2003 Annual Monitoring Report
Biological Baseline Studies and Follow-up Monitoring
Former Fort Ord
Monterey, California

Prepared for

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1.0 INTRODUCTION

This report was prepared to address the United States Department of the Army (Army) and United States Fish and Wildlife Service (USFWS) biological resources monitoring requirements, as identified in the *Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California* (HMP; *USACE, 1997a*) and the Biological and Conference Opinions (BO/BC) issued by the USFWS, for sites where ordnance and explosive (OE) removal or lead, chemical, or groundwater remediation has taken place. The HMP identifies flora species, fauna species, and habitats of concern within the Former Fort Ord and specifies mitigation measures to monitor the regeneration of these species and habitats following base closure and reuse activities. Base closure and reuse activities conducted at the Former Fort Ord are required to follow specific protocols approved by the USFWS, as detailed in the BO/BC on the Closure and Reuse of Fort Ord, Monterey County, California (*USFWS, 1997*). This protocol was expanded based on a 1998 memoranda (*Willison, 1998*) which resulted in a reinitiation of formal consultation with USFWS pursuant to Section 7 of the Endangered Species Act of 1973, as amended. The resulting BO/BC on the Closure and Reuse of Fort Ord, Monterey County, California (*USFWS, 1999*) identified additional mitigation measures to be implemented during remediation and predisposal and activities.

The impacts of groundwater remediation activities were not considered in the HMP. At the request of the Army, Harding and Lawson Associates (HLA) identified the potential effects groundwater remediation activates and developed HMP species specific guidelines and general mitigation measures (*HLA, 1998*) to be utilized at University of California Natural Reserve System (UC/NRS) Fort Ord Natural Reserve (FONR) for agency consultation. The HMP species specific guidelines and general mitigation measures to be used at UC/NRS FONR and are identified in the BO/BC on the Closure and Reuse of Fort Ord, Monterey County, California (*USFWS, 1999*).

Contra Costa goldfields were not identified in the HMP as a species of concern. The effect of OE removal on Contra Costa goldfields was considered in a BO/BC (*USFWS, 1999*), which subsequently specified mitigation measures to be implemented during OE removal, in addition to those presented in the HMP, in areas where Contra Costa goldfields occur. These measures were summarized in the 1998 memorandum the Directorate of Environmental Natural Resources (DENR) (*Willison, 1998*). In 2003, the USFWS (6*8 Federal Register 46648*) designated approximately 6,878 acres of Former Fort Ord as critical habitat for the Contra Costa goldfields (*Lasthenia conjugens*), a federally endangered plant which occurs at the site. Areas designated as Contra Costa goldfields critical habitat areas are identified as Unit 9 in the Contra Costa goldfields critical habitat final rule (6*8 Federal Register 46648*).

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. The baseline surveys are conducted to characterize the composition of these habitats in order to establish an informational database identifying current biological resources. Follow-up monitoring is required for a period of five years following OE removal or lead and chemical remediation projects. Follow-up monitoring is required for a period of three years following groundwater investigation/remediation projects (*USFWS, 1999*).

As data accumulates for these sites, the methods used to minimize adverse effects on those species identified in the HMP may be refined.

1.1 Habitats and Species Considered for Habitat Monitoring

The habitats of concern identified in the HMP as occurring within the OE removal or lead, chemical, and groundwater remediation sites are the central maritime chaparral and wetland habitats. Central maritime

chaparral surveys are characterized in terms of flora species composition and dominance, the location and extent of HMP species, and the location and extent of special status animals observed at remediation sites. Wetland habitats, such as vernal pools and ponds (waterbodies,) are surveyed 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 monthly during the rainy season for the waterbodies. Central maritime chaparral and waterbody habitats possess many of the special status plants and animals identified in the HMP.

As identified in the HMP, terrestrial species associated with the OE removal and remediation project sites are listed in Table 1 and include Hooker's manzanita (*Arctostaphylos h. hookeri*), Toro manzanita (*Arctostaphylos montereyensis*), sandmat manzanita (*Arctostaphylos pumila*), Monterey ceanothus (*Ceanothus cuneatus rigidus*), Monterey spineflower (*Chorizanthe p. pungens*), Seaside bird's-beak (*Cordylanthus rigidus littoralis*), Eastwood's goldenbush (*Ericameria fasciculata* coast wallflower (*Erysimum ammophilum*), sand gilia (*Gilia tenuiflora arenaria*), Contra Costa goldfields (*Lasthenia conjugens*), and California black legless lizard (*Anniella pulchra nigra*). The federal, State, and California Native Plant Society (CNSP) listing status for these species are also included in Table 1.

As identified in the HMP, wetland species associated with the OE removal and remediation project sites are listed in Table 1 and include the California tiger salamander (*Ambystoma californiense*), California red-legged frog (*Rana aurora draytoni*), and California linderiella (*Linderiella occidentalis*). Although California linderiella is neither state nor federally listed, surveys are being continued to monitor the health of this wetland species following cleanup activities. Additional species of concern that are associated with wetland habitats and have the potential to occur at the Former Fort Ord were identified in the Wetland Restoration Plan for Unexploded Ordnance Removal Activities at Former Fort Ord (WRP, *USACE, 1997b*) and include tricolored blackbird (*Agelaius tricolor*).and southwestern pond turtle (*Clemmys marmorata pallida*).

According to the HMP, community regeneration is an important success criteria parameter for the restoration of habitats at the project sites and is characterized during the follow-up monitoring activities. Successful regeneration of central maritime chaparral is defined in the HMP as a habitat consisting of "healthy, high-diversity maritime chaparral habitat that has a variety of seral stages and age-classes and that includes microhabitat for sand gilia, Monterey spineflower, Seaside bird's-beak, and black legless lizard." The success criteria for HMP annual species is defined as if "after five monitoring years, HMP annual species population sizes are . . . similar in size to those estimated for these species in 1992." The success criterion for restored or regenerated wetland habitat is defined as when "affected wetlands are of the same acreage and provide the same functions as before clearing of ordnance." The HMP also states affected waterbodies must support healthy populations of California linderiella, California tiger salamander, or California red-legged frogs upon completion of restoration activities if the affected waterbody supported these species.

1.2 Previous Baseline Studies and Monitoring

In recent years, baseline and follow-up monitoring surveys were conducted in areas supporting maritime chaparral and HMP annual species that would be disturbed during OE removal or lead and chemical remediation activities. Baseline surveys were conducted at the following OE removal and remediation sites:

- in 1996 at OE-16,
- in 1997 for MRA West,
- in 1999 for Ranges 18 and 19 and MRA North,

- in 2000 for Ranges 21, 24, 25, and 26,
- in 2001 for Ranges 43-48, and
- in 2003 for Range 30A.

These sites are located in areas proposed to become habitat reserves that contain either central maritime chaparral or wetland habitats known to support, or potentially support, species of concern identified in the HMP. The locations of baseline and monitoring surveys conducted through the year 2002 are illustrated on Plate 1.

1.3 2003 Baseline Studies and Monitoring

The monitoring surveys conducted in 2003 include:

- Baseline chaparral and HMP annual species monitoring at Range 30A,
- Follow-up monitoring for HMP annual species at terrestrial OE removal site OE-11,
- Follow-up monitoring for HMP annual plant species at groundwater remediation site UC/NRS FONR,
- Follow-up monitoring surveys for the HMP annual species Contra Costa goldfields at OE removal sites Machine Gun Flats (MGF) and in the mima mounds (undulating terrain consisting of small mounds with hydrologically interconnected depressions) grassland,
- Baseline monitoring for exotic (non-native) species at the Multiple Range Area (MRA),
- Follow-up monitoring at Waterbody 42 and Machine Gun Flats.

Baseline and monitoring activities conducted at the OE removal and remediation sites in 2003 are summarized in Table 2. Plate 2 shows the locations of monitoring activities conducted in 2003.

