. Coverage by early seral species such as rush rose and deerweed remains high (28 percent and 10 percent respectively) in burned areas. Species diversity in burned areas is higher as compared to clipped areas. Overall cover provided by herbaceous species increased to 19 percent in 2000. Herbaceous quadrat sampling was not performed in 2000 so an analysis of herbaceous species is not possible. This increase in herbaceous is most likely the result of herbaceous species becoming established on bare ground. Bare ground coverage decreased from 17 percent in 1999 to 8 percent in 2000. Species composition and cover in burned areas appears to be consistence with that of naturally regenerating maritime chaparral. Future surveys will continue to track the natural regeneration of this site.

OE Site 11: This is the third year of follow-up monitoring conducted at OE Site 11. Baseline data for this site was collected in 1996. The following year, Site OE 11 was manually cleared of vegetation in preparation for OE removal. Cleared vegetation was stacked in parallel rows approximately 3- to 5-feet in height and 6- to 10-feet wide. Coverage provided by chaparral shrub species and perennial species increased to an estimated 67 percent in 2000. Coverage by burl-sprouting species such as shaggy-barked manzanita increased while coverage by HMP seed species Toro manzanita and Monterey ceanothus showed little variation from previous sampling data. Sticky monkey flower provide a large portion (approximately 19 percent) of the cover from perennial species. Cover by herbaceous vegetation decreased to approximately 21 percent in 2000.

Species composition and cover at Site OE 11 does not appear consistent with naturally regenerating chaparral. While overall cover by chaparral shrub species increased and cover by herbaceous species decreased, species diversity continues to remain low at this site. In addition, piled brush occupies approximately 16 percent of cover at this site. The physical and shade barrier produced by these brush piles may be inhibiting recovery at this site.

OE Site 19: Data collected in 2000 represents the third year of follow-up data collected for OE Site 19. Baseline data for this site was collected in 1994. OE Site 19 was burned in 1995 and sampled for OE between 1995 and 1998. Limited clearing by hand clipping was performed on unburned branches and large stems from stump-sprouting species.

Overall species cover by shrub and perennial species was significantly greater in 2000 as compared to1994 when baseline data for this site was collected. One possible reason for this increase in coverage is that coverage by rush

rose and deerweed exceeded 45 percent in 2000. Overall species coverage by burl-sprouting species such as chamise and shaggy-barked manzanita was 41 percent. Species coverage for these two species in 1994 was only 31 percent. Coverage by HMP seed producers, Toro manzanita and Monterey ceanothus was approximately 21 percent in 2000. Overall species coverage by both species in 1994 was approximately 18 percent. Hooker's manzanita was not recorded in 2000. Baseline data taken in 1994 recorded less than 1 percent cover by this species. Hottentot fig was the only exotic species observed at this site in 2000 and accounted for less than 1 percent of overall species coverage.

With the notable exception of high densities associated with the species rush rose and deerweed, the variety and abundance of species observed during this years monitoring event are similar to those observed during baseline conditions in 1994. Based upon this observation, vegetative growth at this site appears to be consistence with that of naturally regenerating maritime chaparral. Future surveys will continue to track the natural regeneration of this site.

4.1.2 Remedial Investigation Sites

Range 18: Data collected in 1999 represents baseline conditions for chaparral habitat that may be used for future comparison if OE removal activities warrant follow-up monitoring. Chaparral stages at this site included disturbed and mature chaparral habitat. Three species, sandmat manzanita, chamise, and shaggy-barked manzanita dominated mature habitat at this site providing approximately 73 percent of overall species cover. Shaggy-barked manzanita provided approximately 51 percent of the cover in disturbed chaparral habitat. Species diversity was slightly increased in disturbed habitat as compared to mature habitat.

Range 19: Data collected in 1997 and 1999 represents baseline conditions for chaparral habitat at this site and may be used for future comparison if OE removal activities warrant follow-up monitoring. Chaparral stages at this site included disturbed and mature chaparral habitat. Three species sandmat manzanita, chamise, and shaggy-barked manzanita dominated both mature and disturbed habitat at this site. Shaggy-barked manzanita provided more than 60 percent of overall species cover in both disturbed and mature habitats.

Range 21: Data collected in 1997 and 2000 represent baseline conditions for chaparral habitat that may be used for future comparison if OE removal activities warrant follow-up monitoring. Range 21 is almost exclusively comprised of intermediate-age chaparral habitat. Three species sandmat manzanita, chamise, and shaggy-barked manzanita dominate intermediate-age habitat, providing approximately 77 of overall species cover at this site.

