FINAL
2006 MRS-16 FUEL BREAKS
BIOLOGICAL BASELINE MONITORING REPORT
FORMER FORT ORD, CALIFORNIA

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

Submitted to:

U.S. Department of the Army
Corps of Engineers
1325 "J" Street
Sacramento, California 95814-2922

Submitted by:

Shaw Environmental, Inc.
PO Box 1698
Marina, California 93933

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Approved by: _____ Date: 3/30/10
Kevin Siemann
Project Manager

Approved by: _____ Date: 3/30/10
Shirley Tudor
Biologist

Approved by: _____ Date: 3/30/10
Tom Ghigliotto
Contractor Quality Control Manager

Approved by: Peter Kelsall Digitally signed by Peter Kelsall DN: cn=Peter Kelsall, o, ou=Shaw E&I, email=peter.kelsall@shawgrp.com, c=US Date: 2010.03.31 11:05:29 -06'00' Date: _____
Peter Kelsall
Project Manager

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Acronyms and Abbreviations

Army	U.S. Department of the Army
GPS	global positioning system
HMP	Habitat Management Plan
MRS-16	Munitions Response Site 16
USFWS	United States Fish and Wildlife Service

1.0 Introduction

This 2006 biological monitoring study was conducted for the U.S. Department of the Army (Army) to address recommendations from the United States Fish and Wildlife Service (USFWS) in the letter dated March 13, 2006 (USFWS, 2006). The request reiterates the USFWS recommendations provided in earlier consultations, which are detailed in several Biological and Conference Opinions on the Closure and Reuse of Fort Ord (USFWS, 2005; USFWS, 2002; USFWS, 1999). The recommendations address the need for biological monitoring of ecologically sensitive habitats and species that could experience potential negative impacts from various work activities related to the cleanup procedures on the former Fort Ord. The Biological Consultations/Opinions are consistent with the intent of the *Installation-Wide Multi Species Habitat Management Plan* (HMP) (USACE, 1997) for the former Fort Ord.

The HMP identifies rare, threatened, or endangered species and habitats occurring on Fort Ord that are designated for protection and future management after munitions removal and other cleanup operations are completed. The HMP also outlines mitigation measures that would be necessary if Army-related munitions cleanup activities are deemed to have significantly impacted rare species and habitats. To determine whether mitigation measures could be required to restore populations of HMP-listed species, the plan requires 5 years of annual monitoring for rare species following completion of the munitions-related cleanup. Annual monitoring data may be used to compare to a site's baseline vegetation survey data to assess whether recovery and regeneration of the protected habitat (maritime chaparral, wetlands, etc.) and their associated species is proceeding toward the baseline conditions.

The purpose of this study is to establish permanent vegetation transects and to collect baseline data for the vegetation within the planned fuel break of Munitions Response Site 16 (MRS-16), a site on the former Fort Ord that has been designated for munitions removal in the fall of 2006. A prescribed burn has been planned for the late summer/early fall of 2006 to remove all the vegetation, which will allow full munitions removal to depth over the entire site.

The vegetation survey focused on maritime chaparral, a primary vegetation component on MRS-16. The baseline data are intended to establish a record of pre-burn conditions so that potential future impacts to rare plant species and habitats can be identified and quantified. There are a number of potential treatments proposed for the fuel break area that could be associated with the proposed 2006 prescribed burn. These treatments could include cutting of the vegetation, "black-lining" the fuel break (burning the fuel-break vegetation to create a containment line), application of chemical fire retardant as part of the prescribed burn, or various combinations of these three treatments. The vegetation survey for the MRS-16 site has been completed (USACE, 1996).

Annual follow-up monitoring of the fuel break is expected to continue for a period of 5 years following the munitions removal on MRS-16, to assess recovery of the maritime chaparral habitat and rare species populations.

1.1 Site Description

Fort Ord is an approximately 28,000-acre former Army base located on the eastern edge of Monterey Bay, about 8 miles north of Monterey, on the central coast of California. Fort Ord supports a variety of vegetation communities, most notably oak woodlands, maritime chaparral, coastal scrub, annual and perennial grasslands, and wetlands and vernal pools. Approximately 30 percent of the former Fort Ord is occupied by maritime chaparral, an evergreen shrub-dominated vegetation type unique to the local geographic region that is home to a variety of rare, threatened, and endangered species, many of which are endemic to the area.