1.3.1 Central Maritime Chaparral Monitoring

Central maritime chaparral baseline monitoring was conducted by MACTEC biologists at Range 30A in March through April 2003. Range 30A encompasses approximately 367 acres of habitat reserve lands located in the southern section of the MRA. Range 30A is defined as the area between Nowhere and Darwin Roads to the north and south and Orion and Evolution Roads to the east and west.

1.3.2 HMP Annual Species Surveys

MACTEC conducted surveys for the population size and location of sand gilia and Monterey spineflower in May at two terrestrial sites, OE-11 and the Range 30A. MACTEC conducted surveys for Seaside bird's-beak at these two sites in July 2003.

In April 2003, follow-up monitoring was conducted at groundwater remediation sites within the UC/NRS FONR for populations of Monterey spineflower and sand gilia. The wells at UC/NRS FONR are used for groundwater monitoring. Surveys of HMP annual species were conducted at existing groundwater monitoring wells and along identified monitoring well access routes.

1.3.3 Contra Costa Goldfields Surveys

Field surveys for Contra Costa goldfields were conducted in May 2003. Contra Costa goldfields on Former Fort Ord occur adjacent to, or in the vernal waterbodies of open grassland habitats that generally

exhibit mima mound (undulating terrain consisting of small mounds with hydrologically interconnected depressions) topography. To date, this species has been located in two discrete locations in OE-10B; one is along the western edge of the vernal pool at Machine Gun Flats (MGF), the other in the mima mounds grassland southeast of MGF. These two occurrences were first monitored in 1998 and 1999 to collect information prior to OE removal activities at OE-10B.

1.3.4 Exotic Species

To identify the locations of exotic (non-native) species in the Multiple Range Area (MRA), surveys for exotic species were conducted in March and April 2003.

Exotic species that were observed during the surveys included jubata grass (*Cortaderia jubata*), hottentot fig (*Carpobrotus edulis*), French broom, (*Genista monspessulana*), and cut-leaved fireweed (*Erechtites glomerata*).

Surveys to identify exotic species were also conducted at wetland and OE removal sites. Exotic species that were observed during the line-intercept and quadrat sampling in chaparral and wetland habitats are noted on the tables and figures for Range 30A, Waterbody 42, and Machine Gun Flats.

1.3.5 Wetland Monitoring

From January through May 2003, follow-up wetland monitoring was conducted at approximately 30-day intervals at Waterbody 42 and MGF as specified in the HMP. There were no new waterbodies identified during the 2003 baseline monitoring activities.

Follow-up data collected at Waterbody 42 and MGF included characterization of wetland vegetation, assessment of the potential occurrence of wetland-associated special-status fauna identified in the HMP, and the collection of data on the physical characteristics and parameters of each seasonal waterbody. Surveys were conducted according to protocol identified in the HMP and follow-up monitoring requirements identified in the Wetland Restoration Plan for Unexploded Ordnance Removal Activities at Former Fort Ord (WRP) (*USACE, 1997b*).

1.4 Future Baseline Studies and Monitoring Activities

A prescribed burn was conducted on October 24, 2003 at Ranges 43-48. Although 487 acres of central maritime chaparral habitat identified to be burned, the prescribed burn resulted in the consumption of approximately 1,500 acres of central maritime chaparral habitat. Baseline central maritime chaparral and HMP annual species surveys were performed in 2003 at Ranges 43-48. Follow-up monitoring surveys at Ranges 43-48 is expected to be limited to HMP annual species in 2004. Follow-up monitoring of central maritime chaparral is not expected to occur at Ranges 43-48 until OE remediation has been completed and the growth of central maritime chaparral seedlings has begun.

Remediation has not been initiated at other OE removal or remediation sites identified in Section 1.2, therefore, no additional monitoring or evaluation is required at these sites.

2.0 METHODS

Methods used to collect data during the 2003 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, 1997b, 1998, 1999, 2000, 2001, 2002*) and the WRP (*USACE, 1997a*) were reviewed and the survey methods described were implemented to maintain consistency in sampling.

The survey methods used were specifically designed for central maritime chaparral or wetland habitats. Survey methods for terrestrial (chaparral) monitoring included 1) line-intercept sampling along permanent transects to characterize central maritime chaparral shrub cover; 2) quadrat sampling in areas with a high percentage of herbaceous vegetation (estimated to have greater than 20 percent cover), and 3) visual surveys in suitable habitat to map the distribution of HMP annual species. Survey methods for wetland habitat include: 1) documentation of faunal characteristics, 2) wetland vegetative cover by species, and 3) physical and hydrological data.

Chaparral and wetland sites monitored in 2003 are shown on Plate 2. All biological monitoring was performed in the MRA with an OE specialist escort.

2.1 Central Maritime Chaparral Monitoring

The survey methods used for central maritime chaparral monitoring are described in detail below in sections 2.1.1 and 2.1.2.

2.1.1 Line-Intercept Sampling Methods

The line-intercept sampling method is used to determine flora species composition and cover in central maritime chaparral habitat. Shrub composition, cover, and abundance are sampled along the length of a measuring tape that is extended above, below, or through the woody canopy. Intercept distance for each species is recorded separately to include foliar overlap. Additional species observed within 10 meters of the transect are also recorded. Intercept distances of each species are combined; this total is divided by the length of the transect and multiplied by 100 to obtain individual species percent cover. Cumulative intercept distances for cover types (i.e., shrubs, bare ground, and vegetated ground) are combined, 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.

Sample sizes for each variation of central maritime chaparral habitat type, or seral stage (i.e. disturbed, intermediate-age, or mature) are determined by calculating the cumulative total cover for the dominant species, of those identified in the HMP, if present. The total is graphed against a running total of the combined transect length. An adequate sample size is considered reached when, after including additional transect data with the combined data, there was a change of less than 10 percent in total cover.

Transect locations for follow-up monitoring are located using Global Positioning System (GPS) equipment. Four- or five-foot lightweight t-posts are installed at transect endpoints and photographs are taken to record the location and condition of the sampling transect. Transects are generally 50 meters (approximately 164 feet) in length, but transect length may be limited by tall, impenetrable brush or OE concerns.

2.1.2 Quadrat Sampling Methods

Quadrat sampling is used to characterize the herbaceous component of central maritime chaparral habitat. Quadrat sampling is conducted at intervals along transects with greater than 20 percent cover provided by herbaceous plant species. Quadrat sampling is conducted along the line intercept tape at 10-meter intervals; 0.25-meter square quadrats are placed; starting at 10-meter intervals alternating from the right to left side of the transect. Plant species present within each quadrat are identified; percent cover provided by each species is estimated and recorded.

2.1.3 Seral Stage Sampling

Seral stage sampling is used to provide the most representative results for each successive vegetative stage of central maritime chaparral. Three successional stages of central maritime chaparral habitat have been identified; mature chaparral, intermediate-age chaparral, and disturbed chaparral. Mature chaparral is composed of fully mature to senescent stands of shrubs that are estimated to be greater than fifteen years in age and are generally between six and fifteen feet in height. Mature stands generally have little open ground, narrow species diversity, with little or no herbaceous plant cover. Intermediate-age stands are estimated to be five to fifteen years in age, and generally range from three to six feet in height. Intermediate-age stands generally exhibit more open ground and herbaceous plant cover, and include a diverse species composition. Disturbed chaparral habitat includes areas that were subject to regular disturbance. This habitat type is generally located in range fans with cleared rows along firing lines interspersed with patches of chaparral species. Disturbed stands are typically transitional in species composition and range from intermediate-age chaparral and mature chaparral habitat. Locations of transects are selected on a site-by-site basis depending on successional stage distribution at the site.

2.2 HMP Annual Species Surveys

2.2.1 Monterey Spineflower, Sand Gilia, Seaside Bird's-Beak Surveys

Visual HMP annual surveys are conducted at monitoring sites to verify the continued presence of previously recorded locations of HMP annuals or to identify new locations.

