

FORA ESCA REMEDIATION PROGRAM

2017 Annual Natural Resource Monitoring, Mitigation, and Management Report

Covering Activities Conducted from 1 January 2017
through 31 December 2017

Environmental Services Cooperative Agreement
Remediation Program Munitions Response Areas

Former Fort Ord
Monterey County, California

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ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order of Consent
Arcadis	Arcadis U.S., Inc.
Army	United States Department of the Army
ASP	Ammunition Supply Point
BLM	Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
BRAC	Base Realignment and Closure
CDFW	California Department of Fish and Wildlife (formerly CDFG, California Department of Fish and Game)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm	centimeter(s)
CNDDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CSUMB	California State University Monterey Bay
CTS	California tiger salamander
dbh	diameter at breast height
DGM	digital geophysical mapping
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESCA	Environmental Services Cooperative Agreement
ESCA RP	Environmental Services Cooperative Agreement Remediation Program
FFA	Federal Facility Agreement
FORA	Fort Ord Reuse Authority
FEG	Future East Garrison
GPS	Global Positioning System
ha	hectare(s)
HMP	Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California
HRP	Habitat Restoration Plan
IAR	Interim Action Ranges
km	kilometer(s)
m	meter(s)

MD	munitions debris
MEC	munitions and explosives of concern
MOU	Memorandum of Understanding
MOUT	Military Operations in Urban Terrain
MPC	Monterey Peninsula College
MRA	Munitions Response Area(s)
MRS	Munitions Response Site
msl	mean sea level
NCA	Non-Completed Area
NRCS	Natural Resources Conservation Service
NRMA	Natural Resources Management Area
QB	Qualified Biologist
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SCA	Special Case Area
SQB	Senior Qualified Biologist
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance

1.0 INTRODUCTION

1.1 Purpose and Scope

This Annual Natural Resource Monitoring, Mitigation, and Management Report summarizes natural resource-related activities performed by the Fort Ord Reuse Authority (FORA) Environmental Services Cooperative Agreement (ESCA) Remediation Program (RP) Team (“ESCA RP Team”, consisting of Arcadis U.S., Inc. [Arcadis], Weston Solutions, Inc., and Westcliffe Engineers, Inc.) during the period from 1 January 2017 through 31 December 2017. This report includes data and associated information that meet requirements outlined in the Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California (HMP; USACE 1997) and the Programmatic Biological Opinion (BO; USFWS 2017) issued to the United States Department of the Army (Army) by the United States Fish and Wildlife Service (USFWS). The HMP and BO identify mitigation measures to avoid and minimize impacts to rare, threatened, and endangered species and their habitats during pre-disposal activities such as munitions investigation activities. Implementation of the requirements by the ESCA RP Team is conducted in coordination with the Army.

Arcadis U.S., Inc. (Arcadis) has prepared this document on behalf of FORA (the Recipient) in accordance with industry standards and consistent with the requirements of the Remediation Services Agreement dated 31 March 2007 by and between Arcadis and the Recipient, including any applicable governing documents and applicable laws and regulations.

This report is the tenth in a series of Annual Natural Resource Monitoring, Mitigation, and Management Reports produced for the ESCA RP. The nine previous reports covered the 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, and 2016 reporting periods (ESCA RP Team 2009, 2010a, 2011a, 2012a, 2013b, 2014, 2015, 2016, and 2017).

1.2 Environmental Services Cooperative Agreement

The former Fort Ord (Figure 1) was placed on the National Priorities List in 1990, primarily because of chemical contamination in soil and groundwater that resulted from past Army operations. To oversee the cleanup of the base, the Army, the Department of Toxic Substances Control (DTSC), the Central Coast Regional Water Quality Control Board (RWQCB), and the United States Environmental Protection Agency (EPA) entered into a Federal Facility Agreement (FFA). One of the purposes of the FFA was to ensure that the environmental impacts associated with past and present activities at the former Fort Ord were thoroughly investigated and appropriate remedial action taken as necessary to protect public health and the environment.

In accordance with the FFA, the Army is designated as the lead agency under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for conducting environmental investigations, making cleanup decisions, and taking cleanup

actions at the former Fort Ord. The EPA is designated as the lead regulatory agency for the cleanup, while the DTSC and RWQCB are supporting agencies.

On March 31, 2007, the Army and FORA entered into an ESCA governing the remaining munitions and explosives of concern (MEC) removal activities required for approximately 3,300 acres (1351.6 hectares [ha]) of former Fort Ord property. In accordance with the ESCA and an Administrative Order on Consent (AOC), FORA is responsible for completion of CERCLA response actions, except for munitions response actions as defined in the ESCA and related documents, except for those retained by the Army. The AOC was entered into voluntarily by FORA, the EPA Region 9, the DTSC, and the United States Department of Justice Environment and Natural Resources Division on December 20, 2006 (EPA Region 9 CERCLA Docket No. R9-2007-03). The underlying property was transferred to FORA in May 2009. The AOC was issued by EPA under the authority vested in the President of the United States by Sections 104, 106, and 122 of CERCLA, as amended, 42 United States Code §§ 9604, 9606, and 9622.

FORA, through the ESCA RP Team, is in the process of completing the Army's MEC response actions in a program hereinafter identified as the ESCA RP. Future land use designations for the ESCA Munitions Response Areas (MRAs) include: habitat reserve, habitat corridor, development (residential and non-residential), and borderland development areas along Natural Resources Management Area (NRMA) interface (Figure 2). As described in the 1997 HMP, these categories are defined as:

Habitat Reserve – management goal is conservation and enhancement of threatened and endangered species

Habitat Corridor – lands between major reserve areas; to be managed to promote connections between conservation areas

Development – no management restrictions; some plans for salvage of biological resources from these lands may be specified

Borderland Development Areas along NRMA Interface (also called Borderland Boundary or Borderland Interface) – areas abutting the NRMA that are slated for development; management of these lands includes no restrictions except along the development/reserve interface

Future Road Corridors – lands within habitat reserve set aside for future road development; to be managed as habitat reserve until road development occurs

Development with Reserve or Development with Restriction – lands slated for development that contain inholdings of reserve or require specific restrictions to protect biological resources values; management of reserve inholdings must match that for habitat reserves, while management in development areas must proceed with certain specific restrictions identified in the HMP.

The nine ESCA MRAs are made up of entire or partial parcels. As defined by the HMP, the parcels have multiple intended uses. These MRAs include: California State University at Monterey Bay (CSUMB) Off-Campus MRA, County North MRA, Del Rey Oaks (DRO)/Monterey MRA, Future East Garrison (FEG) MRA, Interim Action Ranges (IAR) MRA, Laguna Seca Parking MRA, Military Operations in Urban Terrain (MOUT) Site MRA, Parker Flats MRA, and Seaside MRA (Figures 1 and 2). Of these nine ESCA MRAs, five include habitat reserve or habitat corridor parcels: County North, Del Rey Oaks/Monterey, FEG, IAR, and Parker Flats (ESCA RP Team 2009, 2010a, 2011a; Figure 2). These five MRAs that contain habitat reserves or corridors have been subject to natural resource monitoring, mitigation, and management activities since the inception of the ESCA, such as erosion control, target weed management, and active and passive restoration activities. Borderland boundary areas are also subject to erosion control and weed management efforts, as needed. The borderland boundary is shown on Figure 2.

Most of the ESCA RP Team munitions investigation activities were completed in all MRAs by the end of 2013. Associated biological field activities continue to be performed in three MRAs that contain habitat reserve or habitat corridor parcels: FEG, Parker Flats, and IAR (Table 1-1, Figures 3a, 3b, and 3c). As detailed in Appendix A, habitat restoration monitoring activities were conducted in the IAR MRA Range Restoration Areas during this period.

2.0 NATURAL RESOURCE MONITORING AND MITIGATION REQUIREMENTS

Primary requirements for natural resource monitoring and mitigation are described in the HMP (USACE 1997) and the BO (USFWS 2015) issued to Army to enable compliance with the Federal Endangered Species Act (ESA) and to avoid or minimize, to the extent feasible, the take of listed species as well as protecting other native species of concern.

2.1 Habitat Management Plan

The HMP (USACE 1997) and modifications to the HMP provided in the “Assessment, East Garrison—Parker Flats Land Use Modifications, Fort Ord, California” (Zander 2002) present the boundaries of habitat reserve and development areas and describe land use, conservation, management, and habitat monitoring requirements for target species within the former Fort Ord. Following the HMP, a portion of the Interim Action Ranges MRA was subsequently identified as non-residential development in a proposal for land-use modifications titled Assessment East Garrison – Parker Flats Land Use Modifications (“the 2002 Land Use Modifications”; Zander 2002) and in the Memorandum of Understanding Concerning the Proposed East Garrison/Parker Flats Land-Use Modification Between the FORA, Monterey Peninsula College (MPC), County of Monterey, U.S. Bureau of Land Management (BLM), and U.S. Army as Parties to the Agreement (“the 2004 Memorandum of Understanding [MOU]”; Army 2004). The 2002 Land Use Modifications and 2004 MOU included revision to the position of the borderland interface.

The HMP and BO establish guidelines for the conservation and management of wildlife and plant species and habitats that largely depend on former Fort Ord land for survival (USACE

1992, 1997; USFWS 2017). Threatened and endangered plant and animal species as well as designated critical habitat for some species occur at the former Fort Ord. Each reuse area has been screened for potential impacts or disturbances to threatened and endangered species identified in the HMP (USACE 1997). Implementation of the provisions of the HMP and referenced additional measures satisfy the requirements of the ESA.

Pertinent goals of the HMP include:

- Preserve, protect, and enhance populations and habitats of federally listed threatened and endangered wildlife and plant species;
- Avoid reducing populations or habitat of federal proposed and candidate wildlife and plant species to levels that may result in one or more of these species becoming listed as threatened or endangered;
- Preserve and protect populations and habitat of state-listed threatened and endangered wildlife and plant species;
- Avoid reducing populations or habitat of species listed as rare, threatened, and endangered by the California Native Plant Society (CNPS), or with large portions of their range at former Fort Ord, to levels that may result in one or more of these species becoming listed as threatened or endangered.

Natural resource monitoring and mitigation requirements associated with munitions investigation activities addressed in the HMP have several primary objectives: minimize disturbance associated with munitions investigation activities; avoid or minimize impacts to known sensitive HMP species, where feasible; conduct passive and/or active habitat restoration, where required; and conduct employee environmental awareness training.

A total of 18 species are addressed in the HMP and are referred to in this report as HMP species (Table 2-1); these species are described in further detail in Section 4. HMP species are defined as those species that had the following status at the time of HMP preparation (USACE 1997):

- Federally proposed and listed threatened and endangered species;
- Species that are candidates for federal listing as threatened or endangered;
- State-listed threatened and endangered species;
- Species that fell under one of the previous categories during preparation of the 1994 HMP but that no longer have any legal status under the federal or state ESA; and
- California Native Plant Society List 1B species with extensive portions (greater than 10 %) of their known ranges at former Fort Ord: (Hooker's manzanita [*Arctostaphylos hookeri* subsp. *hookeri*], Toro manzanita [*Arctostaphylos montereyensis*], sandmat manzanita [*Arctostaphylos pumila*], Eastwood's ericameria [*Ericameria fasciculata*], and coast wallflower [*Erysimum ammophilum*]).

The types of effects that munitions investigation activities have on sensitive habitats and HMP species were anticipated in the HMP; these include vegetation burning and cutting, whole plant excavation, crushing or trampling from movement of excavation equipment and team foot traffic, and on-site MEC detonation. The anticipated habitat acreage and number of plants of HMP species affected by munitions investigation activities were not quantified in

the HMP because the range and quantity of MEC targets had not been determined and investigations are ongoing.

The HMP addresses potential effects of MEC investigation and remedial activities at the former Fort Ord to sensitive HMP wildlife species, including California black legless lizard (*Anniella pulchra nigra*), California red-legged frog (*Rana draytonii*), California tiger salamander (CTS; *Ambystoma californiense*), California linderiella (*Linderiella occidentalis*), Smith's blue butterfly (*Euphilotes enoptes smithi*), Monterey ornate shrew (*Sorex ornatus salarius*), and western snowy plover (*Charadrius nivosus nivosus*). HMP plant species include Monterey spineflower (*Chorizanthe pungens* var. *pungens*), robust spineflower (*Chorizanthe robusta* var. *robusta*), sand (Monterey) gilia (*Gilia tenuiflora* subsp. *arenaria*), seaside bird's beak (*Cordylanthus rigidus* subsp. *littoralis*), coast wallflower, Yadon's piperia (*Piperia yadonii*), Eastwood's ericameria, Hooker's manzanita, Toro manzanita, sandmat manzanita, and Monterey ceanothus (*Ceanothus rigidus*). Several HMP species have estimated ranges that include more than 50% of their population at the former Fort Ord; these include: sand (Monterey) gilia, Monterey spineflower, Eastwood's ericameria, Monterey ceanothus, sandmat manzanita, and Toro manzanita (USACE 1997). The HMP considers two federally-listed HMP annual species with populations concentrated at the former Fort Ord as particularly vulnerable to the potential effects of MEC investigation and remedial activities at the former Fort Ord: Monterey spineflower and sand (Monterey) gilia.

Monitoring requirements at munitions investigation sites include baseline surveys prior to munitions investigation activities as well as follow-up monitoring after munitions investigation activities are complete. Follow-up surveys for shrubs and subshrubs are conducted in Years 3, 5, and 8 after munitions investigation activities, and follow-up surveys for HMP annuals are conducted in Years 1, 3, and 5 after munitions investigation activities (Tetra Tech and EcoSystems West 2015). Data to be gathered during maritime chaparral baseline and follow-up monitoring include site size, methods used for vegetation clearing, extent of soil disturbance, percent cover by different shrub species, percent cover by non-native species, HMP annual species density, field notes and photographic documentation.

Habitat restoration activities in central maritime chaparral vegetation affected by munitions inspection activities focus on restoring naturally regenerating vegetation that exhibits characteristics such as high species diversity, a mosaic of seral stages and age classes, and suitable habitat to support HMP species such as sand (Monterey) gilia, Monterey spineflower, seaside bird's beak, and California black legless lizard.

Post-disturbance restoration focusing on HMP annual species - sand (Monterey) gilia, Monterey spineflower, and seaside bird's beak is considered successful if three criteria are met five years after disturbance: self-sustaining populations of these HMP annual species are observed in a mosaic of various stand ages of central maritime chaparral, the amount of habitat supporting these species is comparable to 1992 levels, and population sizes are comparable to 1992 levels (USACE 1997). After each year's monitoring, the resulting data are then utilized for adaptive management of restoration activities to reflect changing conditions and continued progression toward success criteria, including supplemental weeding, planting, or seeding.

Wetlands used by CTS, if disturbed, are also required to be restored (USFWS 2017). Corrective measures for vernal pool and pond (referred to as “aquatic features” by the ESCA RP Team) restoration include minimizing excavation area and depth, topsoil salvaging and replacement, and restoring affected wetlands so that they are of the same acreage and provide the same functions as before MEC clearance. Aquatic feature effects are evaluated on a case-by-case basis.