The study site is a proposed fuel break, 22.6 acres in area, surrounding MRS-16, an 80-acre fenced site at the intersection of Eucalyptus Road and Parker Flats Road just north of the impact area on the former Fort Ord. The fuel break is 150 feet wide, extends around the entire perimeter of MRS-16, and is included within the fenced boundary of the site. MRS-16 is within the area designated in the HMP as future habitat reserve.

The vegetation community within the fuel break is primarily central maritime chaparral with a few small patches of annual grassland along the south and southeast sides of the site, and a significant oak woodland area along the site's northwest and west sides. There are some coastal scrub patches on the north side, along with stands of *Ceanothus thyrsiflorus*.

Munitions Response Site 16 and its fuel break are designated in the HMP as areas for future habitat management. Central maritime chaparral is a vegetation type that is protected under the former Fort Ord HMP because of the large number of rare, threatened, and endangered species with which it is associated.

Terrain on the site consists of rolling hills, with two parallel drainages separated by a ridge that run west to east through the site.

1.2 Species Included in 2006 Baseline Survey

Central maritime chaparral is the primary habitat of concern (as identified in the HMP) within the MRS-16 fuel break. The HMP also lists specific annual, shrub, and perennial species of concern for which monitoring is required. Many are listed either as federally rare, threatened, or endangered, or as California State rare, threatened, or endangered. The complete list of shrub species encountered in this monitoring study is shown in Table 1. They include the HMP-listed shrubs: sandmat manzanita (*Arctostaphylos pumila*), Monterey manzanita (*Arctostaphylos montereyensis*), Hooker's manzanita (*Arctostaphylos hookeri*), and Monterey Ceanothus

(*Ceanothus cuneatus spp. rigidus*). Annual plants included in the survey were the HMP-listed sand gilia (*Gilia tenuiflora spp. arenaria*) and Monterey spineflower (*Chorizanthe pungens spp. pungens*). The third listed annual species covered by the HMP, Seaside bird's beak, (*Cordylanthus rigidus spp. littoralis*) was not encountered on the site.

Since there are no wetlands within the fuel break, wetland delineation was not included as part of this report.

2.0 Methods

The vegetation survey was conducted between the May 8 and 11, 2006, with a follow-up date on May 30, 2006, for additional work on the annual grass survey.

2.1 Methods for Shrub Survey

The methods for the shrub survey followed the *Protocol for Conducting Vegetation Sampling at Fort Ord in Compliance with the HMP* (USACE, 1995). This sampling protocol requires using the line-intercept method along line transects to determine shrub cover. In this method, distance in centimeters is recorded for every shrub or tree species encountered along a 50-meter measuring tape. The total distance is then added for each species, and divided by the total distance (5,000 centimeters) to calculate direct percent cover of each species on each transect.

Transect locations were selected randomly, but with consideration for accessibility and orientation. Transects had to be oriented to fit within the relatively narrow fuel break width. Areas excluded from consideration were those areas with impenetrable brush, or dominated with oak trees, poison oak, or non-chaparral species.

Chaparral stand age over the fuel break was estimated by field observations, or in areas of impenetrable brush, from observing the relative canopy cover taken from aerial maps of the region. Since chaparral stand ages were fairly consistent over the site, transects were not grouped by age or seral stage. While there were areas of younger versus older seral stages, the available sampling area within chaparral habitat was not sufficient to place adequate numbers of transects to make a comparison of chaparral stand ages.

A total of seven 50-meter line transects were established within the fuel break in maritime chaparral. Seven was determined to be adequate to characterize the vegetation, even with minor differences in stand age between transects. Transect endpoints were recorded using global positioning system (GPS), and endpoints were used as photopoints for each transect (two per transect).

2.2 Methods for Herbaceous Vegetation Survey

The sampling protocol requires herbaceous species sampling using quadrats only if the herbaceous component is significant. Since on all the sampled transects, herbaceous percent cover was very low, no quadrat sampling by species was performed. Instead, herbaceous species were combined under the general grouping “herbaceous vegetation.”