Prior to conducting visual surveys for HMP annual species, aerial photographs or maps showing previously recorded locations are reviewed to identify suitable or potential habitat. The HMP annual surveys are conducted by inspecting areas of known or potential habitat by walking species-specific habitats at approximately 25-foot intervals. Estimates for the number of individuals in low density populations of HMP annuals are based upon direct counts. At locations supporting relatively large numbers or high densities of HMP annuals, estimates of HMP annuals are based upon direct counts of representative sample areas. These sample counts are then used to estimate the number of HMP annuals individuals throughout a given location. The locations of observed HMP annual species are recorded using GPS. Results of large populations of HMP annuals on OE sites are categorized as follows:

- Low density populations are estimated to contain between 1 – 100 individuals per acre,
- Medium density populations are estimated to contain between 101 – 1,000 individuals per acre, and
- High density populations are estimated to contain over 1,001 individuals per acre.

2.2.2 OE Sites

Population estimates for sand gilia on UC/NRS FONR sites are obtained by direct visual count surveys. Population estimates for Monterey spineflower at low and medium density populations are obtained by direct counts. Population estimates for high density populations are obtained by sub-sampling and calculating population estimates based upon the area measured. Surveys are conducted at existing groundwater monitoring well sites and along approved access routes. Areas supporting sand gilia and Monterey spineflower are identified, flagged, and delineated using GPS.

2.2.3 Contra Costa Goldfields Surveys

Sampling methods for Contra Costa goldfields involve determining population totals by performing visual walking surveys through grassland habitats where this species might occur. Particular attention is given to topographically low areas that contain species associated with the presence of Contra Costa goldfields. Areas found to support Contra Costa goldfields are flagged. Population totals for Contra Costa goldfields are obtained by direct counts or by sub-sampling large populations and calculating densities on a per acre basis. Sub-sampling of larger sub-populations involves using a random quadrat method to estimate population size, during which 0.25-meter square quadrats are randomly placed in each sub-population area, the Contra Costa Goldfield individuals are counted, and the populations delineated using GPS. The number of quadrats utilized varies depending on the size of the sub-population. In general, 10 to 20 percent of the area in each sub-population will be sampled. Population estimates are then calculated.

2.3 Exotic Species

To determine the locations and extent of exotic species at the sites, walking surveys are performed and visual results recorded. Exotic plant species of interest include jubata grass, hottentot fig, French broom, and cut-leaved fireweed. During the visual surveys, the population size and extent of the observed exotic species are recorded and their locations mapped by GPS.

2.4 Wetland Monitoring

The WRP (*USACE, 1997b*) bases the level of effort for monitoring on the degree of disturbance that occurred during OE removal. Methods used to collect baseline and monitoring data on special-status fauna, physical parameters and wetland vegetation were developed in accordance with guidelines specified in the HMP and WRP, and are described briefly in the sections below.

2.4.1 Wetland Vegetation Sampling

Wetland vegetation sampling is conducted using a modified quadrant-transect method designed for central maritime chaparral surveys (*USACE, 1995a*). This modified version of the sampling protocol uses different interval sizes between quadrats and is described in the HMP. The original protocols were developed for vegetation sampling in chaparral habitat where the vegetation tended to be mono-typic. The quadrat transects for wetland habitat monitoring are placed every ten feet to capture abrupt vegetation changes, such as intermittent patches of bare ground and open water. The number of transects established at wetland sites are based upon the size and variability of habitat.

According to the WRP, the wetlands monitoring periods are based upon the assumption that performance functions of a wetland will be successfully achieved within 5 years of disturbance activities and at least three monitoring events are required within a five-year period after OE disturbance activities have been

completed. The requirement for any additional follow-up monitoring would be based on the results of the surveys.

2.4.2 Fauna

Faunal monitoring consists of conducting visual surveys to document the presence or absence of wildlife species identified in the HMP, or other potentially occurring special-status species as identified in the WRP, including California linderiella, California tiger salamander, California red-legged frog, tricolored blackbird, and southwestern pond turtle. In addition, vertebrate species observed during fauna surveys are recorded in field logs.

California linderiella (*Linderiella occidentalis*)

To assess the presence or absence of California linderiella and other vernal pool brachiopod species, representative portions of the site waterbodies are sampled using a dipnet. Vernal pool brachiopod species caught are examined with a field-magnifying lens to identify genus. Samples are collected systematically from each waterbody at the site until habitat is adequately represented. The relative abundance of vernal pool brachiopods is estimated by collecting between 10 and 20 samples from each waterbody (depending on the size and complexity of each waterbody). The number of vernal pool brachiopods in each sample is totaled and the relative abundance defined as follows:

- Low abundance: 1 to 10 vernal pool brachiopods,
- Moderate abundance: 11 to 100 vernal pool brachiopods,
- High abundance: 101 to 300 vernal pool brachiopods, and
- Very high abundance: more than 300 vernal pool brachiopods.

California tiger salamander (*Ambystoma californiense*)

California tiger salamanders (CTS) are commonly associated with grasslands in rolling terrain or foothills that contain suitable underground retreats, such as burrows of the California ground squirrel (*Spermophilus beecheyi*) and Botta's pocket gopher (*Thomomyhs bottae*). However, CTS have been found in areas with no apparent underground retreats. In these areas, CTS may utilize cracks in the ground or may burrow into loose soil, or seek refuge in and under rotting logs or fallen branches. In captivity, CTS have been observed to readily burrow into loose substrate, such as decomposed oak leaves. CTS typically use vernal pools or other small, temporary waters that fill during winter rains and are dry by mid-summer as breeding ponds. CTS can utilize artificial impoundments (farm ponds), even permanent ones, if they do not contain fish or bullfrogs (*Rana catesbeiana*).

To assess the presence or absence of CTS, representative portions of each waterbody at the site are sampled using a dip-net and examined for the presence of CTS larvae. Dip-net samples are collected systematically from each waterbody at the site until habitat is adequately represented. In addition to the dipnet surveys for larvae, upland habitat is surveyed for the presence of adult CTS. Upland surveys consist of walking transects from the edge of the waterbody into upland habitat and looking underneath downed tree branches and rocks, in burrow entrances, and soil fissures under tree canopies where there are suitable upland refugia and recording observations.

California red-legged frog (*Rana aurora draytonii*)

The California red-legged frog (CRLF), a federally listed Threatened species, can be encountered in and around freshwater within permanent to semi-permanent water bodies, such as springs creeks, and naturally or artificially created ponds containing thick emergent vegetation such as bullrush (*Scrirpus* sp.) or cattails (*Typha* sp.). The CRLF requires fresh water of at least two feet in depth with suitable emergent vegetation to provide escape cover from predators, allow for thermo-regulation during summer months, and allow for metamorphosis of the young. CRLFs may move up to one mile away from their resident drainages at the onset of the first winter rains and have been known to move away from creeks and into riparian woodlands and adjacent grasslands.

To assess the presence or absence of CRLF, representative portions of each waterbody at the site are sampled using a dipnet, and samples examined for presence of CRLF tadpoles. Samples are collected systematically from each waterbody at the site until the habitat was adequately represented. In addition to the dipnet surveys for tadpoles, the perimeter of each waterbody is visually assessed for the presence or absence of adult CRLF and the observations are recorded. In addition, habitat features are noted, such as duration of ponding, the presence of submergent and emergent vegetation, and the presence of adequate upland estivation habitat.

Tricolored blackbird (*Agelaius tricolor*)

The tricolored blackbird (TCBB), a Species of Concern in California, is commonly found throughout the Central Valley and in coastal districts from Sonoma County and southward. TCBBs are typically found near fresh water, preferably in emergent wetland with tall, dense cattails or tules, but also in thickets of willow, blackberry, wild rose, and tall herbs. TCBBs are a summer resident in northeastern California and feed primarily on seeds in grassland and cropland habitats. Dense breeding colonies of up to 500 TCBBs have been known to be vulnerable to massive nest destruction by mammalian and avian predators, including Swainson's hawks and other buteo's. Walking surveys are conducted to determine the presence or absence of TCBBs by searching for nesting materials or other physical evidence of the species and recording observations.