Follow-up monitoring of restored aquatic features occurs during each rainy season for five years after restoration. Data to be gathered during monitoring of restored aquatic features include dates when the aquatic features begin to fill, when they dry out, water conditions, percent cover by different wetland vegetation types, and occurrence and relative abundance of California linderiella, CTS, and California red-legged frog.

Monitoring methods are detailed in Section 5.

2.2 Biological Opinions

The USFWS has issued BOs to the Army, of which six are applicable to the ESCA (USFWS 1999, 2002, 2005, 2007, 2015, and 2017). All BOs related to the former Fort Ord are cited in the references of this report; the brief summary below focuses on the applicable BOs. The ESCA RP Team acts as the Army’s agent to implement relevant requirements of the BOs while conducting fieldwork within ESCA MRAs. In this role, the ESCA RP Team members are in frequent communication with Mr. William Collins, Base Realignment and Closure (BRAC) Office Environmental Coordinator and Mr. Bart Kowalski, Chenega Support Services Wildlife Biologist supporting BRAC, to address natural resource compliance requirements and progress.

Of the applicable BOs, the 30 March 1999 “Biological and Conference Opinion on the Closure and Reuse of Fort Ord, Monterey County, California (1-8-99-F/C-39R)” addresses the impacts that the closure and reuse of Fort Ord may have on nine sensitive species, which were at the time federally listed or proposed to be listed (USFWS 1999).

The 22 October 2002 “Biological and Conference Opinion on the Closure and Reuse of Fort Ord, Monterey County, California as it affects Monterey Spineflower Critical Habitat (1-8-01-F-70R)” addresses the impacts that the closure and reuse of Fort Ord may have on the Monterey spineflower and its critical habitat (USFWS 2002). Monterey spineflower critical habitat exists in County North, IAR, Laguna Seca Parking, and FEG MRAs (USACE 1992).

The 30 March 2005 BO titled “Cleanup and Reuse of Former Fort Ord, Monterey County, California, as it affects California Tiger Salamander and Critical Habitat for Contra Costa Goldfields (*Lasthenia conjugens*) 1-8-04-F-25R)” addresses the impacts that the closure and reuse of Fort Ord may have on CTS and critical habitat for Contra Costa goldfields (USFWS 2005); it was amended in 2007 to address new findings of CTS north of Reservation Road as well as a Marina Coast Water District project (“Amendment to Biological Opinion 1-8-04-F-25R, for the Cleanup and Reuse of Former Fort Ord, Monterey County, California”; USFWS 2007). CTS occur within areas adjacent to County North, IAR, FEG, Laguna Seca Parking,

MOUT Site, Parker Flats, and Seaside MRAs (USACE 1992). It should be noted that no critical habitat for Contra Costa goldfields occurs on former Fort Ord.

The 28 May 2015 BO titled “Programmatic Biological Opinion for Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California (8-8-09-F-74)” contains an updated analysis of the effects of Army cleanup and transfer activities on Contra Costa goldfields, California tiger salamander, Monterey gilia, Smith’s blue butterfly, Yadon’s piperia (*Piperia yadonii*), and any relevant critical habitat. It should be noted that Contra Costa goldfields and Yadon’s piperia have not been reported to occur within the IAR MRA and there is no designated critical habitat for Contra Costa goldfields or Yadon’s piperia within the former Fort Ord site. In 2017, the Army re-initiated the Programmatic Biological Opinion (USFWS 2017). The 2017 BO superseded all previous BOs.

3.0 SITE DESCRIPTION

Former Fort Ord is located about 8 miles (13 kilometers [km]) north of the city of Monterey, California and occupies approximately 28,000 acres (11,331 ha) adjacent to Monterey Bay and the cities of Marina, Seaside, Sand City, Del Rey Oaks, and Monterey. State Highway 1 crosses the western portion of the former Fort Ord, separating the beachfront from most of the former Fort Ord site (Figure 1). The former Fort Ord lies just to the south of the Salinas River delta in a broad low area between the Santa Lucia Mountains to the south and the Santa Cruz Mountains to the north.

The site is dominated by Pleistocene-age Aeolian sand dunes and other geologically younger sediments (Aromas sand and sandstone, Baywood sand, Oceano sand, Paso Robles formation, gravels, sands, silts, and clays), which cover older consolidated rocks, including Mesozoic granite and metamorphic rocks, Miocene sedimentary rocks of the Monterey shale formation, and upper Miocene to lower Pliocene marine sandstones. The sand sheet in the Salinas Basin is the northernmost of six distinctive sand sheets that occur in geologically subsiding basins at the mouths of rivers along the coast of southern California and northern Baja California (Hunt 1993).

The local weather pattern of mild, wet winters and warmer, dry summers is characteristic of Mediterranean-climate regions, with most precipitation concentrated between October and April. In the Monterey area, local climate is influenced by summer fog and predominant cool northwest winds. There is a sharp gradient in climate from the coast to inland areas, where summer temperatures may be much higher, especially during calm periods and/or in areas sheltered from the prevailing winds.

3.1 Vegetation Types in MRAs

The four most frequently encountered vegetation types in MRA habitat parcels are central maritime chaparral, coast live oak woodland, grassland, and aquatic features. Other vegetation types, such as central coastal scrub, cover smaller areas; a brief description of coastal scrub is incorporated into the vegetation description for central maritime chaparral

that follows. Observed plant and wildlife species are documented in each of the monitoring areas in the ESCA MRAs, especially those with habitat parcels where the ESCA RP biologists most frequently work (Tables 3-1 and 3-2). These lists do not represent a comprehensive inventory of all species expected in the MRAs, but only those that have been observed to date.

3.1.1 Central Maritime Chaparral

The predominant vegetation at the former Fort Ord is central maritime chaparral, which is comprised of evergreen shrubs and occasional multi-trunked coast live oaks that grow together at varying densities from open stands to almost impenetrable thickets in coastal areas of the Central Coast underlain with sand or sandstone-derived soils. This woody chaparral shrub vegetation ranges from 4 to 15 or more feet (1 to 5 meters [m]) in height, although low-growing annuals and herbaceous perennials are scattered in exposed openings. Species composition varies with microhabitat characteristics and stand age since the last disturbance.

In general, maritime chaparral is an unusual vegetation type found primarily on sandy substrates in a few coastal locations in Santa Barbara, San Luis Obispo, Monterey, and Santa Cruz Counties. Often these maritime chaparral associations are dominated by local endemic species of ceanothus (*Ceanothus*) and manzanita (*Arctostaphylos*) mixed with other widespread and endemic species (Holland 1986; Holland and Keil 1995). Maritime chaparral is a vegetation type of particular concern in the HMP because it supports a number of rare, threatened, and endangered species populations; see Section 4 below.

Central maritime chaparral is the dominant vegetation type in the ESCA MRAs in which 2017 vegetation transect monitoring was conducted. Mature chaparral vegetation structure consists of a relatively simple canopy layer with a diversity of annual and short-lived herbaceous species occurring in sunny openings between shrubs, including a number of local endemic taxa.

The sandy substrate typical of maritime chaparral habitats tends to be low in organic matter and nutrients, particularly nitrogen and phosphorus (Smith et al. 2002). As a result, microflora and microfauna play a particularly important role in nutrient cycling, and cryptogamic soil crusts are observed in most undisturbed chaparral vegetation. Two generalized subtypes of maritime chaparral have been characterized at the former Fort Ord: sandhill maritime chaparral and inland maritime chaparral (USACE 1992). Sandhill maritime chaparral occurs in the rolling sand hills of coastal areas on loose Aeolian sand (Smith et al. 2002). The deep sandy soils allow deep root penetration and retained moisture below the dry surface layers in summer. Sandhill maritime chaparral is typically dominated by stump-sprouting shrubs such as shaggy-barked manzanita (*Arctostaphylos tomentosa* subsp. *tomentosa*) and chamise (*Adenostoma fasciculatum*), along with a mixture of obligate-seeding regional endemics such as sandmat manzanita, Monterey ceanothus, and dwarf ceanothus (*Ceanothus dentatus*); these obligate-seeding shrubs are often codominant with the stump-sprouting shrubs, and chamise rarely contributes the greatest cover of any shrub species to the canopy. Sandhill chaparral occurs in the Seaside, Parker Flats, and IAR MRAs, as well as elsewhere on the western half of the former Fort Ord.

Further inland the elevation increases as sandstone outcroppings appear. The relatively thin veneer of sand, derived from sand deposits and weathering, forms a layer over the top of the sandstone outcroppings. Soil texture and permeability have a direct impact on root penetration and plant species distribution. Like sandhill chaparral, the inland maritime chaparral vegetation is also dominated by stump-sprouting shrubs such as chamise, which has relatively higher cover on sandstone compared with sand. Shaggy-barked manzanita is replaced by another stump-sprouting shrub, brittleleaf manzanita (*Arctostaphylos crustacea* subsp. *crustacea*), in inland areas, and a stump-sprouting ceanothus species, blue-blossom (*Ceanothus thyrsiflorus*), forms large colonies in the chaparral vegetation. Obligate-seeding shrub dominants include Toro manzanita, Hooker's manzanita, dwarf ceanothus, Monterey ceanothus, and others. Inland chaparral is widespread in the FEG MRA.

Fire plays a major role in chaparral ecosystems, typically occurring every few decades, returning nutrients to the soil that are tied up in dead wood and leaf litter as well as creating openings with ample sunlight and space for seed germination and seedling establishment. Several chaparral shrubs, such as shaggy-barked manzanita, brittleleaf manzanita, and chamise have underground or surface stems (burls) that resprout after fire. Other shrubs, such as dwarf ceanothus, Monterey ceanothus, sandmat manzanita, Hooker's manzanita, and Toro manzanita, are obligate seeders that can only recolonize a burned site from seed after fire; often the seed requires fire-induced cues to germinate. Post-fire sites are often carpeted with a mixture of obligate-seeding shrubs and herbaceous species the spring after a wildfire. As shrubs become re-established after fire, herbaceous and smaller species tend to be excluded by expanding canopies of the dominant shrubs; however, even in mature stands of central maritime chaparral, open areas may occur between shrubs that support herbaceous species.

The primary vegetation alliance for this vegetation type is the Shaggy-Barked or Brittleleaf Manzanita Shrubland Alliance, as characterized by CNPS and California Department of Fish and Wildlife (CDFW; Sawyer et. al 2009). Shaggy-barked or brittleleaf manzanita chaparral has a G2/S2 rating (6-20 viable occurrences and/or 2,000-10,000 acres [518-2,590 ha] worldwide and statewide), as listed in the CDFW Natural Communities Hierarchy (CDFW 2010) and in California Natural Diversity Database (CNDDB, CDFW 2017); G2/S2 ratings indicate an alliance that is threatened throughout its range.

Central coastal scrub shares many shrub species with central maritime chaparral vegetation, although dominant species differ. Overall stature of mature chaparral vegetation is generally taller than that of coastal scrub vegetation and mature chaparral dominants tend to produce waxy sclerophyllous leaves that contrast with the softer, pubescent, or smaller leaves of many coastal scrub dominants such as black sage. In addition, the wood of chaparral shrubs tends to be harder and the burls larger and more resistant to surface disturbance than the stems and burls of shrubs that predominate in coastal scrub vegetation. Coastal scrub vegetation generally occurs in drier sites than chaparral, often on south-facing exposures at slightly lower elevations. Coastal scrub dominants frequently appear in chaparral vegetation immediately after disturbances such as burns or vegetation cutting but gradually get overtopped by the larger chaparral dominant shrubs. Central coastal scrub occurs in a small portion in northeastern Parker Flats MRA.

This vegetation type would be classified as the Black Sage Shrubland Alliance by CNPS and CDFW (Sawyer et. al 2009); the Black Sage Shrubland Alliance has global and state ranks of G5/S5 (no threats known), as listed in the CDFW Natural Communities Hierarchy (CDFW 2010) and in CNDDDB (CDFW 2017).

3.1.2 Coast Live Oak Woodland

Coast live oak woodland is dominated by mixed-aged stands of coast live oak (*Quercus agrifolia*) that vary in density from concentrated bands of oaks along drainage bottoms to scattered trees on nearby slopes. Coast live oak is an evergreen tree ranging from 20 to 75 feet (6 to 25 m) in height, with a spreading crown, many massive branches, and a dense canopy of thick waxy leaves. Trees can live for 100 years or more. Although common in the hills surrounding Monterey, coast live oaks are restricted to a 50-mile (8-km) wide swath along the coast from Mendocino County south to northern Baja California. They are completely absent in the Sierra Nevada and other interior ranges; rather, they tend to occur in the maritime belt that receives fog during the summer months.

Most healthy stands of coast live oak woodland contain mixed age classes of oak trees, saplings, and seedlings that can vary widely in overall appearance, depending on moisture availability. Associated species such as toyon (*Heteromeles arbutifolia*), poison-oak (*Toxicodendron diversilobum*), California blackberry (*Rubus ursinus*), coastal wood fern (*Dryopteris arguta*), bracken fern (*Pteridium aquilinum*), yerba buena (*Satureja douglasii*), wood mint (*Stachys bullata*), and others also form a dense understory in undisturbed oak woodland.

Coast live oak woodland is found in the FEG MRA in drainage bottoms as well as in the Parker Flats and County North MRAs. Like chaparral vegetation, oak woodland and annual grassland may integrate in areas with extensive habitat disturbance.

Coast live oak woodland is characterized as the Coast Live Oak Woodland Community in the CNDDDB legacy community classification system (Holland 1986), and as the *Quercus agrifolia* Woodland Alliance in the CNPS Manual of California Vegetation (Sawyer, Keeler-Wolf, and Evens 2009). *Quercus agrifolia* Woodland Alliance has a G5 global rarity ranking (demonstrably secure because of its worldwide occurrence) and an S4 state rarity ranking (greater than 100 viable occurrences statewide, and/or more than 31,110 acres [12,950 ha]); some associations within the *Quercus agrifolia* Woodland Alliance have G3 and S3 rankings (21-100 viable occurrences worldwide/statewide, and/or more 6,400-31,110 acres [2,590-12,950 ha]), according to the CDFW (2010 and 2017).

3.1.3 Grassland

Annual grassland vegetation is located in disturbed areas where there has been prior soil disturbance, as well as along roadways, access routes, and fuel breaks; annual grasslands tend to be dominated by non-native annual grasses and other native and weedy herbaceous species. Among the non-native grasses observed are invasive annual Mediterranean grasses such as slender wild oats (*Avena barbata*), rip-gut brome (*Bromus diandrus*), soft chess

(*Bromus hordeaceus*), red brome (*Bromus madritensis* subsp. *rubens*), foxtail barley (*Hordeum murinum*), and annual fescues (*Festuca* species) and forbs such as filaree (*Erodium cicutarium*, *E. botrys*), iceplant (*Carpobrotus* spp., especially *C. edulis*), and others. Degraded central maritime chaparral subjected to habitat disturbances often supports a mosaic of shrubs and weedy non-native grasses.

Limited annual grassland vegetation occurs in disturbed areas in the three MRAs containing habitat parcels where monitoring was conducted during 2017.