2.3 Methods for Sand Gilia Survey

Methods for conducting the 2006 annual plant monitoring were based on the *Protocol for Conducting Vegetation Sampling at Fort Ord in Compliance with the HMP* (USACE, 1995).

Areas occupied by sand gilia were mapped using GPS, and data were recorded as total number of plants in each patch encountered.

2.4 Methods for Monterey Spineflower Survey

Methods for conducting the 2006 annual plant monitoring were based on the *Protocol for Conducting Vegetation Sampling at Fort Ord in Compliance with the HMP* (USACE, 1995), with the following modifications as described below.

Monterey spineflower data were collected by mapping areas and densities of populations. Density was estimated as one of the following categories of percent cover: Low (<5 percent cover), Medium (6-25 percent cover), or High (>25 percent cover). Note that density classes were used rather than total number of plants as described in the protocol. This is because plants in some areas were tiny, while in other areas they were larger, forming large tangled mats. Where plants are mat-forming (medium to high percent cover) it is very difficult to estimate number of individual plants. Percent cover is a much more biologically relevant unit of measurement for this species, because of its spreading growth habit, and highly variable individual plant sizes. Percent cover provides a more direct measurement of relative spineflower reproductive biomass (seed production).

2.5 Methods for Annual Grass Survey

Annual grass locations were identified in the field, assigned a density estimate, and mapped using GPS. Density was estimated as one of the following categories of percent cover: Low (<5 percent cover), Medium (6-25 percent cover), or High (>25 percent cover). Photopoints of sample locations of each density class were established using GPS.

2.6 Methods for Invasive Weeds Survey

Locations of invasive weed species, other than annual grasses, were identified in the field, and mapped using GPS.

3.0 Results

3.1 Results of Shrub Transect Survey

Locations for the seven transect locations are shown in Figure 1. Photographs from each transect endpoint are shown in Photographs 1 through 14. Shrub diversity was relatively high, with a total of 17 species represented in the transects. Percent shrub cover for each of seven transects are shown in Table 2 and summarized in Table 3. The two species with highest percent cover overall were shaggy-barked manzanita (40 percent) and sandmat manzanita (21 percent), with Monterey Ceanothus being the third most abundant at 8 percent cover. There was some variation between transects, but the top three dominant species were consistent. All other shrub species represented 5 percent or less of the total shrub cover.

Shaggy-bark manzanita was the dominant species in four of the seven transects, and sandmat manzanita was dominant or co-dominant with shaggy-bark manzanita in the other three transects.

Bare ground was relatively high in all transects, accounting for an average of 24 percent of the total cover, and ranging from 11 to 35 percent. These relatively high numbers, in addition to the high diversity, reflect the observation that the chaparral varies from disturbed to intermediate in age throughout most of the fuel break. Dead shrub skeletons predominate over the northeast, east and south sides of the site, indicating a burn in recent history (e.g. Transect 6, see Photograph 12).

Monterey Ceanothus (an HMP-listed species) had relatively high abundance in six of seven transects. Note that percent covers appear low, but this reflects the small stature of the species and very small leaf cover compared to other dominant species, such as shaggy-barked manzanita. Visual observations confirmed that Monterey Ceanothus was a common species throughout most of the chaparral areas on the site, with high numbers of individuals. Photograph 14, taken from the transect endpoint 7-2, was taken in an area with some of the highest density stands of Monterey Ceanothus that were observed within the fuel break.

The other HMP-listed species encountered in the transects were Hooker's manzanita and Monterey manzanita. Hooker's manzanita were present in low numbers in the fuel break, and individuals were all noted to be small plants of low-stature. Hooker's manzanita were found in Transects 5, 6, and 7 on the northeast, east, and southeast areas of the fuel break, particularly along old roads or other open areas. Hooker's manzanita occupied the same habitat throughout most of the interior of MRS-16. Monterey manzanita was encountered only in Transect 5. The species was found only in a small area (perhaps several acres) on the northeast side of the fuel break, in the vicinity of Transect 5, but dense impenetrable brush on the north side prevented

more accurate mapping for this species. Though few plants were seen in the fuel break, site visits to the interior indicated the species is scattered throughout the north side of the site.