Southwestern pond turtle (*Clemmys marmorata*)

The southwestern pond turtle (SWPT), listed by the state as a Species of Special Concern, originally inhabited many of the Pacific drainage basins in California (*Stebbins, 1985*). Primary habits for SWPT include permanent water sources such as ponds, streams, and rivers. The SWPT is often seen basking on logs, mud banks, or mats of vegetation, although wild populations are wary and individuals will often plunge for cover after detecting movement from a considerable distance. Although it is an aquatic species, it can move across land in response to fluctuating water levels, an apparent adaptation to the variable rainfall and unpredictable flows that occur in many coastal California drainage basins (*Rathbun, et al. 1992*). In addition, the SWPT can over-winter on land and water or remain active in the winter, depending on environmental conditions (*Jennings and Hayes, 1994*). Walking surveys are conducted to determine the presence or absence of SWPTs by searching for physical evidence of the species and recording observations.

2.4.3 Physical Characteristics

Waterbodies requiring hydrological monitoring are defined in the WRP Table 3. Generally, waterbodies that require hydrologic monitoring are those where OE removal activities have resulted in excavations greater than four feet in depth or those containing soil conditions other than a thick deep clay horizon. Hydrological monitoring is collected to assess the waterbodies functions and values, including pH, maximum water depth, duration of ponding, and surface area. The physical characteristics of waterbodies

are also recorded to identify factors that could potentially affect the continuing presence or absence of special-status fauna, including: California linderiella, other vernal pool brachiopod species, CRLF, CTS, TCBB, and SWPT.

Measurements of pH are collected during each monitoring event at the waterbodies prior to other survey activities that could affect data accuracy (e.g., gathering depth measurements, vegetation sampling, and/or dipnetting). A portable pH field meter is calibrated prior to each field monitoring visit. Measurements are taken no sooner than 24 hours after a storm event, as required by protocol specified in the WRP.

Maximum water depth is measured during each monitoring event by locating the center or deepest portion of the waterbody until the apparent maximum depth was located. The depth is measured by placing a staff gauge into the deepest portion of the waterbody and recording the depth on field forms. The area of ponding at waterbodies is calculated using GPS to measure the perimeter of the ponded area.

3.0 RESULTS

This section presents survey data collected during 2003 monitoring activities. The results are presented according to the types of monitoring conducted: central maritime chaparral, HMP annual species and Contra Costa goldfields, as well as exotic species and wetlands.

3.1 Central Maritime Chaparral Habitat Monitoring

The results of the line-intercept sampling are summarized below. Results of chaparral vegetation sampling are presented in terms of dominant and/or HMP shrub species. Tables 3 through 5 provide the percent cover by transect for line-intercept for each species observed at the OE sites monitored in 2003. Figures 1 through 3 provide site photographs of seral stages encountered at the OE site monitored in 2003. Figures 4 through 6 provide the percent cover by shrub species for line-intercept sampling for the OE site monitored in 2003.

3.1.1 OE Sites

Range 30A: To adequately represent the successional stages of central maritime chaparral at the site, MACTEC placed a total of 22 transects located at this site. Six transects were placed in disturbed chaparral habitat, six transects were placed in intermediate-age chaparral habitat, and ten transects were placed in mature chaparral habitat. It should be noted that the presence of high explosive OE prevented the access and placement of transects in certain portions of this site. The starting and ending points of transects were recorded using GPS.

Results of line-intercept for Range 30A disturbed chaparral habitat are presented in Table 3 and Figure 4. Figure 1 is a representative site photograph of disturbed chaparral habitat observed at this site. Dominant shrub species (contributing greater than 4 percent absolute cover) observed in disturbed chaparral habitat include: shaggy-barked manzanita (*Arctostaphylos t. tomentosa*) at 34.33 percent, chamise (*Adenostoma fasciculatum*) at 34.70 percent cover, (*Salvia mellifera*) at 8.36 percent. Bare ground was estimated at 25.31 percent. The cover provided by herbaceous vegetation was estimated at 1.65 percent. HMP shrub species encounter in disturbed chaparral habitat include: Hooker's manzanita (2.70 percent), Monterey ceanothus (2.46 percent), and sandmat manzanita (1.85 percent). Quadrat sampling was not performed at disturbed habitat transects as the cover provided by herbaceous species did not exceed 20 percent at the transects.

Results of line-intercept for Range 30A intermediate-age chaparral habitat are presented in Table 4 and Figure 5. Figure 2 is a representative site photograph of intermediate-age chaparral habitat observed at this site. Dominant shrub species encountered in intermediate-age chaparral habitat include: shaggy-barked manzanita (51.72 percent), chamise (22.72 percent), Hooker's manzanita (7.54 percent), black sage (5.82 percent), and Monterey ceanothus (4.61 percent). Bare ground was estimated at 13.47 percent. The cover provided by herbaceous vegetation was estimated at 2.57 percent. HMP shrub species encounter in disturbed chaparral habitat include: Hooker's manzanita (7.54 percent), Monterey ceanothus (4.61 percent), and sandmat manzanita (3.23 percent). Quadrat sampling was not performed at intermediate-age habitat transects as the cover provided by herbaceous species did not exceed 20 percent at the transects.

Results of line-intercept for Range 30A mature chaparral habitat are presented in Table 5 and Figure 6. Figure 3 is a representative site photograph of disturbed chaparral habitat observed at this site. Dominant

shrub species encountered in intermediate-age chaparral habitat include: shaggy-barked manzanita (46.69 percent), chamise (34.58 percent), Monterey ceanothus (14.70 percent), black sage (14.52 percent), and dwarf ceanothus (*Ceanothus dentatus*) at 6.08 percent. Bare ground was estimated at 8.05 percent. The cover provided by herbaceous vegetation was estimated at 0.57 percent. HMP shrub species encounter in disturbed chaparral habitat include: Monterey ceanothus (14.70 percent), Hooker's manzanita (0.93 percent), and sandmat manzanita (0.23 percent). Quadrat sampling was not performed at mature habitat transects as the cover provided by herbaceous species did not exceed 20 percent at the transects.

3.2 HMP Annual Species Surveys

MACTEC conducted focused visual surveys for three HMP annual species at OE-11, Range 30A, and at the UC/NRS-FONR. MACTEC also conducted visual surveys for Contra Costa goldfields populations at two sites in OE-10B. The following sections summarize results of HMP annual species monitoring at these locations.

3.2.1 OE Sites

HMP annual species surveys were conducted at two terrestrial OE removal sites in 2003, including baseline surveys of the Range 30A and follow-up surveys of OE-11.

Range 30A: Plate 3 illustrates the extent of baseline follow-up surveys conducted for HMP annual species at this site. No HMP annual species were observed at this site in 2003.

OE-11: Plate 4 illustrates the extent of baseline follow-up surveys conducted for HMP annual species at this site. No HMP annual species were observed at this site in 2003.

3.2.2 UC/NRS FONR Groundwater Remediation Sites

Activities conducted within UC/NRS FONR property are required to follow specific protocols that are identified in the BO/BC (*USFWS, 1999*). In accordance with these protocols, MACTEC conducted follow-up surveys in April 2003 for Monterey spineflower and sand gilia at the UC/NRS FONR.

Plate 5 illustrates the location and extent of sand gilia and Monterey spineflower populations present at groundwater monitoring wells and along access routes at the UC/NRS-FONR. Surveys were conducted at all groundwater monitoring well sites and along approximately 5.5 miles of identified access routes. Monitoring surveys were also conducted along the access routes for two additional groundwater monitoring well sites installed in 2003.