In general, the annual grassland areas would be classified as Non-Native Grasslands in the CNDDDB legacy community classification system (Holland 1986) and as California Annual Grassland Series within the CNPS Manual of California Vegetation (Sawyer, Keeler-Wolf, and Evens 2009). Non-native Grassland has a global rank of G4 (apparently secure, but factors exist to cause some concern; i.e., there is some threat or somewhat narrow habitat) and a state rank of S4 (apparently secure, but factors exist to cause some concern; i.e., there is some threat or somewhat narrow habitat), as listed in the CNDDDB (CDFW 2017).

Perennial grassland vegetation at the former Fort Ord is more common adjacent to broad drainages and swales, where spreading grasses such as alkali rye (*Elymus triticoides*) form large colonies. Perennial grasslands occur near some aquatic features in the northeast corner of the FEG MRA. Small stands of native perennial bunchgrass species such as purple needlegrass (*Stipa pulchra*) also are observed within central maritime chaparral in all MRAs. In all cases, perennial grassland colonies within MRAs are too small (< 0.2 acres) to be classified separately as perennial grassland.

3.1.4 Aquatic Features

Aquatic features are dominated by native herbaceous annual and perennial plants that are typical of seasonal wetlands in coastal California (Table 3-3). Species tend to occur in zones depending on the depth of the depression, from submergent aquatic species to emergent species and then surrounding upland vegetation such as coast live oak woodland, central maritime chaparral, and grassland. Arroyo willow (*Salix lasiolepis*) occurs adjacent to some of the aquatic features in the northeast corner of the FEG MRA as well. A total of 12 aquatic features are found only in the FEG MRA in two main clusters, one in the northeastern corner and the other in the southern portion of the MRA in a former grenade range (Section 3.2.1). These aquatic features were described in detail in Appendix C of the 2011 Annual Natural Resource Monitoring, Mitigation, and Management Report (ESCA RP Team 2012a). Mostly bare sandstone surrounds the grenade range aquatic features due to apparent historical disturbance.

3.2 Environmental Characteristics of MRAs with Habitat Parcels

A summary of environmental characteristics and existing vegetation for each of the MRAs containing habitat parcels where natural resource monitoring was conducted during 2017 is provided in the following sections. These MRAs are shown in Figures 3a, 3b, and 3c.

3.2.1 Future East Garrison MRA Site Description

The FEG MRA (formerly known as the East Garrison MRA) is located in the northeastern portion of the former Fort Ord (Figures 2 and 3a), and is wholly contained within the jurisdictional boundaries of Monterey County. This MRA encompasses approximately 251.5 acres (102 ha) and contains the following four United States Army Corps of Engineers (USACE) parcels: E11b.6.1, E11b.7.1.1, E11b.8 (includes 100-foot [30-m] borderland interface buffer), and L20.19 1.1. Of the 252 acres (102 ha) within this MRA, 177.5 acres (71.8 ha) are designated as habitat reserve.

The topography of the FEG MRA is variable, with gentle ridges and steeper canyon walls. Overall, slopes descend from south to north, with higher ridges in the south over 450 feet (137 m) above mean sea level (msl) and lower slopes to the north at 170 feet (52 m) above msl. The southern portion of the FEG MRA is bisected by a small drainage that descends gradually from west to east before joining an unnamed tributary to the Salinas River. Sandstone Ridge borders this drainage to the south, reaching over 400 feet (122 m) above msl; upper slopes of this drainage exceed 500 feet (152 m) elevation to the immediate west of the FEG MRA. Another small forked drainage is located in the northern portion of the FEG MRA and descends directly to the Salinas River floodplain to the north.

The slope of the terrain in the FEG MRA ranges from relatively flat (3 to 5 percent) within an area formerly used as an Ammunition Supply Point, to steep (up to 50 percent) along the drainages. The FEG MRA is underlain by several hundred feet of Aeolian deposits (Aromas formation) consisting mostly of weathered dune sand (NRCS 2013). Surface soil conditions in the FEG MRA are predominantly weathered dune sand and/or sandstone.

Vegetation on the ridges of the FEG MRA primarily consists of central maritime chaparral, with coast live oak woodland predominating in drainages. A limited amount of grassland vegetation is present as well. The western portion of the MRA is designated as critical habitat for Monterey spineflower (Figure 4).

There are twelve aquatic features concentrated in two main areas within the FEG MRA (Figure 3a). Three aquatic features are located in the eastern portion of the former grenade range. The former grenade range has been repeatedly scraped; as a result, much of the terrain surrounding the aquatic features in the former grenade range is un-vegetated sandstone. The remaining aquatic features occur in the northeast corner of the FEG MRA and are surrounded by coast live oak woodland, arroyo willow clusters, and grassland vegetation.

Protocol aquatic larval surveys were completed in the FEG MRA during the 2009-2010 and 2010-2011 rainy seasons to determine whether CTS were present in advance of munitions investigations remediation activities, consistent with the HMP, 2005 BO, Wetland Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at the Former Fort Ord (Burleson 2006) and the Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander (CDFW [CDFG] 2003); two CTS larvae were observed in 2011 by the ESCA RP Team in

aquatic features located in northeast FEG MRA in the habitat parcel (ESCA RP Team 2011a and 2012a).

3.2.2 Parker Flats MRA Site Description

The Parker Flats MRA is located in the central portion of the former Fort Ord, bordered by the CSUMB Off-Campus MRA and the County North MRA to the north, the IAR MRA to the south, CSUMB campus property to the west, and additional former Fort Ord property to the east and southeast (Figures 2 and 3b). The Parker Flats MRA is contained within the jurisdictional boundaries of the City of Seaside and Monterey County.

The Parker Flats MRA was targeted for development prior to the closure of Fort Ord in 1994, and in 1999 all vegetation was mowed as a part of munitions investigations activities. A subsequent land exchange resulted in this parcel being rezoned as habitat reserve (Zander 2002). In 2005, FORA, under the supervision of the Army, performed a prescribed burn on 147 acres (59.5 ha) in the Parker Flats MRA.

The Parker Flats MRA has been divided into two phases of work by FORA, identified as Parker Flats MRA Phase I and Parker Flats MRA Phase II. The Army completed a Track 2 Munitions Response Remedial Investigation/Feasibility Study and the signed Track 2 Munitions Response Site Record of Decision (ROD; MACTEC 2006 and Army 2008, respectively) for the Parker Flats MRA Phase I area. The remediation plan documented in the Army ROD for the Phase I area is implemented in this area by FORA. The Parker Flats MRA (Phase I and Phase II areas) encompasses approximately 1,180 acres (477.5 ha) and fully contains USACE parcels E18.1.1, E18.1.2, E18.1.3, E18.4, E19a.1, E19a.2, E19a.5, E20c.2, E21b.3, L20.18, L23.2, and L32.1, and portions of USACE parcels E19a.3 and E19a.4. The remaining portions of USACE parcels E19a.3 and E19a.4 are contained in the County North MRA. Of the 1,180 acres (477.5 ha) identified as the Parker Flats MRA, approximately 211 acres (85.36 ha) are designated as habitat reserve. The borderland interface in this MRA where the reuse area abuts the NRMA is in the middle of the Parker Flats MRA (Figures 2 and 3b).

The terrain of the Parker Flats MRA consists primarily of rolling sandy hills. The elevation ranges from approximately 280 to approximately 490 feet (85 to 149 m) msl, with 2 to 15 percent slopes. The surface soils are characterized as Aeolian (sand dune) and terrace (river deposits), formed from unconsolidated materials of the Aromas and Old Dune Sand formations. The primary soil type present in the Parker Flats MRA is Oceano Loamy Sand with smaller areas of Arnold-Santa Ynez complex and Baywood Sand, which are all weathered dune sands (NRCS 2013).

Vegetation in the Parker Flats MRA consists primarily of coast live oak woodland, maritime chaparral (and associated central coastal scrub vegetation), and grassland. Vegetation varies from sparsely vegetated areas to heavy brush.

3.2.3 Interim Action Ranges MRA Site Description

The IAR MRA is located in the north-central portion of the former Fort Ord, within the boundary of the historical impact area. The IAR MRA is bordered by the Parker Flats MRA to the north, the Seaside MRA to the northwest, and the historical impact area to the southeast, south, and southwest (Figures 2 and 3c). The IAR MRA is contained within the jurisdictional boundaries of Monterey County and a small portion of the City of Seaside.

The IAR MRA encompasses approximately 227 acres (92 ha) and is located in the area designated by the Army as Munitions Response Site (MRS) Ranges 43-48. An Interim Action ROD was produced by the Army in August 2002 for Interim Action Sites at the former Fort Ord, including MRS Ranges 43-48 (Army 2002). The remedial action selected for the Interim Action Sites was presented in the Interim Action ROD and included surface and subsurface MEC removal.

On January 18, 2017, the Army recorded the final remedial decision for the IAR MRA in the IAR MRA ROD (Army 2017), documenting the selected remedial alternative of Land Use Controls for managing the risk to future land users from MEC that potentially remain in the IAR MRA. The IAR MRA ROD states: (1) construction and implementation of the IAR MRA restoration areas has been completed and restoration systems are in place, operational and functioning; (2) operation and maintenance to support the long-term success of restoration at the site is being implemented through a post-installation adaptive management process to evaluate and manage the restoration areas as described in the HRP; and (3) initiated restoration activities are currently on track to achieve the prescribed performance criteria in the IAR MRA restoration areas.

Previous interim remedial actions conducted by the Army resulted in designation of areas, totaling approximately 235 acres (95 ha), within MRS Ranges 43-48 where subsurface MEC removal was not completed as SCAs or Non-completed Areas (NCAs). Approximately 35.9 acres (14 ha) of the SCAs and approximately 9.2 acres (4 ha) of NCAs within MRS Ranges 43-48 are located within the boundaries of the IAR MRA. An additional surface MEC removal was conducted in a portion of the Range 44 SCA in 2007. Range 44 SCA, Range 47 SCA, and Central Area NCAs are the focus of the ESCA RP Team's efforts. Two additional SCAs (Range 45 Trench SCA [approximately 1.2 acres] and a small portion of the Fenceline SCA [one partial 100-ft by 100-ft grid]) are also located within the IAR MRA; however, these areas were not included in the interim remedial action completed by the ESCA RP Team. The IAR MRA fully contains the following five USACE Parcels: E38, E39, E40, E41, and E42. Of the 227 acres (92 ha) within this MRA, 202 acres (82 ha) are designated as habitat reserve, and the northern boundary comprises part of the borderland interface (Figure 3c).

The terrain of the IAR MRA consists of gently undulating slopes ranging from 370 to approximately 530 feet (161.5 m) above msl, generally with 2 to 15 percent slopes. No ravines pass through the IAR MRA, although a few low areas support grassland and scattered shrubs and/or trees. In the Range 47 SCA, prior military earthwork has modified the original topography, resulting in an artificial escarpment located in the southwest portion of this area.

The primary soil type present in the IAR MRA is Arnold-Santa Ynez Complex, with Baywood Sand in the northwestern portion of the MRA. Soil conditions at the MRA consist predominantly of weathered Aeolian dune sand and are described as unconsolidated materials of the Aromas and Old Dune Sand formations (NRCS 2013).

Vegetation in the IAR MRA consists primarily of central maritime chaparral, with a small patch of grassland vegetation in the southern portion of the MRA. Prior to 2003, much of the IAR MRA was inhabited by mixed-aged stands of dense maritime chaparral. The MRA was subjected to a prescribed burn in 2003. Except for a small parcel on the northern edge of the area, most of the MRA is designated as critical habitat for Monterey spineflower (Figure 4).

The areas within the IAR MRA that have been the focus of monitoring efforts are designated with the following names for the purposes of this report (Figure 3c):

- North Range 44: North Range 44 SCA;
- South Range 44: South Range 44 SCA/Central Area NCAs;
- Range 47 Subarea A: Includes a portion of Range 47 SCA subject to large-scale excavation in which the vegetative cover has historically been low, 10% or less (ESCA RP Team 2012a). Non-native pampas grass (*Cortaderia jubata*, *C. selloana*) was abundant in places. Historical aerial imagery indicates that the vegetation of the area has changed little since the 1970s, despite an apparent lack of recent disturbance, except for fire that has affected the whole range;
- Range 47 Subarea B: Includes the majority of Range 47 SCA, which was subject to large-scale excavation prior to restoration activities;
- Range 47 Subarea C: Includes a small portion of Range 47 SCA surrounding the large-scale excavation area in which vegetation cutting took place in 2012.

4.0 HMP SPECIES

The requirements outlined in the HMP (USACE 1997) and in the BO (USFWS 2015) are described in more detail in Section 2 and focus on compliance with the federal ESA and avoidance or minimization, to the extent feasible, of take of listed species, as well as protection of other species of concern. A total of 18 species were addressed in the HMP (Table 2-1, see Section 2). Of these, 11 are plant species and 7 are wildlife species. Five species are restricted to the Monterey Bay region: the Monterey ornate shrew, Toro manzanita, sandmat manzanita, Eastwood's ericameria, and Yadon's piperia. An additional eight species are endemic to the Central Coast of California between the Bay area and Santa Barbara County, including the California black legless lizard, Smith's blue butterfly, Hooker's manzanita, Monterey ceanothus, Monterey spineflower, robust spineflower, sand (Monterey) gilia, and seaside bird's beak. Most of these species have 10 or more percent of their populations concentrated at the former Fort Ord. Two HMP plants (robust spineflower and Yadon's piperia) and three HMP wildlife species (California red-legged frog, CTS, and California linderiella) have 99% of their range outside the Fort Ord region.

Those HMP species that occur in vegetation types that are widespread at the former Fort Ord, such as central maritime chaparral, tend to be much more common in the MRAs addressed in this report than species confined to specific habitats such as aquatic features and shoreline areas. A summary of each HMP species is provided below, along with brief comments on occurrence in the MRAs.

4.1 HMP Amphibians

There are two amphibian species that are designated as HMP species (USACE 1997).

California tiger salamander (CTS, *Ambystoma californiense*) – Federally Endangered and California Threatened. Adults are 7 to 8 inches (18 to 20 centimeters [cm]) long, black with yellow to cream-colored spots, larvae are greenish-gray in color. CTS occur in open woodlands and grasslands, ponds, and vernal pools from Sonoma to Santa Barbara Counties, inland to portions of the Sierra Nevada. Surveys were conducted for CTS larvae in 2010 and 2011 in aquatic features in the FEG MRA in advance of munitions investigation activities. Two CTS larvae were observed by the ESCA RP Team in the FEG MRA during the 2011 aquatic surveys (ESCA RP 2012a; Appendix C). Both aquatic features are located in northeast FEG MRA in the habitat parcel. USFWS designated habitat zones for CTS on site are shown on Figure 5. ESCA RP biologists did not observe CTS in ESCA MRAs during 2017.

California red-legged frog (*Rana draytonii*) – Federally Threatened and California Species of Concern. Adults are 2 to 5 inches (5 to 13 cm) long, reddish-brown, olive, or green with black flecks; hind legs can be red underneath. California red-legged frogs require cold water ponds or slow-moving river pools with emergent and submergent vegetation and riparian vegetation at the edges. California red-legged frogs range from Humboldt to San Diego Counties and in portions of the Sierra Nevada. Larvae of California red-legged frogs have been reported in the BLM portion of the Fort Ord National Monument adjacent to Toro Park (William Collins, personal communication) and suitable habitat is present in parcels outside of ESCA MRAs (USACE 1997). No red-legged frogs have been reported from vernal pools during Army monitoring since 1994. ESCA RP biologist did not observe California red-legged frogs in ESCA MRAs during 2017.