Other common chaparral species were present in several transects at a low percent cover as indicated by the data. These included many of the early seral stage species such as black sage and sticky monkey flower.

Only one shrub/tree species was observed on the site, but not found in any transects. This was *Ceanothus thyrsiflorus*, which is present in large stands on the north (along Parker Flats Road) and west sides of site only. No transects were placed there as the vegetation type in the vicinity was primarily a coastal scrub dominated by poison oak, without maritime chaparral species.

3.2 Results of Herbaceous Vegetation Survey

Herbaceous vegetation cover was measured in only 3 out of 7 transects. Where it was present, percent cover was very low (1.4 percent, 2.2 percent), though in Transect 4 it reached 9 percent. Diversity was also low, the most commonly seen species being herbaceous chaparral perennials such as Horkelia (*Horkelia cuneatus spp. cuneatus*), Carex sp., and rush rose (*Helianthemum scoparius*). The federally threatened Monterey spineflower was a common component of the annual herbaceous vegetation, but present at a very low percent cover. Detailed data for Monterey spineflower are presented in a section below.

3.3 Results of Sand Gilia Survey

Sand gilia was encountered in three small patches within the fuel break on the south side of MRS-16 (Figure 2). Sand gilia had not previously been encountered on the site. Sand gilia plants were all in flower with early stages of seedset evident in many plants. Photographs 15 and 16 show photopoint locations for sand gilia Areas 1 and 2.

Patch areas and number of plants were as follows:

Total area occupied by sand gilia = 0.093 acre (9,507 square feet)

Total number of sand gilia plants = 510

Sand Gilia Area 1: 0.013 acre (5,851 square feet) **Number of plants = approx. 400**

Sand Gilia Area 2: 0.01 acre (549 square feet) **Number of plants = approx. 50**

Sand Gilia Area 3: 0.07 acre (3,107 square feet) **Number of plants = approx. 60**

3.4 Results of Monterey Spineflower Survey

Areas occupied by Monterey spineflower are shown in Figure 3. Monterey spineflower were mostly in flower during the survey. Though some *Chorizanthe* were at the leafy rosette stage, these were assumed to be the similar diffuse spineflower (*Chorizanthe diffusa*), which was found to be abundant within the fuel break later in the season.

Monterey spineflower density in almost all surveyed areas was Low (<5 percent cover). Plants were numerous, but very diminutive (< 1cm diameter to a few centimeters in diameter) so that they constituted a very small percent cover of the soil surface. In most areas designated "Low" density, actual cover was closer to 1 percent or less.

The breakdown of spineflower acreage at the three densities was as follows:

Low Density (<5 percent cover) = 9.4 acres (407,972 square feet)

Medium Density (6-25 percent cover) = 0.17 acre (7,327 square feet)

High Density (>25 percent cover) = 0.026 acre (1,124 square feet)

Photographs 17 through 20 show representative photopoint locations for Monterey spineflower, with close-ups of plants in low and high density areas.

Total area of Monterey spineflower in this survey was 9.6 acres, representing about 42 percent of the fuel break area. The distribution of spineflower was primarily on the east and south sides of the site, where soil conditions appear more suited to this species. Soils were the typical sandhill formation, which has a high proportion of sand and is loosely consolidated. The topsoil layer on the northern half of the site was generally more consolidated, with a greater presence of rocks and gravels.

3.5 Results of Annual Grass Survey

Eleven annual grass locations were mapped, and are shown on Figure 4. Locations of annual grasses were on the southeast, south, and west sides of the site. Photographs of representative grassland areas are shown in Photographs 21 through 24. Two areas were mapped (Areas 3 and 11) that were outside the fuel break, but were included in the study, as they are close enough that they represent a potentially significant source of grass seed into the fuel break following a prescribed burn. Note that almost all annual grass areas occurred at high density (>25 percent cover), which represents close to the maximum density usually encountered in these soil conditions.

Total annual grass area, and area at each density, are as follows:

Total annual grass area was 2.9 acres.

Low density (<5 percent cover) = 0.053 acre (2,324 square feet)

Medium density (6-25 percent cover) = 0.10 acre (4,382 square feet)

High density (>25 percent cover) = 2.8 acres (121,628 square feet)

3.6 Results of Invasive Weeds Survey

Two invasive weed species were identified in the fuel break survey: iceplant (*Carpobrotus edulis*) and pampas grass (*Cortaderia jubata*). Locations for these species are shown in Figure 5.