Approximately 3,229 individuals of sand gilia were observed along 4,254.05 linear feet of access roads. Sand gilia populations are usually small and randomly scattered at groundwater monitoring wells and along the access routes. Nine medium density populations of sand gilia (over 100 individuals) were observed at UC/NRC FONR. The largest population of sand gilia (over 900 individuals) was observed along an access road coming from the southern perimeter road.

Approximately 20,284 individuals of Monterey spineflower were observed along 4,435.31 linear feet of access roads. Four high density populations (over 1,000 individuals) and a number of medium density (101 - 1,000) individuals) of Monterey spineflower were observed at well sites and along access roads in 2003. Several low density populations (less than 100 individuals) of Monterey spineflower populations are randomly scattered along access roads at the UC/NRS FONR.

A discussion of sand gilia and Monterey spineflower monitoring population fluctuations results is provided in Section 4 of this report. Plate 6 illustrates the history of sand gilia and Monterey spineflower populations present at nine portions at the UC/NRS-FONR.

3.2.3 Contra Costa Goldfields Surveys

In May 2003, MACTEC conducted visual surveys of Contra Costa goldfields at OE-10B. The two occurrences of Contra Costa goldfields are along the western edge of the vernal pool at Machine Gun Flats (MGF) and in the mima mound grasslands southeast of MGF.

Plate 7 displays the size and extent of Contra Costa goldfields populations at MGF. Figure 7 is a representative site photograph of Contra Costa goldfields observed at MGF. The populations at MFG were observed to comprise approximately 74,643 individuals in areas totaling 794.58 square feet.

Plate 8 displays the size and extent of Contra Costa goldfields populations at the mima mounds. Figure 8 is a representative site photograph of Contra Costa goldfields observed at the mima mounds. The populations at the mima mounds were observed to comprise approximately 1,392,406 individuals in areas totaling 4,545.54 square feet.

Plants observed were associated with topographically low-lying habitat, transitional between areas dominated by obligate wetland species and those 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.

3.3 Exotic Species

The results of the survey for jubata grass, hottentot fig, French broom, and cut-leaved fireweed are presented on Plate 9.

Jubata grass was primarily observed along former access roads with scattered individuals in grassland and central maritime chaparral openings. Four large populations of jubata grass (greater than 80 percent cover) were observed at Range 26, Range 28, Range 29, and Range 37. Thick stands of jubata grass were also observed in several erosion gullies found on abandoned access roads.

Hottentot fig was also primarily observed along former access roads of the MRA. A number of small scattered populations (less than 10 percent cover) were observed in sandy openings between Range 19 and Watkins Gate Road. Large hottentot fig mats (100 percent cover) were observed at Range 18, Range 37, Range 39, the MOUT area, and along a target berm located south of Range 43 - 48.

French broom was not observed to occur often. Three large (greater than 80 percent cover) populations of French broom were observed at Range 37, the Range 35A access road, and in grassland habitat adjacent to an access route from South Boundary Road.

3.4 Wetland Monitoring

A summary of wetland survey dates and the type of survey conducted at Waterbody 42 and MGF is presented in Table 6. Figures 9 and 10 represent site photographs of Waterbody 42 and MGF. Results of the wetland monitoring are discussed below.

3.4.1 Wetland Vegetation Sampling

Annual follow-up wetland monitoring is being conducted in order to evaluate whether OE removal activities have affected baseline conditions previously observed at these waterbodies.

Two survey transects were established at Waterbody 42 based upon the limited size and flora variability at the project site. Transect lengths ranged from 50 to 241 feet. Transect lengths, number of quadrats and total area sampled on each transect are summarized in Table 7. The number, location, and length of each selected transect was chosen to provide representative sampling of the transitional and emergent habitats at each waterbody. Transect start and endpoint locations were mapped using GPS data collected during baseline studies. Photographs were taken to record the vegetative condition at each of the waterbodies throughout the survey period. Sampling was conducted along each transect by placing a 0.25-meter square quadrat at the starting point and at 10-foot intervals, alternating from right to left. Plant species present within the quadrat were identified, percent cover was estimated for each species, and compositional data were recorded.

Vegetative monitoring surveys were conducted at Waterbody 42 and MGF in May 2003. This sampling focused on characterizing wetland-influenced vegetation and associated transitional herbaceous species Plant species observed during 2003 wetland monitoring surveys are listed in Table 8.

Waterbody 42

Species composition and estimated percent cover at Waterbody 42 are presented in Table 9 and Figure 11. Plate 10 illustrates the transect locations surveyed at Waterbody 42 in 2002. Thirty-four plant species were observed at Waterbody 42. Dominant plant species, present at greater than 10 percent of the combined average cover, include: smooth cat's-ear (*Hypochaeris glabra*) at 21.94 percent and silver European hairgrass (*Aira* caryophyllea) at 13.31 percent. California plantain (*Plantago erecta*), purple needlegrass (*Nassella pulchra*), scarlet pimpernel (*Anagallis arvensis*), hayfield tarweed (*Hemizonia congesta*), blue-eyed grass (*Sisyrinchium bellum*), coast eryngo (*Eryngium armatum*), and coastal tarweed (*Hemizonia corymbosa*) were present between 6.06 and 2.96 percent of the combined average cover. Most other plant species were 2 percent or less of the combined average percent cover. Approximately 28.93 percent of the species encountered at Waterbody 42 were exotic including: smooth cat's-ear (21.94 percent), silver European hairgrass (13.31 percent), scarlet pimpernel (5.44 percent), rat-tail fescue (*Vulpia m.* myuros) at 1.76 percent, brass buttons (*Cotula coronopifolia*) at 1.56 percent, soft chess (*Bromus* hordeaceous) at 1.26 percent, slender wild oat (*Avena barbata*) at 1.14 percent, red-stemmed filaree (*Erodium cicutarium*) at 0.94 percent, white-stemmed filaree (*Erodium moschatum*) at 0.94 percent, rabbitfoot grass (*Polypogon monspeliensis*) at. 0.75 percent, small quaking grass (*Briza minor*) at 0.69 percent, grass poly (*Lythrum hyssopifolium*) at 0.63 percent, Carolina geranium (*Geranium carolinianum*) at 0.31 percent, and nit grass (*Gastridium ventricosm*) at 0.20 percent. Of the 34 species observed during sampling, 20 were determined to be native.

Machine Gun Flats

Species composition and estimated percent cover at MGF are presented in Table 10 and Figure 12. Plate 11 displays transect locations associated with this waterbody. Fifty plant species were observed at MGF. The dominant plant species, present at greater than 10 percent of the combined average cover is smooth cat's-ear (16.67 percent). Soft chess brome, saltgrass (*Distichlis spicata*), Italian ryegrass (*Lolium multiflorum*), western rush (*Juncus occidentalis*), rush (*Juncus*), purple needlegrass, pale spike-rush (*Eleocharis a. acicularis*), coastal tarweed, rat-tail fescue, prickley sow-thistle (*Sonchus* asper), redstem filaree, Carolina geranium, owl's clover (*Castilleja exserta*), and South American conyza (*Conyza bonariensis*) were present between 8.86 and 2.13 percent of the combined average cover. The remaining

plant species were 3 percent or less of combined average cover. Approximately 57.79 percent of the species encountered at MGF were exotic including: smooth cat's-ear (15.87 percent), Italian ryegrass (7.82 percent), rat-tail fescue (3.51 percent), prickly sow-thistle (2.90 percent), redstem filaree (2.66 percent), Carolina geranium, (2.47 percent), South American conyza (*Conyza bonariensis*), at 2.13 percent, grass poly (1.69 percent) rabbitfoot grass (1.51 percent), small quaking grass (1.45 percent) silver European hairgrass (1.32 percent) cut-leaved plantain (*Plantago coronopus*) at 1.21 percent, white-stemmed filaree (1.17 percent), ripgut grass (*Bromus diandrus*) at 0.89 percent, common sow-thistle (*Sonchus oleraceus*) at 0.54 percent, poison hemlock (*Conium maculatum*) at 0.41 percent, slender wild oat (0.36 percent), long-beaked filaree (*Erodium botrys*) at 0.31 percent, scarlet pimpernel (0.28 percent), nit grass (0.16 percent), cut-leaved geranium (*Geranium dissectum*) at 0.14 percent, brass buttons (0.12 percent), curly dock (*Rumex cripus*) at 0.11 percent, common cudweed (*Gnaphalium luteo-album*) at 0.09 percent, and rattlesnake grass (*Briza maxima*) at 0.04 percent. Of the 50 species observed during sampling, 24 were determined to be native.