4.2 HMP Reptiles

There is one reptile species that is designated as an HMP species (USACE 1997).

California black legless lizard (*Anniella pulchra nigra*) – California Species of Concern. The limbless adults reach 7 inches (18 cm) in length and are dark on the upper surface and yellow below. Black legless lizards occur in various coastal plant communities where loose sandy soil and abundant invertebrate populations are available. Presently they are found in Monterey County and possibly extirpated from Santa Cruz and San Luis Obispo Counties.

California black legless lizards have been observed by the ESCA RP Team in Parker Flats MRA and IAR MRA. In 2009, a California black legless lizard was observed in an area of

oak woodland habitat at the interface with maritime chaparral habitat in sandy soil in the habitat parcel in the Parker Flats MRA. In 2010, a California black legless lizard was observed in maritime chaparral habitat in a development parcel of Parker Flats MRA. In 2012, a California black legless lizard was observed in maritime chaparral with sandy soil in a habitat reserve parcel in IAR MRA. ESCA RP biologists did not observe black legless lizards in ESCA MRAs during 2017.

4.3 HMP Birds

There is one bird species that is designated as an HMP species (USACE 1997) and it occurs outside of the ESCA MRAs, found in the Beach Ranges.

Western snowy plover (*Charadrius nivosus nivosus*) – Federally Threatened and California Species of Concern. The western snowy plover is a small shore bird about 6 to 7 inches (18 cm) in length with pale grayish brown upper body and white underbody bearing a dark breast band, and black legs and bill. Western snowy plovers occur on flat sandy beaches above the high tide level from Washington to Baja California. Western snowy plovers have not been observed by ESCA RP biologists in any of the MRAs on site, and no MRA includes shoreline habitat.

4.4 HMP Mammals

There is one mammal species that is designated as an HMP species (USACE 1997).

Monterey ornate shrew (*Sorex ornatus salarius*) - California Species of Concern. The Monterey ornate shrew is a small mammal approximately 3.5 to 4.25 inches (10 cm) long with grayish brown black fur. It occurs in riparian, woodland, and upland communities where there is thick duff or downed logs. It is endemic to Monterey region. Potential habitat exists for the Monterey ornate shrew in County North, CSUMB Off-Campus, FEG, IAR, MOUT Site, and Parker Flats MRAs. No Monterey ornate shrews have been observed during ESCA RP biological surveys.

4.5 HMP Invertebrates

There are two invertebrate species that are designated as HMP species (USACE 1997).

California linderiella (*Linderiella occidentalis*) – No California or federal listing. California linderiella is a small (<0.5 inch, or 1.2 cm) aquatic fairy shrimp found in seasonal ponds. California linderiella have been observed by ESCA RP biologists in two aquatic features in habitat parcels in the FEG MRA during the 2010 aquatic surveys (ESCA RP 2011a).

Smith's blue butterfly (*Euphilotes enoptes smithi*) – Federally Endangered. Adults with a wingspan of one-inch (2.5 cm); males with bright blue upper (dorsal) wing surfaces and females with brown upper wing surfaces; both with orange spotted band on hind upper wing surface edge and whitish gray underwings with dark speckling. It occurs in coastal sand dunes and ravines associated with coast and seacliff buckwheats in Monterey, Santa Cruz,

and San Mateo Counties. The Smith's blue butterfly has not been observed by ESCA RP biologists in the ESCA MRAs; it occurs outside of the ESCA MRAs in the Beach Ranges.

4.6 HMP Shrubs

There are five shrub species that are designated as HMP species (USACE 1997).

Hooker's manzanita (*Arctostaphylos hookeri* subsp. *hookeri*) – CNPS 1B.2. Hooker's manzanita is a low-growing to medium-sized shrub in the heather family that rarely reaches 5 feet (1.5 m) in height, and is usually much shorter in stature; it lacks a basal burl and therefore does not resprout after fire or vegetation cutting. Hooker's manzanita is endemic to the general Monterey Bay region, where it occurs in central maritime chaparral vegetation, especially in sandy soils (Baywood sands) or on ancient marine terraces of the Aromas sandstone formation. Hooker's manzanita is a smaller manzanita than the two widespread stump-sprouting manzanitas in the MRAs: shaggy-bark manzanita, which predominates in lowland ocean-facing central maritime chaparral, and brittleleaf manzanita, which occurs further inland. Hooker's manzanita has been previously mapped as relatively common in portions of the Parker Flats, FEG, and the MOUT Site MRAs, with smaller numbers in the Laguna Seca Parking MRA (USACE 1992). Mapping work completed in 2012 by ESCA RP biologists suggests that densities of Hooker's manzanita have been over-estimated due to previous plant misidentification. Hooker's manzanita is found in the FEG, Parker Flats, and the MOUT Site MRAs.

Toro manzanita (*Arctostaphylos montereyensis*) – CNPS 1B.2. Toro manzanita is a large single-trunked shrub to 12 feet (3.6 m) in height in the heather family; it lacks a basal burl and therefore does not resprout after fire or vegetation cutting. Toro manzanita is endemic to the Monterey region, where it occurs in central maritime chaparral vegetation, especially in sandy soils (Arnold sands) overtopping leached Aromas sandstone bedrock. Toro manzanita is scattered to dominant in maritime chaparral in portions of the Parker Flats, FEG, and MOUT Site MRAs; it occurs in lower densities in the Seaside and Laguna Seca Parking MRAs.

Sandmat manzanita (*Arctostaphylos pumila*) – CNPS 1B.2. Sandmat manzanita is a low mound-forming shrub in the heather family that can reach up to 3 feet (1 m) in height, with broad spreading branches bearing bicolored dull green to grayish leaves. Like Toro manzanita, sandmat manzanita lacks a basal burl and does not resprout after a fire or vegetation cutting. Sandmat manzanita is endemic to Monterey County, and tends to be found in central maritime chaparral and at the margins of oak woodland and Monterey pine forest in Baywood sands and on marine terraces of the Aromas and Paso Robles formations and sandstones allied to Monterey shale. Sandmat manzanita occurs commonly in maritime chaparral in the Seaside, IAR, Parker Flats, and Del Rey Oaks/Monterey MRAs, and in lower densities in the County North and Laguna Seca Parking MRAs.

Monterey ceanothus (*Ceanothus rigidus*) – CNPS 4.2. Monterey ceanothus is a densely-branching shrub in the buckthorn family that reaches approximately 4.5 feet (1.4 m) in height and rarely exceeds 6 feet (2 m). It lacks a basal burl and does not resprout after a fire or

vegetation cutting. Monterey ceanothus is endemic to maritime chaparral, central coastal scrub, and Monterey pine forest habitats from southern Santa Cruz to San Luis Obispo County, with its center of distribution in Monterey County. Monterey ceanothus occurs commonly in maritime chaparral in the Seaside, IAR, Parker Flats, FEG, Laguna Seca Parking, MOUT Site, and Del Rey Oaks/Monterey MRAs.

Eastwood's ericameria (*Ericameria fasciculata*) – CNPS 1B.1. Eastwood's ericameria is a multi-stemmed, rounded subshrub to small shrub in the sunflower family that rarely reaches 5 feet (1.5 m) in height. It can resprout after fire or vegetation cutting. Eastwood's ericameria is endemic to Monterey County and is found primarily in central coastal scrub and central maritime chaparral in sandy inland soils (Arnold sands overtopping Aromas sandstone). Eastwood's ericameria occurs in maritime chaparral in the Seaside, IAR, Parker Flats, FEG, MOUT Site, and Del Rey Oaks/Monterey MRAs.

4.7 HMP Herbaceous Perennials

There are two herbaceous perennial species that are designated as HMP species (USACE 1997).

Coast wallflower, sand-loving wallflower (*Erysimum ammophilum*) – CNPS 1B.2. Coast wallflower is a biennial to short-lived perennial in the mustard family that reaches from several inches to 1 to 2 feet (0.3 to 0.6 m) in height when flowering. It is endemic to coastal dunes flanking the Monterey Bay region and is also found on Santa Rosa Island in Santa Barbara County. It is found at Marina Dunes State Beach and has been observed east of the City of Marina. During 2013, 2014, 2015, 2016, and 2017, coast wallflower was observed by ESCA RP biologists in the IAR MRA North Range 44 and during 2013 and 2014 it was observed by ESCA RP biologists in Seaside MRA.

Yadon's piperia (*Piperia yadonii*) – Federally Endangered, CNPS 1B.2. Yadon's piperia is a perennial herb in the orchid family with basal leaves and an elongate flowering spike when it blooms in late spring and summer. A 1992 survey located a population of Yadon's piperia in northwestern former Fort Ord, just to the east of Highway 1 and the Del Monte Boulevard exit (USACE 1997). Yadon's piperia also exists in several locations to the east and south of the IAR MRA (David Styer, personal communication). Yadon's piperia has not been observed by ESCA RP biologists in any of the MRAs on site.

4.8 HMP Annuals

There are four annual species that are designated as HMP species (USACE 1997); these annual HMP species have sometimes been referred to as HMP focus species in past Annual Natural Resource Reports. These HMP species occur on some development parcels as well as some habitat parcels; a general summary is provided below, but the remainder of this report focuses on habitat parcel occurrences.

Monterey spineflower (*Chorizanthe pungens* var. *pungens*) – Federally Threatened, CNPS 1B.2. Monterey spineflower is a low spreading annual in the buckwheat family that is

covered with gray hairs and blooms in late spring and early summer. It occurs in sandy soils in coastal strand, coastal scrub, maritime chaparral, margins of oak woodland and riparian habitats, and disturbed sites in grassland below 450 m elevation. It is endemic to northern Monterey and southern Santa Cruz Counties. Monterey spineflower occurs commonly in maritime chaparral in the County North, CSUMB Off-Campus, Del Rey Oaks/Monterey, FEG, IAR, MOUT Site, Parker Flats, and Seaside MRAs; USFWS-designated critical habitat for Monterey spineflower on site is shown on Figure 4. During 2017, Monterey spineflower was observed by ESCA RP biologists in FEG, IAR, and Parker Flats MRAs.

Robust spineflower (*Chorizanthe robusta* var. *robusta*) – Federally Endangered, CNPS 1B.1. Robust spineflower is low spreading to erect annual in the buckwheat family. It occurs in sandy soils in coastal dune and coastal scrub habitats. Robust spineflower ranges from Santa Cruz County to northern Monterey County. Historically one population was found on former Fort Ord west of Highway 1 to the north of the Lightfighter Road exit. According to the HMP, former Fort Ord does not provide important habitat for this species (USACE 1997). Robust spineflower has not been observed by ESCA RP biologists in any of the MRAs on site.

Seaside bird's beak (*Cordylanthus rigidus* subsp. *littoralis*) – California Endangered, CNPS 1B.1. Seaside bird's beak is a multi-stemmed annual root parasite that reaches 1 to 2 feet (0.3 to 0.6 m) in height at maturity. Seaside bird's beak generally occurs in openings in coastal dune scrub, central coastal scrub, and maritime chaparral and is restricted to the ancient sand sheets of Santa Barbara and Monterey Counties. Seaside bird's beak has been observed by ESCA RP biologists in maritime chaparral in IAR, Seaside, and FEG MRAs. According to the HMP, seaside bird's beak has the potential to occur in Del Rey Oaks/Monterey and Parker Flats MRAs. During 2017, seaside bird's beak was observed by ESCA RP biologists in the FEG and IAR MRAs.

Sand (Monterey) gilia (*Gilia tenuiflora* var. *arenaria*) – Federally Endangered, California Threatened, CNPS 1B.2. Sand (Monterey) gilia is a small annual in the phlox family that produces a basal rosette of leaves and lavender flowers that emerge from a short branching inflorescence that reaches about 6.5 inches (16.5 cm) in height in late spring. It occurs in open loose sandy soils with low silt content in coastal dune scrub and maritime chaparral habitats in limited locations near Monterey Bay and the adjacent coastal plain of the Salinas Valley. Sand (Monterey) gilia generally occurs in maritime chaparral and has been observed in IAR, FEG, Parker Flats, and Seaside MRAs. During 2017, sand (Monterey) gilia was observed by ESCA RP biologists in the FEG and IAR MRAs.

5.0 METHODS FOR MUNITIONS INVESTIGATION ACTIVITIES AND HABITAT MONITORING

Methods used for ESCA RP munitions investigation activities and associated biological monitoring activities are summarized in this section. The ESCA RP munitions investigation activities addressed here are those that have resulted in disturbance to native vegetation in habitat parcels in the FEG, Parker Flats, and IAR MRAs. By the end of 2013, most of the

munitions investigation activities were completed in all ESCA MRAs, and all munitions investigation activities in these MRAs were completed by the end of 2015.

Munitions investigation activities included analog or geomagnetic investigation, vegetation cutting, small- or large-scale soil disturbance, and other minor activities. These are defined more specifically in Section 5.1. A grid system developed by the Army was used to document all activities; each grid was assigned a unique number and covered 100 feet by 100 feet (30.5 m x 30.5 m).

Associated biological monitoring involved using established or modified protocols to document baseline conditions prior to munitions investigation activities as well as documenting post-activity vegetation recovery. Minimization and avoidance measures were also implemented to avoid or reduce impacts to sensitive biological resources.

5.1 Methods for Munitions Investigation Activities

Munitions investigation activities often required vegetation removal to facilitate target investigation using visual and electromagnetic means. When surface targets were identified, they were generally removed by hand or with the use of handheld tools. When subsurface targets were identified, they were investigated individually or in larger contiguous areas (soil excavation and sifting). Subsurface investigation areas ranged in size from a single cubic foot to several cubic feet, depending on the type, location, and position of the target. A shovel or other hand tool was typically used, although a backhoe was used for deeper targets. If MEC was identified but was unsafe to move, in situ detonation was sometimes conducted. During soil replacement field crews were directed to follow the same sequence in reverse, with replacement of subsoil and then topsoil replacement after munitions investigation activities were complete.

This method facilitated vegetation regeneration by retaining the seed bank, nutrients, and beneficial organisms on the surface. Other minor activities in support of munitions investigation activities included installation of signage, trash and debris removal, erosion control monitoring and installation of erosion prevention materials.

A summary of general methods for munitions investigation activities is provided below.

5.1.1 Tools and Techniques in Munitions Investigations - Digital Geophysical Mapping and Analog Investigations

Digital Geophysical Mapping (DGM) munitions investigation was conducted in areas subject to vegetation cutting (see Section 5.1.2) with either an EM61-MK2 towed array platform (“the FORA ESCA Sled”) or manually towed single-array EM61-MK2 combined with a navigation system. Personnel guided the sled along parallel transects through the work area. Data were evaluated, and target anomalies were selected for further investigation. Unexploded ordnance (UXO) technicians reacquired target anomalies based on Global Positioning System (GPS) coordinates and intrusively investigated targets to depth.