Range 24: Data collected in 1997 and 2000 represent baseline conditions that may be used for future comparison if OE removal activities warrant follow-up monitoring. Range 24 is almost exclusively comprised of mature chaparral habitat. A small section of disturbed habitat is located along the southern edge of this range. Two species chamise and shaggy-barked manzanita dominate both mature and intermediate-age habitat at this site. Both species provide approximately 85 percent of overall species cover in disturbed habitat and approximately 93 percent of overall species cover in mature habitat. Species diversity is slightly greater in mature habitat than in disturbed habitat.

Range 25: Data collected in 1997 and 2000 represent baseline conditions for chaparral habitat at this site and may be used for future comparison if OE removal activities warrant follow-up monitoring. Range 25 is almost exclusively comprised of mature chaparral habitat. A small section of disturbed habitat is located in the western section of the range. Sandmat manzanita and bare ground provide

approximately 87 percent of overall cover in disturbed habitat at this site. Mature habitat at this site is dominated by chamise and shaggy-barked manzanita. Both species provide approximately 98 percent of overall species cover in mature habitat at this site. Species diversity is greater in mature habitat than in disturbed habitat.

Range 26: Data collected in 1997 and 2000 represent baseline conditions that may be used for future comparison if OE removal activities warrant follow-up monitoring. Chaparral stages at this site intermediate-age and mature chaparral habitat. Two species shaggy-barked manzanita and dwarf ceanothus dominate both mature and intermediate-age habitat at this site. Both species comprise approximately 83 percent and 80 percent, respectively, of overall species cover in intermediate-age and mature habitat.

4.1.3 2000 Burn Area

Data collected in 1999 and 2000 represent baseline conditions for chaparral habitat at this site. This data may be used for future comparison if vegetation clearance for OE removal activities warrant follow-up monitoring. Chaparral sucessional stages at this site include disturbed, intermediate-age, and mature chaparral habitat. Sandmat manzanita dominates disturbed habitat, providing approximately one-one of overall cover. Shaggy barked manzanita and chamise dominate the remaining cover in disturbed habitat. Three species, sandmat manzanita, chamise, and shaggy-barked manzanita dominate intermediate-age chaparral habitat. Together, these three species provide approximately 75 percent of overall cover. Shaggy-bark manzanita provides over 60 percent of overall cover in mature chaparral habitat. Species diversity was approximately the same for all three successional stages.

Based upon field observations, a general pattern regarding successional stages of chaparral habitat was observed. These observations may not hold true for all areas of the 2000 Burn Area as access to some areas of the monitoring site was limited due to potential OE hazards associated with the MRA. In general, disturbed habitat was most often found in the eastern portion of the MRA between Ranges 42 and 45 and along old access roads. Mature and intermediate-age habitat appeared evenly distributed throughout the remainder of the 2000 Burn Area. As expected, intermediate-age chaparral was often found adjacent to grassland meadows transitioning toward mature as distance from the grassland meadow increased. However, tall, dense stands of mature chaparral habitat were frequently found adjacent to old access roads.

4.2 HMP Herbaceous Annual Species Surveys

4.2.1 OE Sites

OE Site 10A: Results of 1999 surveys for herbaceous species monitoring for this site is not available. Surveys in 2000 represent the third year of follow-up monitoring for HMP annual species at this site. Surveys for HMP species at OE Site 10A identified several scattered populations of Monterey spineflower and two separate populations of sand gilia. The 2000 surveys for both species may actually represent baseline data and provide a basis for comparison in future surveys. It was discovered during surveys in 1998, that populations previously identified as Monterey spineflower and sand gilia, included individuals of closely related species. It was determined that population totals are actually less than originally identified during baseline surveys conducted in 1997. Therefore, population data collected in 1998 more accurately represents baseline conditions for these species. Populations initially identified as Monterey spineflower were actually diffuse spineflower (*Chorizanthe diffusa*). These species are taxonomically close and some individuals displays features, which are intermediate between the two forms. In addition populations initially identified as sand

gilia, were later identified as slender-flowered gilia (*Gilia tenuiflora tenuiflora*). Future monitoring is required and changes in population totals from year to year will be tracked and compared with reported basewide population fluctuations for those same years.