3.4.2 Fauna

Wildlife monitoring was conducted at Waterbody 42 and MGF from January through May, 2003. California linderiella were observed during wetland monitoring at Waterbody 42 and MGF. No special status vertebrae species listed as threatened or endangered were observed at these sites during the 2003 surveys. Table 11 represents the list of special-status vertebrate species observed at wetland monitoring sites in 2003. Table 12 represents the list of vertebrate fauna observed during 2003 wetland monitoring surveys.

California linderiella

Surveys for California linderiella and other potentially present vernal pool brachiopods were conducted during the January and February monthly site visits at Waterbody 42. A high abundance of immature fairy shrimp (101-3003 individuals) was observed at Waterbody 42 in January. Vernal pool brachiopods were not observed at Waterbody 42 in February as water temperatures increased and water levels receded. No invertebrate surveys were conducted at this at Waterbody 42 from March through June due to the absence of standing water.

Surveys for California linderiella and other vernal pool brachiopods were conducted during monthly site visits at MGF from January through April. California linderiella were present in very high numbers at MGF in the January and February monitoring (over 1,000 individuals). No California linderiella individuals were observed at MGF during subsequent surveys. Surveys for vernal pool brachiopods were not conducted at MGF in May due to reduced ponding at this site

Table 13 presents a summary of California linderiella data collected each month at Waterbody 42 and MGF during 2003 follow-up monitoring events

California tiger salamander

Surveys to determine the presence or absence of CTS at Waterbody 42 and MGF were conducted by searching for physical evidence of the species during monthly site surveys from January through May, 2003. Surveys for CTS at Waterbody 42 were limited to upland surveys from March through May due to the absence of standing water at this site.

CTS juveniles were observed in MGF during the May follow-up monitoring survey. CTS (juveniles or adults) were not previously observed during the 1998 baseline surveys, but were identified at MGF in the 1992 Flora and Fauna Study. CTS juveniles were observed in a western pond at MGF.

California red-legged frog

Surveys to determine the presence or absence of CRLF at Waterbody 42 and MGF were conducted by searching for physical evidence of this species during monthly site surveys at from January through May. Dipnet surveys for CRLF at Pool 42 were not conducted from March through May due to the absence of standing water at this site during this period of time.

Southwestern pond turtle

Surveys to determine the presence or absence of SWPT at Waterbody 42 and MGF were conducted by searching for physical evidence of this species during monthly site surveys at from January through May. SWPT was not observed at Waterbody 42 or MGF during 2003 monitoring events.

Tricolored blackbird

Surveys to determine the presence or absence of TCBB at Waterbody 42 and MGF were conducted by searching for physical evidence of this species during monthly site surveys at from January through May. TCBB was not observed at Waterbody 42 or MGF during 2003 monitoring events.

3.4.3 Physical Characteristics

Physical data were collected at two seasonal wetlands, MGF and Waterbody 42, to characterize the functions and values of these waterbodies. Although not specifically required in the WRP, physical characteristics were collected at Waterbody 42 and MGF in order to assess the waterbodies functions and values, including pH, maximum water depth, duration of ponding, and surface area. Disturbance to the wetland habitat during data collection was minimized by restricting the amount of wading in each waterbody to what was necessary for dipnet sampling and measurements of physical characteristics. Physical characteristics were not recorded at MGF monthly during January through May, and at Waterbody 42 in January and February. Physical characteristics were not collected at MGF in May due to the limited size of the waterbody. Data was not collected at Waterbody 42 from March through May due to the absence of water.

The physical parameters measured monthly in each of the waterbodies during the 2003 Wetland Monitoring activities include water depth, area of ponding, and pH level. A summary of physical parameters at Waterbody 42 and MGF is presented in Table 14.

The maximum area of ponding (0.11 acres) and water depth (10 inches) at Waterbody 42 was observed in January. Measurements for Turbidity (16) and pH (6.3) measurements at Waterbody 42 were conducted in January. Waterbody 42 dried out between the second and third wetland surveys.

MGF exhibited ponded water from the time of the initial site visit in January through the May site visit. The maximum area of ponding (4.44 acres) and water depth (12.5 inches) was observed in January at MGF. Measurements for pH ranged from 6.1 to 6.89, while measurements for turbidity ranged from 11.8 to 126 at MGF.

The area of ponding and water depth at MGF was significantly reduced between the second and third wetland monitoring events. Beginning in April, ponding was limited to a deep pool located on the western edge of MGF (bullfrog pond).

4.0 DISCUSSION

The HMP habitats of concern within OE removal or lead, chemical, and groundwater remediation sites on the Former Fort Ord, include central maritime chaparral and wetland habitats. These habitats possess many of the special-status plants and animals identified in the HMP in which the success criteria for habitats of concern and special-status species are defined. The success criterion at groundwater remediation sites is defined in the BO/BC on the Closure and Reuse of Fort Ord, Monterey County, California (*USFWS, 1999*). This section identifies which OE removal, lead, chemical, and groundwater remediation sites have or have not met the success criteria defined in the HMP.

4.1 Central Maritime Chaparral Habitat Monitoring

Success criteria for central maritime chaparral habitat is defined in the HMP as healthy, high-diversity maritime chaparral habitat that has a variety of seral stages and age-classes and that includes microhabitat for sand gilia, Monterey spineflower, Seaside bird's-beak and black legless lizard.

4.1.1 OE Sites

Baseline surveys were performed at one OE Site in 2003. Follow-up surveys at OE Sites were not required in 2003.

Range 30A: Data collected in 2003 represent baseline conditions for chaparral habitat at this site. Baseline data colleted at this site will be used for future comparison with vegetation recovering OE removal activities.

Two species, shaggy-barked manzanita and chamise, dominated (provided more than 70 percent of overall cover) disturbed, intermediate-aged, and mature chaparral habitat at this site. Sandmat manzanita, generally associated with disturbed habitat, was rarely observed at this site. A large percent of overall cover was provided by Hooker's manzanita in intermediate-aged chaparral habitat and Monterey ceanothus provided a large percent of overall cover in mature chaparral habitat at this site. Species diversity was approximately the same for all three successional stages.

Chaparral successional stages observed at this site include disturbed, intermediate-age, and mature chaparral habitat. Disturbed habitat was most often found in the southern portion of the site and adjacent to access roads. Intermediate-age chaparral was often found adjacent to grassland meadows transitioning toward mature as distance from the grassland meadow increased. Mature chaparral habitat comprises approximately 80 percent of the Range 30A. Follow-up monitoring of central maritime habitat is not planned until after a prescribed burn and OE removal activities have been completed at this site.

4.2 HMP Annual Species Surveys

HMP annual species associated with OE removal, lead, chemical and groundwater remediation sites include: sand gilia, Monterey spineflower, Contra Costa goldfields, coast wallflower, and Seaside bird's-beak. The success criteria for HMP annual species states that restoration for these sites will be considered successful "if after five monitoring years, population sizes are observed to vary over time within a range that includes annual populations similar in size to those estimated for these species in 1992."

4.2.1 OE Sites

Baseline surveys for HMP annual species were performed at one OE Site in 2003. Follow-up surveys for HMP annual species was also performed at one OE Site in 2003.

Range 30A: Surveys in 2003 represent the baseline survey for HMP annual species at this site. The HMP annual species were not observed at this site. Follow-up monitoring for HMP annuals is not planned until after a prescribed burn has occurred at this site.