Analog munitions investigations were generally conducted on foot by technicians to locate and remove surface or subsurface MEC or munitions debris (MD). Technicians generally walked 3-foot (1-m)-wide search lanes through grid cells (grids) with a handheld magnetometer, which recorded the presence of ferrous metal targets. If potential MEC was detected in an investigation area, subsurface investigation (excavation) was sometimes required.

5.1.2 Methods for Vegetation Cutting

Vegetation cutting in this report generally refers to removal of most vegetation to ground level by manual and/or mechanical means, leaving the root mass, soil seedbank, and associated microorganisms and nutrients intact. Prior to initiation of munitions investigation activities, manual and mechanical vegetation cutting was conducted under the direction of the Senior Unexploded Ordnance Supervisor in coordination with an ESCA RP biologist. Manual vegetation cutting entailed the use of power chippers, powered weed cutters, DRTM trimmers, chainsaws, and a variety of similar hand tools and equipment. Vegetation-cutting support equipment included skip loaders, self-loading log trucks, and/or excavators with grappling arms, which were used to haul out salvageable timber or remove cut brush from the work area for chipping. If consolidated chipping operations were conducted, excavators or loaders were used to feed the chipping or grinding equipment and spread or load chips (masticated plant material).

Vegetation cutting and associated target-specific investigations (see Section 5.1.3) were conducted in habitat parcels in the FEG, Parker Flats, and IAR MRAs.

Where feasible, mature coast live oak trees with a diameter at breast height (dbh) equal or greater than 6 inches (15 cm) and HMP shrubs with a smaller dbh were left in place (retained) and limbed up to a height that allowed human access below the tree canopies. Manzanita retention was conducted in the FEG MRA.

5.1.3 Types of Excavations

In general, subsurface investigation areas (excavations) ranged in size from a single cubic foot to several cubic feet, depending on the type, location, and position of the target. Excavation work sometimes involved removal of root mass of individual native plant species and displacement of soil seedbank.

A ‘**target-specific investigation**’ is a subsurface investigation that is smaller than 100 square feet [9.3 m²]. A shovel or other hand tool was typically used to dig for a target, however a backhoe was sometimes required for deeper targets. Target-specific investigations were conducted in portions of the FEG, Parker Flats, and IAR MRAs on an as-needed basis after vegetation cutting activity.

A ‘**small-scale excavation**’ is a subsurface investigation that affected an area between 100 square feet and 1 acre [9.3 m²], or alternatively, an area that was greater than 100 square feet but less than 100 feet (30.5 m) wide on the narrowest side. Small-scale excavations were

conducted in portions of the IAR MRA and were also required in a portion of the former grenade range in the FEG MRA.

A **‘large-scale excavation’** is a subsurface investigation that disturbed an area over 1 acre (0.4 ha) in size. For the habitat parcels, only one large-scale excavation was conducted in the IAR MRA in Range 47 SCA.

5.1.4 Methods for Target Specific Investigation

Target specific investigation was used on most of the ESCA RP habitat parcels. This investigation method focused soil disturbance to individual targets, thereby minimizing impacts to the natural resources.

Additionally, a “step-out” approach was employed in the FEG MRA to minimize the areas that were initially cut and investigated. When it became necessary to do munitions investigation in a larger area, successive grid step-outs were performed on an as-needed basis to reduce vegetation cutting to only that required for munitions investigation activities.

5.1.5 Methods for Small-Scale Excavation

Small-scale excavations were used in areas where target-specific investigation was not viable due to anomaly density, depth, and expanse of investigation area. An investigative approach was developed and implemented by the ESCA RP Team in 2011 to minimize impacts to intact central maritime chaparral vegetation and relatively high densities of associated HMP herbaceous species in the IAR MRA. This approach was implemented under a Design Study and addressed locations where the Army had not previously conducted subsurface MEC removal, called NCAs and SCAs. The IAR MRA Design Study confined vegetation cutting and subsurface investigations to 10-foot-wide (3-m-wide) linear transects placed in the NCAs and SCAs in the IAR MRA; usually two parallel investigation transects traversed a single grid but often extended in a north-south linear alignment of contiguous grids in the study areas (see Appendix A). The Design Study approach greatly reduced disturbance to native habitat while gathering critical information about the location, type, and level of munitions investigation activities needed to support the Army’s interim ROD; this process is described in the Phase II Interim Action Work Plan (ESCA RP Team 2011b).

5.1.6 Methods for Interim Action Ranges MRA Design Study

An investigative approach (called the Design Study) was developed by the ESCA RP Team in 2011 to minimize impacts to intact central maritime chaparral vegetation and relatively high densities of associated HMP herbaceous species in the IAR MRA. The Design Study addressed locations where the Army had not previously conducted subsurface MEC removal - NCAs and SCAs. The Design Study confined vegetation cutting and subsurface investigations to 10-foot-wide (3-m-wide) linear transects placed in the NCAs and SCAs in the IAR MRA; as described in Section 5.1.5.

5.1.7 Methods for FEG MRA Step-outs

A “step-out” approach was employed in the FEG MRA to minimize the areas that were initially cut and investigated. When it became necessary to do munitions investigation in a larger area, successive step-outs were performed on an as-needed basis in order to reduce vegetation cutting to only that required for munitions investigation activities.

5.1.8 Methods for Large-Scale Soil Excavation

In the Range 47 SCA, large-scale excavation was required due to the high density of sensitively-fuzed munitions, small metallic debris, and ammunition links discovered within the soil in 2011 in an area encompassing 13.4 acres (5.4 ha). Prior to soil excavation, the above- and below-ground vegetation was removed by “root raking;” during root raking, a bulldozer equipped with heavy tines pushed the tines through the soil, pulling out entire plants, including roots and burls, while retaining most of the soil. The plant material was stockpiled, masticated into wood chips, and inspected by a UXO technician to determine that the material was free from potential MEC or MD. Although there were initial plans to use wood chip material in the Range 47 Restoration Area as mulch and for producing charate, the quantity of weeds and residual materials in the wood chip pile made that approach infeasible. Following size reduction, the material was transported and placed within the development portion of the IAR MRA.

Excavated soils were removed with bulldozers or excavators, transported by dump trucks to an onsite mechanical sift plant, where potential MEC was removed from the soil by UXO technicians.

The excavation process consisted of a sequence of topsoil removal (top 6 to 12 inches [15 to 30 cm]), followed by removal of subsoil. Each soil layer was sifted and stockpiled separately. Soil replacement followed the same sequence in reverse, with replacement of subsoil and then of topsoil. This process encourages regeneration of native species through replacement of seed bank, soil nutrients, and beneficial soil organisms.

The habitat restoration requirements in the large-scale excavation area in Range 47 SCA are detailed in the Phase II Interim Action Work Plan Addendum Habitat Restoration Plan (HRP) for the IAR MRA (ESCA RP Team 2013a), in accordance with the HMP (USACE 1997). See Section 7.0 and Appendix A for details on restoration planning, implementation, and monitoring in the IAR MRA.

5.1.9 Methods for Other Activities in Support of Munitions Investigation Activities

Other minor activities in support of munitions investigation activities have included installation of signage, trash and debris removal, weed and erosion control monitoring, and installation of erosion control materials reflecting current best management practices (BMPs). Most of these activities have been conducted on an as-needed basis except for erosion and weed monitoring. Methods for weed monitoring and management are described in more

detail in Section 5.2.7 and methods for erosion monitoring and control are described in Section 5.2.8.

Field activities are conducted in accordance with the HMP, BOs, and the appropriate ESCA work plan. All project personnel and subcontractors working in ESCA parcels receive environmental awareness training provided by ESCA RP Qualified Biologists.

5.2 Biological Monitoring Methods

Biological monitoring in 2017 was conducted in habitat parcels in which vegetation was disturbed as a result of ESCA RP munitions investigation activities to meet the requirements of the 1997 HMP and the BO; biological monitoring methodology adhered to the Revisions of Protocol for Conducting Vegetation Monitoring for Compliance with the Installation-Wide Multispecies Habitat Management Plan, Former Fort Ord (Tetra Tech EcoSystems West 2015).

The Army consulted with USFWS in 2017, which resulted in the issuing of the 2017 reinitiated Programmatic Biological Opinion (USFWS 2017), which supersedes all previous BOs. The 2017 BO contains a directive to apply revised monitoring protocol to all vegetation monitoring (*Revisions of Protocol for Conducting Vegetation Monitoring for Compliance with the Installation-Wide Multispecies Habitat Management Plan Former Fort Ord*; Tetra Tech and EcoSystems West 2015). The BO was issued after the ESCA RP Team completed 2017 spring quantitative monitoring. However, the ESCA RP Team collected the appropriate data (e.g., HMP herbaceous frequency and percentage of bare ground) in 2017 and therefore, are still conducting surveys consistent with the required protocol methods.

Pre-disturbance (i.e., “baseline”) vegetation surveys were conducted to document species dominance and cover in shrub- and tree-dominated central maritime chaparral. In addition, baseline data are gathered on HMP herbaceous species distribution and density prior to munitions investigation activities. Post-remediation surveys are conducted in native shrub- and tree-dominated vegetation types in Years 3, 5, and 8. Post-remediation surveys for HMP annuals and herbaceous perennial species are completed in Years 1, 3, and 5.

Methods are also detailed below for post-rainfall CTS monitoring, monitoring of aquatic features, weed monitoring, and erosion monitoring. Monitoring related to restoration activities in the IAR MRA is described in Appendix A.

Plant nomenclature follows the *Jepson Manual: Vascular Plants of California*, Second Edition (Baldwin et al. 2012). In addition, pertinent volumes of the *Flora of North America* (Flora of North America Editorial Committee, eds. 1993+) are also utilized for plant identification. Plant community classifications and sensitive species information follow Holland (1986), Sawyer, Keeler-Wolfe, and Evens (2009), and the CNDDDB (CDFW 2017).

5.2.1 Methods for Vegetation Monitoring

Line-intercept vegetation transects are used to measure shrub and herbaceous vegetation cover in areas subject to munitions investigation activities in project work areas. Both baseline and post-activity transects are monitored in central maritime chaparral vegetation, along with a limited number of transects in central coastal scrub and oak woodland vegetation that consistently support central maritime chaparral species. Differences in stand age, species diversity, or other characteristics are documented to stratify transect placement into areas that are likely to have distinct species composition and distribution.

Vegetation transects are placed randomly on an MRA-by-MRA basis. A random number generator is used to A) select a grid (total number of grids in strata), B) select the quadrant of the grid for transect starting point (1-4), and C) select which compass direction in which to align the transect from the starting point (0-360 degrees). If a transect location is randomly selected and overlaps another transect, it is discarded and a new transect location is chosen. Transects are generally measured by using a 164-foot-long (50-m-long) tape, although a shorter transect length may be used if it is placed in a single isolated grid; diagonal placement in a grid enables monitoring of a transect that is 141 feet (43 m) long, as in the FEG MRA. Some shorter transects have also been placed in small-scale excavation areas in Range 44 in the IAR. GPS waypoints and the transect survey direction (e.g., north to south) are recorded so that the same transect can be revisited in subsequent years. Additionally, each year a photograph is taken from one end of each transect. Locations of 2017 transects are shown on Figures 6a, 6b, and 6c.

Aerial cover by shrub and tree species is recorded on data sheets for all plants that intercept the monitoring tape; all layers of shrub and tree species cover are recorded, so there may be two or more species recorded in the same location. Cover by herbaceous species in the absence of shrub or tree overstory is recorded by species; per the Tetra Tech and EcoSystems West revised protocol (Tetra Tech and EcoSystems West 2015).

Frequency data are represented here as the percentage of total transects containing at least one rooted individual of a given species.

Bare ground and/or thick layers of masticated vegetation are recorded in transect segments devoid of vegetation; prior to 2014, the “bare ground” category often included both bare ground and loose masticated vegetative material.

Table 1-1 presents all monitoring effort to date.

5.2.1.1 Future East Garrison MRA Vegetation Transect Monitoring

As previously described, a “step-out” approach was employed in the FEG MRA to minimize the areas that were initially cut and investigated. When it became necessary to do munitions investigation in a larger area, successive step-outs were performed on an as-needed basis in order to reduce vegetation cutting to only that required for munitions investigation activities.

Baseline Transects:

A total of 43 baseline transects were established by the Army in the FEG MRA prior to ESCA RP munitions investigation activities (HLA 1996, 1998). ESCA RP baseline transects are described below:

2010-2011 - Thirty-nine baseline transects were installed in central maritime chaparral.

2012 - Two baseline transects were installed in oak woodland at the edge of the former grenade range; this oak woodland vegetation supported many dominants of central maritime chaparral in the understory and likely represented a seral stage in mature chaparral development.

Baseline data from these 41 transects were gathered during the year of installation, and post-activity data were collected from transects, per the 2009 protocol schedule (Burlison 2009). If there were no previously established transects in an area in which monitoring was required, new transects were established. In 2013, there were no baseline transects in grids subject to activities in 2010, and 6 new transects were installed in these grids. These data were then compared to the 39 original baseline transects.

Munitions Investigation Activities Dates:**2010**

- West habitat parcel in the FEG MRA: vegetation cutting took place in four isolated grids and along the single roadway/maintained fuel break.
- East habitat parcel in the FEG MRA: vegetation cutting occurred in 23 scattered grids, along the single roadway/maintained fuel break, and along narrow strips scattered throughout the parcel.

2011

- West habitat parcel in the FEG MRA: vegetation cutting was confined to narrow strips scattered throughout the parcel.
- East habitat parcel in the FEG MRA: vegetation cutting occurred in most grids that had not been previously cut, except for the former grenade range/MRS-11, as well as a few grid clusters around the perimeter of the parcel.

2012

- West habitat parcel in the FEG MRA: vegetation cutting occurred in all remaining uncut area.
- East habitat parcel in the FEG MRA: vegetation cutting occurred in the former grenade range/MRA-11 and in clusters of grids around the perimeter of the parcel.

2013

- West habitat parcel in the FEG MRA: no vegetation cutting occurred.
- East habitat parcel in the FEG MRA: less than an acre (0.4 ha) of vegetation cutting occurred in portions of four grids along the southeast side of the Ammunition Supply Point (ASP) or Explosive Storage Location, which is located in the middle of the MRA.

2015

- East habitat parcel in the FEG MRA: Vegetation pruning was conducted in approximately ¼ acre (0.1 ha) of central maritime chaparral habitat south of the ASP in preparation for munitions investigation. Senior Biologist and certified arborist Mary Carroll assessed the vegetation on January 28, 2015 and gave vegetation crews authorization to cut some live plant material as follows: No removal of individual shrubs and restrict pruning to less than 25% of living branches by limbing-up plants in active work areas to improve access for munitions investigation teams.

Post-activity Transects (Shown in Figure 6a):

2013 - Six Year 3 post-activity transects were established in order to monitor vegetation establishment in areas subject to vegetation cutting in 2010; three transects were placed in the west habitat parcel and three in the east habitat parcel (ESCA RP Team 2014).

2014 - Seventeen Year 3 post-activity vegetation transects in central maritime chaparral were monitored in areas that had been subject to munitions investigation activities, including vegetation cutting, in 2011; all of these transects were located in the east habitat parcel. Monitoring events were conducted on 28-30 April and 5-6 May 2014 (ESCA RP Team 2015).