Iceplant: Fourteen locations were identified, all on the south side of the fuel break. Areas ranged in size from small patches of 10 square feet to larger patches (typically occurring around oak tree canopy) of almost 6,000 square feet. Total area of iceplant within the surveyed area of the fuel breaks is approximately 10,534 square feet (0.24 acre).

Pampas grass: A single location of pampas grass was found. One plant was mapped in a location just outside the fuel break, within the MRS-16 site.

4.0 Discussion

4.1 Shrub Survey

The results of the shrub survey show typical species diversity and dominance of an intermediate-aged chaparral community. Typically, one or two species (usually *Arctostaphylos*) are dominant, while a variety of other shrub and perennials species are present in lower numbers. On the fuel break, shaggy-barked manzanita (*Arctostaphylos tomentosa spp. tomentosa)* and sandmat manzanita (*Arctostaphylos pumila*) were the two dominant species in the chaparral community.

After a burn, shaggy-barked manzanita, chamise, and other burl-forming species would be expected to resprout from a root-crown, and quickly form the dominant shrub components. Germination of non-burl-forming shrub species, such as Monterey Ceanothus, sandmat manzanita, and black sage would be expected to begin the year following the burn, with growth proceeding gradually for the first few years. Without a burn in the fuel break, the burl-sprouting species are likely to predominate and germination rates for other shrubs would be expected to be low to none.

4.2 Herbaceous Vegetation Survey

Herbaceous vegetation within chaparral habitat is often low in abundance, particularly where shrubs are well established, and the habitat has remained undisturbed for some time. Competition from shrubs combined with other factors such as changes in soil chemistry deter germination.

Following a burn, herbaceous cover would be expected to increase by a large amount, particularly the first 2 or 3 years before shrub cover becomes established. If no burning occurs within the fuel break, herbaceous cover would be expected to remain as low as in the unburned, baseline conditions.

4.3 Sand Gilia Survey

Sand gilia has not been identified on this site in previous surveys (USACE, 1992). This may also reflect the temporal variation commonly seen in the sand gilia population. Sand gilia is known to respond to fire, as surveys on other burned sites on Fort Ord have shown (e.g., USACE, 2005), and will likely be found in larger numbers following a burn. Without a burn in the fuel break, sand gilia may be expected to germinate in or near the same areas, with abundance dependent upon rainfall.

4.4 Monterey Spineflower Survey

Monterey spineflower is known to be widespread on Fort Ord particularly where soils are sandy, relatively well developed, and there are openings in the chaparral, grasslands, or other vegetation to support this disturbance-loving species.

The map of Monterey spineflower distribution in the fuel break shows that this species predominates on south side of site, where soil conditions are more favorable to the species. Monterey spineflower is often present in chaparral. Diminutive plant size noted in this survey is not uncommon in chaparral, particularly in dry years. Low rainfall, soil conditions in intermediate to late seral-stage chaparral, and absence of recent disturbance may all be factors contributing to smaller plants.

The highest density patches of Monterey spineflower were associated with sand gilia patches and grasslands. Grasslands that harbor active ground-squirrel or gopher populations may provide beneficial islands of disturbance for the plants within the normally competitive environment of annual grasses.

A prescribed burn within the fuel break would likely benefit Monterey spineflower by improving soil nutrient content and reducing plant competition.

4.5 Annual Grass and Invasive Weeds Survey

Invasive weeds and annual grass locations were mapped to document baseline conditions prior to a prescribed burn. Burns are known to promote annual grass and weed growth especially in the year following the burn, because of the increased soil nutrient content and the lack of competition from large established plants.

It is to be expected that annual grasses in particular would flourish on the site following a burn. In addition to grassland locations mapped in the fuel break, there is also a large grassland inside MRS-16 in the southwest of the site. This grassland is likely to provide an additional large source for grass seed that could spread into adjacent areas following a burn.

Iceplant and pampas grass are usually destroyed above the soil surface following a burn, but recover from the root systems in the following year. Both species tend to germinate in profusion following burns.

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