OE Site 11: Surveys in 2003 represent the fourth year of follow-up monitoring for HMP annual species at this site. The HMP annual species were not observed at this site in 2003. The HMP annual baseline survey for this site was conducted in 1996.

One individual of Seaside bird's-beak was observed while Monterey spineflower or sand gilia were not observed during the baseline survey. Although the HMP call for five years of monitoring, HMP annual species have not been observed at this site in subsequent follow-up monitoring surveys and are not expected to be present at this site. No further HMP annual monitoring is planned at this site.

4.2.2 UC/NRS FONR Groundwater Remediation Sites

Surveys conducted at the UC/NRS FONR in 2003 for sand gilia and Monterey spineflower comprise the fourth year of monitoring activities. Baseline surveys for HMP annual species at this site were conducted in 1999. The size and location of HMP annual populations are illustrated on Plate 5.

The overall populations of sand gilia observed are slightly larger than the population of sand gilia observed in the 1999 baseline survey. The population of sand gilia observed has remained consistent during annual follow-up monitoring. The notable exception is the low number of sand gilia observed in 2002. The 2002 population of sand gilia observed was estimated to be approximately 600. The population of sand gilia observed in the 1999 baseline survey was estimated to be 2,900. The overall populations of Monterey spineflower observed in 2001, 2002, and 2003 are noticeably higher than the populations of Monterey spineflower observed in the 1999 baseline survey. The population of Monterey spineflower was approximately 10,200 in the 1999 baseline survey. Figure 13 represents the estimated populations of Monterey spineflower and sand gilia from 1999 through 2003. The large increase in Monterey spineflower populations reported in 2001, 2002, and 2003 can be attributed to the addition of several access roads beginning in 2001.

Since baseline studies began in 1999, Monterey spineflower monitoring surveys have been expanded to include eight additional access roads for new groundwater monitoring wells. In 2001, four additional access roads required monitoring, two access roads were added in 2002, and two more access roads were added in 2003. When additional access roads are not considered, population of Monterey spineflower is consistent with population as observed in the 1999 baseline survey. The population of sand gilia observed has remained fairly uniform since the 1999 baseline survey despite lower 2002 sand gilia population estimates. The low population of sand gilia observed in 2002 can be attributed to low annual precipitation (76 percent of normal) in 2002. Figure 14 represents revised estimated populations of Monterey spineflower and sand gilia from 1999 through 2003 where the additional access roads have been excluded.

Observed population differences may be attributable to normal annual population fluctuations, including fluctuations due to differences in annual rainfall. The decrease in observed populations of sand gilia and

Monterey spineflower at UC/NRC-FONR in 2002 coincided with a lower annual precipitation (76 percent of normal) for the city of Monterey.

Nine areas have been selected to illustrate the population fluctuations of Monterey spineflower and sand gilia at access roads and well sites at UC/NRS-FONR. Plate 6 illustrates the historic sampling of HMP annual Species populations present at the nine areas along access roads at the UC/NRS-FONR.

Area 1: The population of Monterey spineflower observed in Area 1 during monitoring surveys has varied from a low of 32 in 1999 to a high of 634 in 2000. A small population of sand gilia was observed at Area 1 in the 2002 follow-up survey. This small population of sand gilia is located outside of the access roads buffer zone. Sand gilia was not observed in Area 1 in the 1999 baseline survey.

Area 2: The populations of Monterey spineflower observed in Area 2 follow an observed population trend of HMP annuals at the UC/NRS with the lowest number of HMP annuals occurring in 2002. It should be noted that despite low annual precipitation in 2002, a high number of sand gilia were observed at Area 2 in 2002. The high number of sand gilia observed at Area 2 in 2002 can be attributed to the monitoring of HMP annuals along an access road not preciously monitored.

Area 3: Area 3 serves as a good example to illustrate the wide range of population fluctuations of sand gilia observed during monitoring surveys. Less than 10 individuals of sand gilia were observed in 2000, over 750 individuals of sand gilia were observed in 2001, and sand gilia was not observed in 2002. Approximately 490 individuals of sand gilia were observed in 2003. The population fluctuations of Monterey spineflower observed at Area 3 are consistent with a previously identified population trend of HMP annuals at the UC/NRS.

Area 4: Low populations of Monterey spineflower was observed in Area 2 in 2002 and 2003 as compared to populations observed during previous monitoring surveys (generally over 1,500). The decreased Area 4 Monterey spineflower population observed in 2002 may be attributed to low precipitation levels in 2002. The low number of Monterey spineflower in 2003 could be the result of ground disturbance. Horse hoof prints were observed along a portion an access road located in Area 4 resulting in excessive disturbance of this portion of the road. Monterey spineflower was not observed along the disturbed portion of the access road. Dense populations of Monterey spineflower have been observed along this section of the access road during previous follow-up monitoring surveys. Due to the low number of sand gilia individuals observed at Area 4, a statement about the occurrence of sand gilia at this site is not possible. Less than five individuals of sand gilia were observed at Area 4 in 1999 and 2001. Sand gilia was not observed at Area 4 in 2000, 2002, or 2003.

Area 5: The populations of Monterey spineflower observed were high (greater than 450) in 1999 and 2001 and low (less than 150) in 2000 and 2003. The populations of sand gilia observed were high (approximately 400) in 2001 and 2003 and low (less than 100) in 2000 and 2002.

Area 6: The populations of Monterey spineflower observed at Area 6 in the 2003 follow-up monitoring survey (less than 600) is conspicuously lower than those (over 1,500) observed in previous monitoring surveys. The populations of sand gilia observed in Area 6 follows the observed previously identified population trend of HMP annuals at the UC/NRS.

Area 7: The populations of Monterey spineflower and sand gilia observed in Area 7 follows the observed previously identified population trend of HMP annuals at the UC/NRS.

Area 8: The populations of Monterey spineflower and sand gilia observed in Area 8 follows the observed previously identified population trend of HMP annuals at the UC/NRS.

Area 9: 2001 represents the baseline survey of Monterey spineflower and sand gilia populations at this site. Populations of Monterey spineflower observed in 2002 and 2003 are greater than those observed in the 2001 baseline survey. Populations of sand gilia observed in 2002 and 2003 are lower than those observed in the 2001 baseline survey.

Four years of monitoring have been observed at the UC/NRS FONR. The differences in Monterey spineflower populations observed in follow-up monitoring surveys at seven areas (Areas 1, 2, 3, 4, 5, 7, and 8) are not likely attributable to vehicle access and may be attributable to normal annual population fluctuations or to differences in rainfall totals. No further HMP annual monitoring is planned at these areas. The populations of Monterey spineflower and/or sand gilia observed two areas (Areas 6 and 9) are lower than those observed in baseline surveys. Further HMP annual monitoring will occur at these two sites to further document the need for the development of a Monterey spineflower and/or sand gilia restoration plan in these areas. Further HMP annual monitoring is also planned to occur at new groundwater monitoring wells and along their access roads.

4.2.3 Contra Costa Goldfields Surveys

Surveys in 2003 represent the fourth year of follow-up monitoring for Contra Costa goldfields at the MGF and mima mound sites. Baseline surveys for Contra Costa goldfields were conducted in 1998 and 1999 at these two sites.

The estimated density of Contra Costa goldfields populations at MGF and the mima mounds in 2003 is notably greater than Contra Costa goldfields populations identified in previous monitoring surveys. The density and location of Contra Costa goldfields in MFG ant the mima mounds are illustrated on Plates 7 and 8. Population densities observed in the 2003 survey at MFG are estimated to contain 75,000 individuals as compared to 57,000 individuals in the 2002 survey and 14,000 individuals in the 2000 survey. The population density of Contra Costa goldfields was estimated at 6,500 individuals in the 1999 MGF baseline survey. Contra Costa population densities observed in the 2003 survey at the mima mound are estimated to comprise approximately 1,400,000 individuals as compared to 236,000 individuals in the 2002 survey and 148,000 individuals in the 2000 survey. The 1999 baseline survey identified approximately 50,000 individuals Contra Costa goldfields at the mima mound site.