2015 - A total of 32 post-activity vegetation transects were monitored on 4-8 and 11-15 May 2015, including 26 Year 3 (24 in vegetation cutting and 2 in small-scale excavation areas) and six Year 5 post-activity vegetation transects in central maritime chaparral and oak woodland vegetation; these transects were located in areas that had been subject to munitions investigation activities in 2010 and 2012 (ESCA RP Team 2016).

2016 - A total of 23 post-activity vegetation transects were monitored on 4-8, 25, and 26 April and 3-5 May 2016 (ESCA RP Team 2017). All transects monitored were Year 5 post-activity transects in central maritime chaparral and oak woodland vegetation; these transects were located in areas that had been subject to vegetation cutting and munitions investigation activities in 2011.

2017 - Seventeen Year 5 transects in areas where vegetation was cut in 2012 and two Year 5 transects in the Grenade Range where small-scale excavation occurred in 2012 were monitored on 30 March, 11, 13, and 17-19 April and 2-4 May 2017.

All ESCA RP vegetation monitoring transects in the FEG MRA are shown in Figure 6a.

5.2.1.2 Parker Flats MRA Vegetation Transect Monitoring

Baseline Transects:

Prior to 2008, the Army conducted all biological monitoring (Jones & Stokes 1995a, b; CH2MHill 2005).

2008 - Eleven baseline vegetation transects were established by the ESCA RP Team in the Parker Flats MRA Phase II habitat parcels prior to vegetation cutting in 2009. One isolated transect was established in a small patch of central maritime chaparral surrounded by oak woodland habitat in the middle of the Phase II area. The remaining 10 transects were clustered in the larger contiguous patch of central maritime chaparral on the east end of the habitat reserve; the eastern three transects are dominated by shrubs typical of central coastal scrub (ESCA RP Team 2009).

Vegetation transect monitoring is not required in the Phase I habitat reserve.

Munitions Investigation Activities Dates:

1998 - Phase I: vegetation cutting took place in the MRS-37, MRS-54, and MRS-55 portions of the Parker Flats MRA Phase I habitat reserve completed by the Army.

1999 - Phase I: vegetation cutting took place in the MRS-03 portion of the Parker Flats MRA Phase I habitat reserve completed by the Army.

2000 - Phase I: vegetation cutting was completed in the MRS-52 and MRS-53 portions of the Parker Flats MRA Phase I habitat reserve completed by the Army.

2009 - Phase II: vegetation cutting was completed in the Parker Flats MRA Phase II habitat reserve by the ESCA RP Team. It commenced in the end of 2008 at the east end of the reserve and continued until March 2009 at the west end.

Post-activity Transects (Shown in Figure 6b):

2012 - Eleven Year 3 post-activity vegetation transects were monitored in the same location as baseline transects.

2014 - Eleven Year 5 post-activity vegetation transects were monitored in the same location as baseline transects.

Vegetation monitoring was conducted in the Phase II habitat parcels on 1 and 6-7 May 2014.

2015 – No post-activity vegetation transect monitoring was required in 2015.

2016 – No post-activity vegetation transect monitoring was required in 2016.

2017 – Eleven Year 8 post-activity vegetation transects were monitored in the same location as baseline transects. Vegetation monitoring was conducted in the Phase II habitat parcels on 14, 18-20, and 28 April and 2 and 4 May 2017. All ESCA RP vegetation monitoring transects in the PF MRA are shown in Figure 6b.

5.2.1.3 Interim Action Ranges MRA Vegetation Transect Monitoring

Baseline Transects:

1999-2000 – Baseline transects established by the Army in the Range 44, Range 45, and Range 47 in 2000, prior to the 2003 prescribed burn (HLA 2001, Parsons 2005).

2008 – Thirty transects established by the Army were monitored by the ESCA RP Team (ESCA RP Team 2009).

2010-2011 – Twenty-three baseline transects were designated by the Army in central maritime chaparral and selected as “proxy” baseline transects for upcoming munitions activities, excluding the Range 47 SCA large-scale excavation area. An additional nine new “proxy” baseline transects were designated by the ESCA RP Team near the proposed ESCA RP munitions investigation areas; three of these transects were located immediately west of Range 47 SCA to serve as proxy baseline transects for the large-scale excavation.

As of 2011, no further monitoring of Army transects outside of the IAR MRA NCAs and SCAs was indicated due to vegetation recovery reflecting an appropriate and sustainable trajectory associated with high quality habitat (ESCA RP 2012a).

Munitions Investigation Activities Dates:

2011 - Vegetation cutting and small-scale excavations were completed in linear scrapes in South Range 44. Limited ingress-egress routes were cut for access to work areas.

2011-2012 - Large-scale excavation was conducted in 14.4 acres (5.8 ha) in Range 47 SCA and completed in December 2012. A small amount of vegetation cutting was conducted around the edges of Range 47 SCA in 2012. Limited ingress-egress routes were cut for access to work areas.

2012-2013 - Vegetation cutting in North Range 44 SCA was conducted in 2012 and completed in early 2013; in addition, small-scale excavations in targeted areas and along scrapes were also conducted in 2012 and completed in early 2013.

Post-activity Transects (Shown in Figure 6c):

2012 - Sixteen Year 1 post-activity transects were established in the South Range 44 SCA/NCAs, a small portion of North Range 44, and areas outside the large-scale excavation in Range 47 SCA (ESCA RP Team 2013).

2013 - Thirteen Year 1 post-activity transects were established in North Range 44 SCA. Ten new transects were established in the Range 47 SCA large scale excavation. One of these 10 grids was placed in Subarea A, one was placed in the deer exclusion control area (deer present), and one was placed in the irrigation control area. The remaining seven were in Subarea B (ESCA RP Team 2014).

All 29 transects were monitored in 2013 (Years 1 and 2).

2014 – Twenty-nine transects were monitored on 8 and 13-14 May, 26 and 30 June, and 1-3 and 14-15 July 2014 (ESCA RP Team 2015).

2015 – Thirty-eight transects were monitored on 16 and 24 April and 18, 19, 20, 21, 26, 27, and 28 May 2015. These included 5 Year 3 transects in vegetation-cut areas in North Range 44; 7 Year 4 transects in vegetation-cut areas in South Range 44; and 3 Year 4 transects in vegetation-cut areas in Range 47 Subarea C. An additional 13 transects were monitored in areas subject to small-scale excavations in the IAR MRA; these data are presented in Appendix A. Ten transects were also monitored in the large-scale excavation area in the IAR MRA (ESCA RP Team 2016).

2016 – Twenty transects were monitored on 27, 28, and 29 April and 2 and 5 May 2016. These included seven Year 5 transects in vegetation-cut areas in South Range 44. An additional 13 Year 4 transects in areas subject to small-scale excavations -- eight in North Range 44 and five in South Range 44 (ESCA RP Team 2017).

2017 - Thirteen transects were monitored on 27, 28, and 29 April and 2 and 5 May 2017. These included seven Year 5 transects in vegetation-cut areas in South Range 44. An additional 13 Year 4 transects in areas subject to small-scale excavations -- eight in North Range 44 and five in South Range 44; these data are presented in Appendix A.

Locations of all ESCA RP transects in the IAR MRA are shown in Figure 6c.

5.2.2 Methods for Supplemental Herbaceous Vegetation Monitoring

Herbaceous quadrat monitoring is conducted as a component of the vegetation transect monitoring effort when shrub cover is relatively low and herbaceous species cover is proportionately high; methods follow Tetra Tech and EcoSystems West (2015). These supplementary 2.7 square-foot (0.25 m²) herbaceous quadrats are placed every 32.8 feet (10 m) on alternating sides of each transect, for a total of six per transect. Percent aerial cover for each plant species in the plot is recorded. If any HMP annuals occur within the quadrat, number of plants are counted and recorded. Comparative baseline data may not be available for quadrats.

Monitoring events for supplemental herbaceous vegetation occurs on the same dates and in the same transect locations, when sampled, as vegetation monitoring described in the prior section.

Supplementary herbaceous quadrats are also sampled in grassland vegetation in the IAR MRA. Three grassland “proxy” baseline quadrats were sampled in the IAR MRA grassland on 29 September 2011; these were placed near to proposed munitions investigation activity areas prior to work.

2012 – Six new herbaceous quadrats were monitored in the IAR MRA grassland area on 25 June 2012: three in areas subject to vegetation cutting and three in areas subject to small-scale excavation. These quadrats were not along a transect, but randomly placed within the activity areas, and returned to annually for monitoring.

2013 – The six grassland herbaceous quadrats were monitored on 22 May 2013.

2014 – The six grassland herbaceous quadrats were monitored on 30 June and 1 July 2014.

2015 – The six grassland herbaceous quadrats were monitored on 1 May 2015.

2016 – Twelve herbaceous quadrats were monitored on 5 and 27 April 2016. Six were monitored in FEG. Six grassland quadrats were monitored in the IAR grassland (ESCA RP Team 2017).

2017 – Six post-remediation herbaceous quadrats and five reference herbaceous quadrats were monitored in the IAR grassland on 27 April 2017. Grassland supplemental herbaceous quadrat data are presented in Appendix A.

5.2.3 Methods for HMP Herbaceous Species Monitoring

HMP herbaceous species are sensitive annual or herbaceous perennial species that are generally restricted to the Fort Ord region and are vulnerable to habitat degradation. HMP monitoring surveys document baseline and post-remediation locations and densities during the peak flowering period for each species. A minimum of twenty percent or thirty-eight (which ever number is larger) 100-foot x 100-foot grids per munitions investigation activity type are surveyed for all HMP herbaceous species during the peak flowering period (April through July, depending on the species). Colonies of HMP herbaceous species found within each grid are mapped with a hand-held GPS unit (Trimble GeoHX or Apple iPad with Bad Elf GPS/GLONASS receiver) to record their general distribution and range in the work area (Figures 7a, 7b, and 7c).

Numbers of HMP herbaceous species are either censused, or, in areas with high densities, sampled within circular plots (8.2 feet, or 2.5 m radius), following Burleson (2009). Often an HMP species may be concentrated in only a portion of a grid; these individuals or colonies are mapped with a hand-held GPS unit; those polygons are shown on Figures 7a, 7b, and 7c. On occasion, the plot shape is adjusted to fit the shape of the disturbance area so that the sampled area fits within the grid, the habitat type, the activity type, and the activity year; this was done in portions of Range 44 and along ingress/egress corridors.

In the FEG and Parker Flats MRAs, HMP herbaceous species are sampled in Years 1, 3, and 5 (Tetra Tech and EcoSystems West 2015) after munitions investigation activities. In accordance with the HRP for the IAR MRA, HMP herbaceous species in the IAR MRA are counted in each monitoring plot every year for seven years after habitat disturbance or until performance targets are met. All HMP herbaceous species monitoring performance targets were met in the IAR MRA in 2015 (ESCA RP Team 2016).

Reference colonies of each HMP herbaceous species were mapped and sampled if a given HMP herbaceous species was observed in undisturbed vegetation in or around each MRA during a given year; in many cases a reference location could not be found. Identified reference colonies are re-mapped and re-sampled each year, if present, according to the standard protocol described above.

Locations of all grids monitored for HMP annuals in 2017 in the FEG MRA are shown in Figure 6a.

Grids that support existing colonies of HMP herbaceous species in 2017 monitoring areas are shown in Figures 7a, 7b, and 7c. Table 1-1 summarizes all monitoring effort to date.

5.2.3.1 Future East Garrison MRA Herbaceous Species Monitoring

Baseline Locations for HMP Herbaceous Species Monitoring:

2010 Baseline Monitoring - Baseline monitoring was conducted in 2010 for all HMP herbaceous species in the FEG MRA. Three baseline sand (Monterey) gilia plots were sampled in the north and south ends of the east habitat parcel and two baseline Monterey spineflower plots were sampled in the middle of the east habitat parcel. Due to the dense vegetation at the time, the baseline surveys were limited to accessible areas (ESCA RP Team 2011a).

Munitions Investigation Activities Dates: see Section 5.2.1.1.

Post-activity HMP Herbaceous Species Monitoring (Shown in Figure 6a):

2012 HMP Herbaceous Species Monitoring – Surveys for all HMP herbaceous species in the east habitat parcel; Monterey spineflower and sand (Monterey) gilia sampling (ESCA RP Team 2013b).

2013 HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring for all HMP herbaceous species in portions of the east and west habitat parcels, including Monterey spineflower, sand (Monterey) gilia, and seaside bird's beak sampling (ESCA RP Team 2014).

2014 HMP Herbaceous Species Reference Plots – One seaside bird's beak reference colony, containing three new reference plots, was surveyed immediately to the southeast of the FEG MRA on 24 June 2014. No Monterey spineflower or sand (Monterey) gilia colonies were observed in 2014 (ESCA RP Team 2015).

2014 HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted on 21-25 and 29 April, 12 and 14 May, and 24 June 2014. Three plots were sampled for Monterey spineflower in the middle of the east habitat parcel. One plot was sampled for sand (Monterey) gilia in the north end of the east habitat parcel. Eight plots were sampled for seaside bird's beak just southeast of the FEG MRA (ESCA RP Team 2015).

2015 HMP Herbaceous Species Reference Plots – One seaside bird's beak reference colony, containing three reference plots, was surveyed immediately to the southeast of the FEG MRA on 22 April 2015. In 2015 ESCA RP biologists were not able to locate Monterey spineflower or sand (Monterey) gilia reference colonies in undisturbed parts of the FEG MRA or proximal to the MRA (ESCA RP Team 2016).

2015 HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted on 13, 17, and 22 April 2015. Two plots were sampled for Monterey spineflower in the middle of the east habitat parcel. Three plots were sampled for sand (Monterey) gilia in the north end of the east habitat parcel. Seven plots were sampled for seaside bird's beak in the southeast corner of the FEG MRA (ESCA RP Team 2016).

2016 HMP Herbaceous Species Reference Plots – One seaside bird's beak reference colony, containing three reference plots, was surveyed immediately to the southeast of the FEG MRA on 3 May 2016. In 2016 ESCA RP biologists were not able to locate Monterey spineflower or sand (Monterey) gilia reference colonies in undisturbed parts of the FEG MRA or proximal to the MRA.

2016 HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted on 28-31 March, 1 and 11-14 April, and 3 May 2016. Two plots were sampled for Monterey spineflower in the middle of the east habitat parcel. Seven plots were sampled for sand (Monterey) gilia in the north and south ends of the east habitat parcel. Nine plots were sampled for seaside bird's beak in the southeast corner of the FEG MRA. All areas surveyed in 2016 for HMP herbaceous species in the FEG MRA are shown in Figure 6a, with the exception of the former grenade range, which only includes limited area of central maritime chaparral and oak woodland habitat, although the entire grenade range was surveyed for HMP herbaceous species as a matter of due diligence.

All areas surveyed in 2016 for HMP herbaceous species in the FEG MRA are shown in Figure 6a, with the except of the grenade range, which only includes limited area of central maritime chaparral and oak woodland habitat, although the entire grenade range was surveyed for HMP herbaceous species as a matter of due diligence.