OE Site 10B: Surveys in 1999 represent the third year of follow-up monitoring for HMP species at this site. The results of monitoring activities in 1999 revealed two isolated populations of sand gilia and one large centralized population of Monterey spineflower. Surveys in 1999 may reflect baseline conditions for both species to be used as a comparison for future surveys. Monitoring activities conducted in 1998 revealed that population densities previously used for both Monterey spineflower and sand gilia were smaller than originally estimated due to misidentification for both species. Surveys in 1999 may reflect baseline conditions for both species to be used as a comparison for future surveys.

Surveys in 2000 represent the fourth year of follow-up monitoring for HMP herbaceous species at this site. The results of monitoring surveys in 2000 for Monterey spineflower and gilia revealed several scattered populations for both species. Population estimates increased for both species. Most notable was the increase in the number of isolated populations of sand gilia. These differences may be attributable to normal annual population fluctuations or to differences in rainfall totals. Monitoring surveys in 2000 also revealed the presence of one large population (population to estimated to range from 5,000 – 50,000) and several smaller isolated populations of seaside bird's-beak. Seaside bird's-beak had not previously been identified at this site. Future monitoring is required and changes in population totals from year to year will be tracked and compared with reported basewide population fluctuations for those same years.

OE Site 19: The 2000 data represents the first year of follow-up monitoring for HMP annual species at this site. Baseline data taken in 1999 is not available from BLM at this time. It is not known if HMP annuals were previously identified at this site. Further monitoring for HMP annuals is recommended in order to see if the adjacent population of Monterey spineflower is able to colonize at this site.

4.2.2 Multiple Range Area

Data collected in 2000 represents baseline conditions for HMP annual species at this site. This data may be used for future comparison if vegetation clearance for OE removal activities warrant follow-up monitoring. Changes in population totals from year to year will be tracked and compared with reported basewide population fluctuations for those same years.

4.2.3 Contra Costa Goldfields

Populations of Contra Costa goldfields at MGF were observed to be somewhat larger in size (approximately 20 to 25 percent) compared to locations of the population boundary placed in 1998 and significantly larger (approximately 60 to 70 percent) compared to population boundaries placed in 1999. Populations at the mima mounds were observed to be somewhat smaller in size (approximately 20 to 30 percent) compared to population boundaries placed in 1998. However, populations at the mima mounds were observed to be approximately the same size compared to population boundaries placed in 1999. The number of individuals estimated to be in the populations was significantly greater than counts performed in 1998 and 1999. Population numbers in 1998 were estimated to range between 500 to 1,500 individuals. In 1999, the population at MGF is estimated at approximately 6,000 and at the mima mounds at 50,000. Population numbers in 2000 were estimated at approximately 14,500 individuals at MGF and approximately 148,000 individuals at the mima mounds. The larger population size observed at MGF in 2000 is fairly significant due to the fact that this area had been previously sampled for OE. The difference in population numbers may be attributable to differences in rainfall totals and

water duration in ponded areas. Optimal conditions may not be provided by high rainfall or a long rainy season, but rather a more moderate rainfall season.

Overall, the two populations at OE Site 10B displayed similar habitat preferences and associated species. Observed variations between the two populations involve differences between dominant associates and duration of standing water in low-lying areas. The population at MGF was generally observed to be associated with low-lying areas that supported mostly facultative wetland species. In contrast the population at the mima mounds was generally observed to be associated with similar facultative wetland species, but with a species composition augmented with additional obligate species.

4.2.4 UC/NRS-FONR

Surveys conducted at the UC/NRS-FONR for sand gilia and Monterey spineflower comprise the second year of monitoring activity. It is still too early to determine the effect, if any, groundwater remediation activities, specifically vehicle traffic along the access routes, has had or will have on these species. Populations of sand gilia and Monterey spineflower on the former UC/NRS North Reserve were observed to be somewhat reduced in size (estimated to be 15 to 20 percent smaller) compared to the populations recorded in 1999. This difference may be attributable to normal annual population fluctuations or to differences in rainfall totals. Future monitoring is required and changes in population totals from year to year will be tracked and compared with reported basewide population fluctuations for those same years.

4.3 Wetland Monitoring

The findings presented here represent the first year of wetland monitoring at Waterbody 52. Complete baseline data was collected at this waterbody. Data collected at waterbodies 42 and MGF represents the first year of follow-up monitoring for these waterbodies.

California linderiella were observed during follow-up monitoring in waterbodies 42 and MGF, and baseline surveys at Waterbody 52. Linderiella in Waterbody 52 represent baseline conditions that may be used for future comparison if OE removal activities warrant follow-up monitoring.