The population of Contra Costa goldfields observed has steadily increased since the inception of Contra Costa goldfields monitoring. Moderate populations of Contra Costa goldfields were observed in 2000. A portion of the increase in Contra Costa goldfields observed in 2003 may be attributed to normal population fluctuations and differences in annual precipitation. The increase in populations observed could be attributed to an increase in survey efforts beginning in 2002.

The population at MGF was generally observed to be associated with low-lying areas that supported mostly facultative wetland species. The population at the mima mounds was also observed to be associated with similar facultative wetland species, but with a species composition augmented with additional obligate species.

Although the HMP call for five years of monitoring, the population of Contra Costa goldfields has markedly increased since the completion of OE activities occurred at this site. No further monitoring of Contra Costa goldfields is planned at this site.

4.3 Exotic Species

The California Invasive Plant Council (Cal-IPC) considers jubata grass, hottentot fig, and French broom as extremely invasive and are on Cal-IPC's List A-1; List A-1 is defined as Most Invasive Wildland Pest Plants; Widespread. Cut-leaved fireweed is listed on Cal-IPC's List B; List B is defined as Wildland Pest Plants of Lesser Invasiveness.

Exotic species have the potential for colonization of disturbed habitat within and adjacent to the survey area by jubata grass, hottentot fig, cut-leaved fireweed, and French broom. In addition, wildlife species spread non-native, exotic species through their use of these species as a food source or on their bodies as the transit through areas containing exotic species. Non-native species should be managed to reduce the potential for regeneration of these species after OE clearance and other remedial habitat disturbance activities have been completed within the surrounding area.

The Bureau of Land Management (BLM) located at Fort Ord has implemented a program to eradicate exotic species on BLM and MRA property. Some access roads and a portion of Range 26 jubata grass population have been sprayed annually for every year. Sporadic re-growth of isolated individual plants was observed at the MRA. Re-spraying of jubata grass at the sites of re-growth will reduce the potential for regeneration of these species after OE clearance and other remedial habitat disturbance activities have been completed.

4.4 Wetland Monitoring

The data collected at Waterbody 42 and MGF represents the fourth year of follow-up monitoring for vernal pool brachiopods at these waterbodies.

Waterbody 42

A high number (over 100 individuals) of immature fairy shrimp were observed in January during follow-up monitoring conducted at Waterbody 42. Immature individuals of vernal pool fairy shrimp are not identifiable to a species. Immature individuals found at Waterbody 42 are assumed to be California linderiella based upon data from baseline and previous monitoring surveys at Waterbody 42. A high number (over 100 individuals) of California linderiella were observed in January 2003, very high (over 1,000 individuals) observed in January 2002, low (less than ten) observed in January 2001, and high (over 100 individuals) observed in February 2000 at Waterbody 42. A moderate number of California linderiella (11 to 100 individuals) were observed in the January 1998 baseline survey. Vernal pool brachiopod species were not observed at Waterbody 42 in February. Surveys for vernal pool brachiopods did not occur at Waterbody 42 from March and May due to the absence of water. Variations in the relative abundance of California linderiella could be attributed to variations of natural conditions at Waterbody 42 including precipitation totals and timing, temperature, and pH.

The OE removal activities at OE-10B do not appear to have affected abundance of California linderiella at Waterbody 42. A wide variation in the relative abundance of fairy shrimp has been observed at Waterbody 42 since OE removal activities were completed.

Machine Gun Flats

The number of California linderiella observed at MGF ranged from very high number (over 10,000 individuals) in January to high (over 1,000 individuals) in February during the 2003 monitoring surveys.

A very high number (over 10,000 individuals) of California linderiella were observed in January 2003, very high (over 1,000 individuals) observed in January 2002, very high (over 700 individuals) observed in February 2001, and very high (over 1,000 individuals) observed in February 2000 at MGF. A very high number (over 300 individuals) of were observed in the January 1998 baseline survey at MGF. California linderiella were not observed at MGF in April. Surveys for vernal pool brachiopods did not occur at MGF in May due to the absence of water. Variations in the relative abundance of California linderiella could be attributed to variations of natural conditions at MGF including precipitation totals and timing, temperature, and pH.

The OE removal activities at OE-10A do not appear to have affected abundance of California linderiella at MGF. A high number of fairy shrimp has been observed at MFG since OE removal activities were completed.

California tiger salamander

The data collected at Waterbody 42 and MGF represents the fourth year of follow-up monitoring for CTS at these waterbodies.

Juvenile CTS were observed in April during dipnetting surveys of the remaining inundated portion of MGF. This pond is significantly deeper (over 5 foot deep) than the rest of MGF and has retained water through previous rain years and allowed bullfrogs to become established at MGF. Low rainfall in 2002 dried out the western bullfrog pond and increases the potential for CTS juveniles to be present at MGF. California tiger salamanders were not observed during follow-up monitoring surveys conducted at MGF in 2000, 2001 or 2002.

Juveniles CTSs were observed at Waterbody 42 in 2000, the year following OE removal activities. California tiger salamanders were not observed during follow-up monitoring surveys conducted at Waterbody 42 in 2001, 2002, 2003.

California red-legged frog

The data collected at Waterbody 42 and MGF represents the fourth year of follow-up monitoring for CRLF at these waterbodies. They were not observed during baseline or subsequent follow-up monitoring surveys conducted at these sites.

Waterbody 42 lacks suitable habitat for CRLF. The CRLF requires permanent or nearly permanent pools for larval development. Ponding at Waterbody 42 is not sustained long enough, 11-12 weeks, for CRLF larval development to occur. While minimal suitable habitat for CRLF is present at MGF, the lack of flowing water and suitable dispersal areas would likely rule out their presence, with the exception of winter storms, during which they may be able to move into the area.

Tricolored blackbird

The data collected at Waterbody 42 and MGF represent the third year of follow-up monitoring for TCBB's at these waterbodies. Tricolored blackbirds have not been observed at this site in the 2000 baseline survey or subsequent follow-up surveys.

Southwestern pond turtles

The data collected at Waterbody 42 and MGF represents the third year of follow-up monitoring for SWPT's at these waterbodies. Southwestern pond turtles have not observed at this site in the 2000 baseline survey or subsequent follow-up surveys.

OE removal activities at OE-10A and OE-10B do not appear to have affected MGF or Waterbody 42. Although the HMP call for five years of monitoring, a wide variation in the relative abundance of fairy shrimp has been observed at both waterbodies been since OE removal activities were completed. California tiger salamanders were observed at MGF in the Flora and Fauna Baseline Study of Fort Ord, California (*USACE, 1992*) and CTS juveniles have been observed at both MGF and Waterbody 42 during follow-up monitoring surveys subsequent to the completion of OE removal activities. California red-legged frog, TCBB, and SWPT have not been observed during the baseline and subsequent monitoring surveys conducted at these waterbodies. No further wetland monitoring is planned at MGF and Waterbody 42.

4.5 Anticipated Future Monitoring

Pursuant to HMP monitoring and success criteria requirements, habitat monitoring activities recommended for the 2004 annual monitoring report include:

- Follow-up monitoring of HMP annuals at Range 43 - 48,
- HMP annuals presence surveys of approximately 1,000 acres in the prescribed burn,
- Follow-up chaparral seedling monitoring at the Range 43-48 prescribed burn upon completion of OE removal activities,
- If a prescribed burn occurs follow-up monitoring of chaparral seedlings at Range 30A, OE-9, OE-16, MRA North, and MRA West upon completion of OE removal activates,,
- If a prescribed burn occurs, follow-up monitoring of annual HMP annuals at Range 30A, OE-9, MRA North, and MRA West upon completion of OE removal activities,
- Follow-up wetland monitoring at waterbodies 43, 44, and 53 if OE removal occurs, and
- Follow-up monitoring at Waterbody 52 if remediation is complete.

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