2017 HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted on 27 and 30 March, 10-14 April, and 3 May 2017. Two plots were sampled for Monterey spineflower in the middle of the east habitat parcel. Five plots were sampled for sand (Monterey) gilia in the north end of the east habitat parcel. Eleven plots were sampled for seaside bird's beak in the southeast corner of the FEG MRA. All areas surveyed in 2017 for HMP herbaceous species in the FEG MRA are shown in Figure 6a, with the exception of the former grenade range, which only includes limited area of central maritime chaparral and

oak woodland habitat, although the entire grenade range was surveyed for HMP herbaceous species as a matter of due diligence.

5.2.3.2 Parker Flats MRA Herbaceous Species Monitoring

Baseline Locations for HMP Herbaceous Species Monitoring:

2008 - Phase II Monitoring – Baseline surveys were conducted in the Parker Flats MRA Phase II habitat reserve on 15-23 May 2008 and 8 August 2008. One Monterey spineflower colony, containing three new baseline plots, was surveyed in the middle of the Phase II habitat reserve. An additional seven new baseline plots were sampled in Monterey spineflower colonies that were clustered in several locations in the east end of the habitat reserve close to Watkins Gate Road (ESCA RP Team 2009).

Baseline surveys were not conducted by the ESCA RP Team for herbaceous species in the Phase I habitat reserve, because no munitions investigation activities were conducted in these areas.

Munitions Investigation Activities Dates: see Section 5.2.1.2.

Post-activity HMP Herbaceous Species Monitoring (Shown in Figure 6b):

2011 Phase II HMP Herbaceous Species Monitoring – Ten Monterey spineflower Year 2 post-activity plots were sampled in the same location as baseline plots.

2012 Phase II HMP Herbaceous Species Monitoring – Ten Monterey spineflower Year 3 post-activity plots were sampled in the same location as baseline plots.

2013 Phase II HMP Herbaceous Species Monitoring – Six Monterey spineflower Year 4 plots were sampled in the east end of the habitat parcel.

2014 - Phase I HMP Herbaceous Species Reference Plots – One Monterey spineflower reference colony, containing three new reference plots, was surveyed just west of the Phase I habitat reserve on 3 July 2014.

2014 - Phase I HMP Herbaceous Species Monitoring – Surveys were conducted for all HMP herbaceous species in suitable habitat on 22 April, 13 May, and 4 and 10-12 June 2014; these areas were subject to activities conducted by the Army between 1998 and 2000. Seventy-one Monterey spineflower plots were sampled.

2014 - Phase II HMP Herbaceous Species Monitoring – Year 5 surveys were conducted for all HMP herbaceous species in suitable habitat on 13 May and 4 and 10-12 June 2014. Five Monterey spineflower plots were sampled.

2015 – No HMP herbaceous species monitoring was required in 2015.

2016 – No HMP herbaceous species monitoring was required in 2016.

2017 - Phase II HMP Herbaceous Species Monitoring – Year 8 surveys were conducted for all HMP herbaceous species in suitable habitat on 26 April and 1 May 2017. Three Monterey spineflower plots were sampled in the southeast corner of Phase II.

5.2.3.3 Interim Action Ranges MRA Herbaceous Species Monitoring

Baseline Locations for HMP Herbaceous Species Monitoring:

2010-2011 - Safety issues in the IAR MRA from 2010 until 2012 necessitated modifications to the 2009 HMP herbaceous species monitoring protocol. Sampling was conducted in nearby areas cleared by UXO support personnel outside of the SCAs and NCAs.

Baseline surveys were conducted for all HMP herbaceous species in the IAR MRA in the following locations, with the number of sampled grids (100-foot x 100-foot) reflecting presence of HMP herbaceous species:

- North Range 44 SCA, South Range 44 SCA/Central Area NCAs central maritime chaparral – Forty-one grids sampled for Monterey spineflower, 30 for sand (Monterey) gilia, and 24 for seaside bird's beak.
- South Range 44 SCA/Central Area NCAs grassland - One grid sampled for Monterey spineflower and one for sand (Monterey) gilia.
- Range 47 SCA Subarea A maritime chaparral – One grid sampled for Monterey spineflower, one for sand (Monterey) gilia, and one for seaside bird's beak.
- Range 47 SCA Subarea B maritime chaparral – Twenty-four grids sampled for Monterey spineflower, 24 for sand (Monterey) gilia, and five for seaside bird's beak.
- Range 47 SCA Subarea C maritime chaparral – Three grids sampled for Monterey spineflower, three for sand (Monterey) gilia, and 30 for seaside bird's beak.
- Ingress/Egress corridors maritime chaparral – All existing ingress and egress corridors sampled for Monterey spineflower, sand (Monterey) gilia, and seaside bird's beak.

2012 - Modified baseline HMP species 25 m² plots were sampled in 59 grids for Monterey spineflower, 20 grids for sand (Monterey) gilia, and four grids for seaside-bird's beak around the perimeter of the SCAs/NCAs in habitat with similar vegetation structure and diversity to that of off-limit areas. In addition to monitoring plots, HMP herbaceous species were counted within entire grids when feasible. Baseline data from plots were extrapolated to entire grids for comparison purposes. The HRP (ESCA RP Team 2013a) describes these baseline locations in more detail; the 2012 data are the reference set for required performance standards related to HMP herbaceous species in the HRP.

Munitions Investigation Activities Dates: see Section 5.2.1.3.

Post-activity HMP Herbaceous Species Monitoring (Shown in Figure 6c):

2012 Central Maritime Chaparral Reference Monitoring – Seven Monterey spineflower reference plots were sampled in the same locations as prior Army transects that also

contained HMP herbaceous species plots. These were scattered around the IAR MRA habitat parcel outside of the ESCA RP NCAs and SCAs.

Five sand (Monterey) gilia reference plots were sampled in the same locations as prior Army transects that also contained HMP herbaceous species plots. These were scattered around the IAR MRA habitat parcel outside of the ESCA RP NCAs and SCAs.

Five seaside bird's beak reference plots were sampled in the same locations as prior Army transects that also contained HMP herbaceous species plots. These were scattered on the eastern half of the IAR MRA habitat parcel outside of the ESCA RP NCAs and SCAs.

2012 HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted in South Range 44 and Range 47 Subarea C.

2013 Central Maritime Chaparral Reference Plots – One sand (Monterey) gilia reference location was sampled in northwest IAR MRA habitat reserve on 6 May 2013.

One Monterey spineflower reference location was sampled just east of North Range 44 on 11 June 2013.

One seaside bird's beak reference plot was sampled just east of South Range 44 on 16 May 2013.

Two coast wallflower reference plots were sampled just outside the North Range 44 SCA.

2013 HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted in North Range 44 and Range 47 Subareas A and B.

2013 HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted in South Range 44 and Range 47 Subarea C.

2014 Central Maritime Chaparral HMP Herbaceous Species Reference Plots - Two new sand (Monterey) gilia reference colonies were surveyed in northwest IAR MRA on 23 May 2014. One new sand (Monterey) gilia reference colony was surveyed just southeast and outside the IAR MRA on 23 May 2014.

Two Monterey spineflower reference colonies, containing with five new reference plots, were sampled just east of North Range 44 SCA on 26 June and 3 July 2014.

One seaside bird's beak reference colony, containing two new reference plots, was surveyed along Tanker Road on the east side of the IAR MRA on 24 June 2014.

2014 Grassland HMP Herbaceous Species Reference Plots - Three Monterey spineflower reference plots were sampled in an undisturbed part of the IAR MRA grassland on 31 July 2014.

2014 HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted in North Range 44 and Range 47 Subareas A and B on the following dates: 5, 9, 23, 25-26 June 2014. In the Range 47 Restoration Area, 51 plots were sampled for Monterey spineflower, 13 for sand (Monterey) gilia, 22 for seaside bird's beak, and four for coast wallflower. HMP herbaceous species were monitored in seeded and planted HMP plots, as well as in all grids per the 2009 protocol (Burleson 2009).

2014 HMP Herbaceous Species Monitoring - HMP herbaceous species monitoring was conducted in South Range 44 and Range 47 Subarea C on the following dates: 13 and 29-30 May, 2-5, 9-12, and 25-26 June, and 3 July 2014. Fifty-one plots were sampled for Monterey spineflower, 13 for sand (Monterey) gilia, and three for seaside bird's beak.

2014 HMP Herbaceous Species Monitoring - HMP herbaceous species monitoring was conducted on the following dates in the IAR MRA: 13 and 29-30 May, 2-5, 9-12, 23, and 25-26 June, and 3 July 2014.

2015 Central Maritime Chaparral Reference Plots - Two sand (Monterey) gilia reference colonies, each containing one plot, were surveyed in northwest IAR MRA on 28 April. One sand (Monterey) gilia reference colony containing one plot was surveyed just southeast and outside the IAR MRA on 15 April 2015.

Two Monterey spineflower reference colonies, each containing one reference plot, were sampled just east of North Range 44 SCA on 28 April 2015.

One seaside bird's beak reference colony, containing two reference plots, was surveyed along Tanker Road on the east side of the IAR MRA on 21 April 2015.

2015 Central Maritime Chaparral HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted in North Range 44 and Range 47 Subareas A and B on the following dates: 14-16, 20, 23, 24, 27, and 28 April 2015. Eighty plots were sampled for Monterey spineflower, 59 for sand (Monterey) gilia, 29 for seaside bird's beak, and three for coast wallflower.

Inside the Range 47 Restoration Area HMP herbaceous species were monitored in all grids per the 2009 protocol (Burleson 2009), which included all seeded and planted HMP polygons.

2015 Year 3 Central Maritime Chaparral HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted in South Range 44 and Range 47 Subarea C on the following dates: 21, 28, 29, and 30 April 2015. Seventy-six plots were sampled for Monterey spineflower, 34 for sand (Monterey) gilia, and two for seaside bird's beak.

2015 Ingress/Egress HMP Herbaceous Species Monitoring – There are two ingress/egress corridors that were sampled for HMP herbaceous species on 14 and 29 April 2015. Two plots were sampled for Monterey spineflower and one for sand (Monterey) gilia.

2015 Grassland HMP Herbaceous Species Monitoring – Four Monterey spineflower plots were sampled in the North Range 44 grassland on 30 April 2015.

Inside the Range 47 Restoration Area, HMP herbaceous species were monitored in seeded and planted HMP plots, as well as in all grids per the 2009 protocol (Burleson 2009); see Appendix A.

2016 – No HMP herbaceous species monitoring was conducted in 2016. Performance criteria were met in 2015; see Appendix A.

2017 – No HMP herbaceous species monitoring was conducted in 2017. Performance criteria were met in 2015; see Appendix A.

5.2.4 Methods for Documenting Species Diversity

Documentation of native species presence in each MRA provides an overview of existing species richness and the suite of species that recolonize work areas over time, along with the relative abundance of HMP species in the site as a whole. A comprehensive list of species for each MRA is compiled and updated each year (Tables 3-1, 3-2, and 3-3).

Additionally, all native plant species occurring along a vegetation transect or within a quadrat were recorded to provide total species richness per sample. All native plant species within one meter of a transect tape measure were also recorded in order to capture a more comprehensive summary of native species in specific munitions investigation areas. Plant species diversity tables for each location and activity type are presented in Tables 6-3 and 6-5. These diversity tables also include information on mean species richness per transect or quadrat, evenness, and summary cover data.

Mean species richness per transect or quadrat is calculated for each year and each activity type.

Diversity was determined using the Shannon-Wiener Index (H'), which is a function of the relative abundances of the species present, depending on both the number of species and their evenness (Pielou 1974). The following equation was used to calculate H' .

$$H' = - \sum p_i \ln p_i$$

Where:

H' = Shannon-Wiener Index

p_i = proportion of community that belongs to the i th species

Evenness (J') was calculated as the ratio of the observed H' to the maximum possible H' for a community with the same number of species (H'_{\max}) (Pielou 1974). The maximum possible

value for evenness (i.e., 1) is achieved when $H' = H'_{\max}$, which occurs when all species are present in equal abundance. The following equation was used to calculate J' .

$$J' = \frac{H'}{H'_{\max}} = \frac{H'}{\log s}$$

Where:

J' = evenness

H' = Shannon-Wiener Index

H'_{\max} = maximum possible H' for a community with s species

s = total number of species present

Discussion of species diversity is incorporated into vegetation monitoring summaries for each MRA (Section 6.1).

5.2.5 Methods for Post-Rainfall CTS Monitoring

CTS tend to emerge from burrows after large rain events. Inspections for CTS are conducted by biologists and field crews after one-half inch (1.2 cm) or more of rain is recorded on site within the previous 24-hour period. Inspections are focused within two kilometers of known, current, or historical CTS breeding pond (Figure 5). All CTS inspectors have received MRA-specific environmental awareness training.

Inspections take place prior to fieldwork commencement and involve careful examination surrounding and under materials, equipment, and vehicles that could be used during the post-rainfall day, often using a high-powered flashlight. If a CTS is observed by a crew member, the ESCA RP Senior Qualified Biologist (SQB) is consulted for approval prior to CTS relocation to a safe place by a USFWS-approved Qualified Biologist (QB), if necessary. A crew member stays with the animal until it is outside of the work area so that it is not injured or killed by a vehicle, predator, or other means.

5.2.6 Methods for Aquatic Feature Monitoring

During 2017, the three aquatic features in the FEG grenade range were monitored on a routine basis during the rainy season, including AF09-1A, which was subject to sifting during remediation activities that took place between October 2012 and January 2013. Water depth, turbidity, pH, presence of submergent and/or emergent vegetation, and presence of aquatic invertebrates and any sensitive species were documented, along with total rainfall for the prior seven days, since the previous monitoring event, and the rainfall season. Aquatic feature monitoring events are summarized in Appendix C. Appendix C also includes aquatic feature monitoring reports and photo documentation from 2017.

5.2.7 Methods for Weed Monitoring and Management

During 2017, weed monitoring was conducted throughout the year using visual surveys, with focused attention on pampas and/or jubata grass (*Cortaderia selloana*, *C. jubata*), French broom (*Genista monspessulana*), and iceplant pursuant to the HMP (USACE 1997).

Weed abatement is conducted where necessary, including in ESCA development parcels, to reduce the spread of these target weed species into and within habitat areas. In addition, any weedy species that are listed by the California Invasive Plant Council as highly invasive weeds are also monitored if present in sufficient numbers to threaten sensitive species or habitats (California Invasive Plant Council 2006). Weed monitoring and abatement events are summarized in Appendix D. Appendix D also includes weed monitoring reports and photo documentation from 2017.

5.2.8 Methods for Erosion Monitoring and BMPs

During 2017, erosion monitoring was conducted in MRAs before and after rain events of 0.5 to 1 inch (1 to 2.5 cm) or more within 24 hours, depending on the intensity of rainfall. When necessary, the ESCA RP Team installed erosion control BMPs, such as burlap sand bags, silt fencing, biodegradable weed-free straw wattles, biodegradable coconut fiber erosion control blankets, and water bars (Figures 9a and 9b). Erosion monitoring events are summarized in Appendix E. Appendix E also includes erosion monitoring reports and photo documentation from 2017.