Linderiella were previously observed in Waterbody 42 during the 1998 baseline monitoring event. Relative abundance during this previous survey was observed to be moderate (11 to 100 individuals) in January and low (1 to 10 individuals) in February. Relative abundance was observed to be significantly higher during the 2000 follow-up monitoring event with an estimated 318 individuals (very high) being observed in February and an estimated 123 individuals (high) being observed in March. Fluctuations in abundance are most likely attributable to variations of natural conditions at the waterbody, including precipitation timing and totals, temperature and pH. OE removal activities at Waterbody 42, which is located within OE site 10A, do not appear to have initially affected abundance of linderiella as evidenced by the higher relative abundance observed following OE removal. Preservation of suitable habitat conditions to support linderiella within Waterbody 42 can probably be attributed to the timing of OE removal and minimization of surface soil disturbance during removal activities.

Linderiella were previously observed in Machine Gun Flats during the 1998 baseline monitoring event. Relative abundance during this previous survey was observed to be high (101 to 300 individuals) in January and moderate (11 to 100 individuals) in February. Relative abundance was observed to be significantly higher during the 2000 follow-up monitoring event with an estimated 1,260 individuals (very high) being observed in February and an estimated 1,485 individuals being observed in March. Fluctuations in abundance are most likely attributable to variations of natural conditions at the waterbody, including precipitation timing and

totals, temperature and pH. OE removal activities at MGF, which is located within OE site 10B, do not appear to have initially affected abundance of linderiella as evidenced by the higher relative abundance observed following OE removal. Preservation of suitable habitat conditions within MGF can probably be attributed to the timing of OE removal and minimization of surface soil disturbance during removal activities.

California tiger salamander were not observed during baseline surveys at Waterbody 52, or during follow-up monitoring at MGF. However, California tiger salamander were observed at Waterbody 42 during the June monitoring event.

Thirteen juvenile tiger salamander were observed during dipnetting surveys of the remaining inundated portion of Waterbody 42. A small section of Waterbody 42 retained water through the June 15 monitoring event. This inundated area, located in the northern section of the waterbody, is the deepest area as well as the only portion that is shaded throughout most of the day. Mature coast live oaks form a closed canopy over this section, thereby reducing the rate of evaporation caused by direct exposure to sunlight. OE sampling and removal activities, including manual vegetation removal of adjacent maritime chaparral habitat, were conducted in and adjacent to Waterbody 42. California tiger salamander had not been previously observed in waterbody 42 during the 1998 baseline surveys, which were conducted prior to any OE removal activities including vegetation removal.

The absence of California tiger salamander in MGF is most likely attributable to the presence of a large number of bullfrogs in the waterbody. Adult bullfrogs are opportunistic feeders whose prey items include fish, salamanders, and other frogs. An area in the western portion MGF, measuring approximately 500 square feet, is significantly deeper than the rest of the waterbody. The depth has been measured at greater than 5 feet when the waterbody is fully inundated. This area has also been observed to retain water throughout a majority of the year (7 to 8 months) which is beneficial to the continued existence of bullfrog in this waterbody.

Although no tiger salamander were observed during baseline surveys at Waterbody 52, suitable habitat exists for this species. OE removal activities have not occurred in or adjacent to this waterbody which could have affected habitat suitability. Migrations to and from breeding ponds may occasionally exceed 1000 meters (*California Department of Fish and Game, 1988*).

Many of the waterbodies occurring at former Fort Ord provide suitable habitat for California red-legged frog, and it is possible that red-legged frog may occur, however they were not observed during previous baseline surveys and follow-up monitoring events or at any of the waterbodies surveyed in 2000.

4.4 Anticipated Future Activities

Habitat monitoring items to be performed and included in the year 2001 annual monitoring report include:

- Follow-up chaparral monitoring at OE site 11
- Follow-up chaparral monitoring at OE site 16, MRA North and West, and the 2000 Burn Area if OE removal occurs
- HMP herbaceous species surveys at OE sites 9, 11, and the UC/NRS - FONR
- Annual HMP surveys at MRA North and West and the 2000 Burn Area if OE removal occurs
- Follow-up monitoring of Contra Costa Goldfields populations at OE 10B
- Follow-up wetland monitoring at waterbodies 1, 2, 42, and MGF

- Follow-up wetland monitoring at waterbodies 43 and 44 if OE removal occurs and 52 if remediation is complete

- Activities associated with groundwater remediation including installation of monitoring and extraction wells at UC/NRS.

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