6.0 BIOLOGICAL MONITORING RESULTS

Baseline biological monitoring data have been gathered in habitat parcels subject to munitions investigation activities in the FEG, Parker Flats, and IAR MRAs in order to meet the requirements of the 1997 HMP and BOs; biological monitoring methodology adhered to the Revisions of Protocol for Conducting Vegetation Monitoring for Compliance with the Installation-Wide Multispecies Habitat Management Plan, Former Fort Ord (Tetra Tech and EcoSystems West 2015); methods and general locations of munitions investigation types are summarized in Section 5.1.

A summary of habitat monitoring activities completed by the ESCA RP Team during 2017 is shown in Table 1-1 and includes vegetation transects and associated herbaceous quadrats in shrub-dominated vegetation types, herbaceous quadrats in grassland vegetation, and HMP herbaceous species monitoring. Species richness data are also collected and reported below. In addition, aquatic features are monitored during the rainy season, and results are reported in Appendix C.

Tables 6-1 through 6-8 present the results from biological monitoring activities in habitat parcels in the FEG and Parker Flats MRAs.

6.1 Vegetation Monitoring in MRAs

2017 vegetation monitoring of habitat parcels that were subject to previous vegetation cutting during ESCA RP Team munitions investigation activities is summarized by MRA in this section. Vegetation monitoring was conducted in the FEG MRA, Parker Flats MRA, and IAR MRA (Table 1-1); transect monitoring of areas subject to vegetation cutting as a component of munitions investigation activities was conducted in the FEG MRA and Parker Flats MRA.

2017 vegetation monitoring in the IAR MRA was confined to areas subject to small-scale excavation during munitions investigation activities, and these results are reported in Appendix A.

6.1.1 Vegetation Monitoring in Future East Garrison MRA

Native vegetation in the FEG MRA is comprised primarily of central maritime chaparral, with oak woodland vegetation in drainage bottoms and on some north-facing slopes. Munitions investigation activities took place in different locations in different years, as summarized in Section 5.2.1.1. As a result, it is possible to have more than one post-activity year represented in vegetation monitoring data in any given year.

During 2017, 17 transects were monitored in those areas subject to vegetation cutting and two transects were monitored in the Grenade Range in areas subject to small-scale excavation activities (Figure 6a). All transects are considered Year 5 post-activity vegetation transects, and are located in central maritime chaparral and oak woodland vegetation. Summary data are presented in Tables 6-1 to 6-3, as well as in Figures 10 to 13.

6.1.1.1 *Vegetation-Cut Areas in the Future East Garrison MRA in Central Maritime Chaparral*

Data from seventeen Year 5 transects in areas subject to vegetation cutting are compared with data obtained from 39 baseline transects in Table 6-1, along with comparisons to data from 24 Year 3 transects collected in 2015 and 23 Year 5 transects collected in 2016. The 2015 and 2016 transects were located in different grid locations in the FEG MRA. Section 5.2.1 summarizes transect monitoring methods and Figure 6a shows 2017 transect locations.

Mean baseline total shrub and subshrub cover in central maritime chaparral in the FEG MRA exceeded 100% in 2010 due to dense and overlapping shrub canopies. In 2017, total mean native cover in Year 5 transects was 77.4% and mean shrub cover averaged 74.5%.

In all transects, the stump-sprouting shrubs brittleleaf manzanita and chamise maintained dominance before and after vegetation cutting, as measured by mean cover, relative cover, and frequency data (Figure 10). Year 5 2017 cover of brittleleaf manzanita (22.7%) was 49.6% of the baseline cover (45.8%).

Twenty-three associated woody species were present in one or more of the 2017 transects, suggesting considerable shrub diversity in these areas. When the total native species within a

meter of transects are considered, 99 native plant species were observed in 2017, reflecting robust ecological health (Table 6-3).

Distribution and abundance of associated shrub species in the FEG MRA vary based on environmental characteristics and site history; the most common HMP shrub species prior to vegetation cutting were Toro manzanita and Monterey ceanothus (Tables 6-1 and 6-2). Mean absolute cover by obligate-seeding shrubs such as Toro manzanita declined after vegetation cutting, from 14.4% average cover in baseline transects to 2.8% in 2016 Year 5 post-activity data, and to 5.0% in 2017 Year 5 post-activity data. Monterey ceanothus, on the other hand, recovered to half of its relatively low pre-disturbance cover (1.5% cover) with 0.6% mean cover in 2016 and 0.7% in 2017 in Year 5 post-activity transects.

Several plants, including colonizing native subshrubs such as coyote bush (*Baccharis pilularis* subsp. *consanguinea*) and deerweed (*Acmispon glaber*) have higher cover in Year 5 transects than during baseline surveys, and both are tolerant of ground disturbance.

Herbaceous mean cover (vegetated ground) was 2% in 2011 baseline transects and 0.5% in 2017 Year 5 transects; 2016 Year 5 transects indicated 12.3% herbaceous cover, reflecting microsite variation depending on sampling location (Table 6.1). Herbaceous cover was not subdivided into native and non-native cover during baseline surveys but during post-activity surveys, these data have been collected. The 2017 Year 5 post-activity transects have higher non-native cover than the 2016 Year 5 post-activity transects. The 2017 transects with 10% or greater non-native cover are all located adjacent to access corridors or in areas previously mapped as low quality disturbed chaparral, such as the grenade range, which was subject to munitions investigation activities in late 2012 and early 2013. Most 2016 transects in the FEG were located in more intact native vegetation and have no to low weed cover.

Frequency data facilitate comparisons of species distributions in a given area, even for species with low cover; see Table 6-1. Two dominant stump-sprouting shrubs, brittleleaf manzanita and chamise, are widespread, exhibiting frequencies greater than 90% before and after vegetation cutting (Figure 11). Although the mean cover of two HMP shrubs, Toro manzanita and Monterey ceanothus, declined after vegetation cutting, frequency data indicate reestablishment of these germinating HMP shrub seedlings in more than three-quarters of the transects in which they were originally present. Toro manzanita was present in 64.1% of baseline transects and in 88.2% of 2017 Year 5 transects. Monterey ceanothus was present in 48.7% of baseline transects and 76.5% of 2017 Year 5 transects.

Openings between shrubs support a range of native herbaceous species, including California croton (*Croton californicus*), small-flowered cryptantha (*Cryptantha micromeres*), nude buckwheat (*Eriogonum nudum*), and the native bunchgrass Coast Range melic (*Melica imperfecta*). Approximately 7% of baseline mean cover was categorized as “bare ground,” which rose to 38.3% in Year 3 transects after vegetation cutting and gradually declined to 17.7 % in Year 5 transects as shrub cover increased.

Plant species richness increased after vegetation cutting in the FEG MRA (Table 6-3 and Figure 18). A total of 25 native plant species was recorded in 39 baseline transects in dense

chaparral vegetation in 2010-2011, 22 of which were shrub species, with an average of 5.7 native shrub species per transect.

In 2017, five years after vegetation cutting, a total of 22 shrub species were recorded in Year 5 transects, with a mean of 9.6 native shrub species per transect and 68 native species on all Year 5 transects combined (Table 6-3). The number of herbaceous species increased from one to 46 between baseline and 2017 Year 5 transect data.

When all species within a meter of 2017 Year 5 transects were compiled, 99 native species were observed in Year 5 transects, including 1 native tree species, 29 native shrub species, and 68 native herbaceous species, and 1 fern.

6.1.1.2 Areas Subject to Small-scale Excavation in the Future East Garrison MRA in Central Maritime Chaparral

Data from two Year 5 transects in areas subject to small-scale excavation are compared with data obtained from two baseline transects in Tables 6-2 and 6-3. Section 5.2.1 summarizes transect monitoring methods.

The area subject to small-scaled excavation in the FEG MRA supported scattered coast live oak trees with associated California blackberry and brittleleaf manzanita prior to munitions investigation activities. This area had been previously disturbed but is contiguous with intact dense oak woodland. Mean baseline cover by coast live oak tree cover was 37.2%, forming roughly half of native cover. Mean baseline total shrub and subshrub cover was 37.1% and an additional 5.4% cover was provided by native herbaceous species.

The small-scale excavation activities took place in the grenade range using a step-out approach. Soil excavation was required in some areas for munitions investigation activities. Just beyond the excavation perimeter, native vegetation was cut and trees were limbed up. Care was taken to leave existing clumps of coast live oak and manzanitas in place, where possible, and cutting them to the ground, if complete excavation of the rootball was not required.

In 2017, absolute native cover in post-activity Year 5 transects averaged 64.6%, with 20.9% cover by coast live oak and 8.4% by brittleleaf manzanita, with a total of 42.3% by native shrubs and subshrubs (Figures 12 and 13). Mean cover by coast live oak was more than half of pre-activity cover and is expected to become fully re-established over time. Cover by brittleleaf manzanita was about three-quarters of the pre-activity cover as a result of stump-sprouting unexcavated shrubs, but California blackberry exhibited lower Year 5 mean cover compared with pre-activity data. Many shrub species had similar or higher mean cover in Year 5 transects compared with baseline data, including California coffeeberry, deerweed, poison-oak, and chamise. Four shrub species were documented in Year 5 transects that were absent in baseline transects, including the HMP shrub Toro manzanita, which was found in both transects, as well as black sage, toyon, and rush-rose.

Mean cover by iceplant was zero in Year 5.

Plant species richness also increased after small-scale excavation munition activities in the FEG MRA (Table 6-3). A total of 14 native plant species was recorded in two baseline transects in open oak woodland vegetation in 2012, 11 of which were shrub species and one tree species also present. An average of 5.5 native shrub species were recorded per transect. In 2017, Year 5 data in the small-scale excavation area indicate a total of 17 shrub species were recorded in two Year 5 transects, with a mean of 12 native shrub species per transect, a total of 30 native species along the transect line, and 41 native species within one meter of all Year 5 transects combined. There was a total of 12 native herbaceous species observed on the transect line in 2017; this number increased to 22 within one meter of the transect line.

6.1.2 Vegetation Monitoring in Parker Flats MRA

During 2017, 11 transects were monitored in the Parker Flats MRA ESCA RP Phase II munitions response areas (Figure 6b). Baseline, Year 3, Year 5, and Year 8 post-activity data are summarized Tables 6-4 and 6-5; see Section 5.2.1 for details on monitoring methods. Eight transects are located in shrub-dominated habitats supporting species typical of central maritime chaparral vegetation and three transects are located in shrub-dominated habitats supporting species typical of central coastal scrub vegetation.

Central maritime chaparral:

Mean total native cover in central maritime chaparral in the Parker Flats MRA exceeded 100% in 2008 in baseline transects and increased to over 85% by Year 8, despite several years of drought during the intervening years. Mean native herbaceous species cover in these transects remains low in this area, ranging from 2.5% in baseline transects to 2.9% in Year 8 data.

As in other MRAs, chamise and a species of stump-sprouting manzanita (primarily shaggy-barked manzanita in Parker Flats MRA) predominate both before and after vegetation cutting, with combined mean cover of these two species alone equaling almost 75% in Years 3 and 5 post-activity transects (Figure 14). 2017 chamise mean cover (39.5%) slightly exceeds pre-disturbance cover levels in Year 8 (37.2%). Mean cover by shaggy-barked manzanita, which predominated prior to munitions excavation activities (57% baseline cover) dropped to 39.1% in Year 3 and averaged 33.9% in Year 8, or 60% of baseline cover.

Year 8 mean cover by individual non-dominant native shrubs was often low, less than 4%, and rarely exceeded values shown in baseline data. Both coyote bush and poison-oak increased in cover after vegetation cutting. Toro manzanita exhibited low mean cover (3.5%) in baseline transects and was absent after vegetation cutting. The colonizing subshrub deerweed was absent in baseline transects but was found in 75% of transects in Year 3 and 50% in Year 8 (Figure 15).

A total of 8 shrub species were documented in all baseline transects; shrub species increased to 12 in Year 8 transects. Except for the previously-mentioned Toro manzanita, all shrub species observed in baseline conditions were present in Year 8 transects. Shrubs such as pitcher sage (*Lepechinia calycina*), snowberry (*Symphoricarpos mollis*), sticky

monkeyflower (*Mimulus aurantiacus*), and golden yarrow (*Eriophyllum confertiflorum*) were absent in baseline transects but present in Year 8 transects (Table 6-6).

Approximately 16.4% of mean bare ground was documented in 2017, a decline from 22.5 % bare ground in 2014; baseline bare ground was 4.2%. There was insufficient herbaceous cover for quadrat sampling in 2017. Non-native target weed cover by iceplant was zero in Year 8 central maritime chaparral vegetation.

Species richness increased after vegetation cutting in central maritime chaparral vegetation in the Parker Flats MRA, with the mean number of species per transect rising from 11 in baseline transects to 17 in Year 3 transects and 40 in Year 8 transects (Table 6-6). Shrub species increased from 8 in baseline transects to 12 in Year 8, and herbaceous species increased from 2 in baseline and Years 3 and 5 but jumped to 27 in Year 8, perhaps reflecting higher than normal recent rainfall. As in previous years, total species increased when data included species within one meter of the transect centerline.

Central coastal scrub:

Total mean cover in central coastal scrub baseline transects in 2008 was 78.3%, comprised almost entirely of shrubs and subshrubs, with herbaceous cover less than 1% between shrubs. Total mean cover rose to 81.8% in Year 8 transects, higher than in baseline data (Table 6-5, Figure 16). Herbaceous species comprised 27.4% native cover in Year 3 and 29.5% in Year 5, and dropped to 9.6% in Year 8.

Cover by the most dominant shrub in central coastal scrub transects, black sage, decreased from a baseline mean cover of 33% to 3.4% in Year 3, rising to 4.3% in Year 5 and 12.4% in Year 8 after vegetation cutting. In contrast, the subshrub bush monkeyflower had higher cover for all post-activity years, with 11.8% cover in Year 8. Coyote bush showed little change between baseline and post-remediation cover values. Deerweed is absent in baseline data but has a mean cover of 9.6% in Year 8 transects. Dominant species in central coastal scrub vegetation exhibit similar frequencies both before and after vegetation cutting (Figure 17).

Openings between shrubs support a range of native herbaceous species, including purple needlegrass (*Stipa pulchra*), Coast Range melic (*Melica imperfecta*), California everlasting (*Pseudognaphalium californicum*), bedstraw (*Galium porrigens*), and needle-leaved navarretia (*Navarretia intertexta*). Bare ground consisted of 30.8% cover in baseline transects and dropped from 26.9% in Year 5 to 16.4% in Year 8. Non-native target weed cover by iceplant was zero in Year 8 central coastal scrub vegetation.

Native plant species richness increased in central coastal scrub vegetation in the Parker Flats MRA after vegetation cutting. A total of 11 native plant species was recorded in three baseline transects and six herbaceous quadrats in central coastal scrub vegetation in 2008, eight of which were shrub species (Table 6-6). A total of 14 native species were recorded in Year 3 transects, including 10 shrub species, one tree species, and three herbaceous species. In Year 5 transects, 21 native species were documented along transects and in quadrats, with an additional 33 native species within one meter of the transect line. Total native species

increased again in Year 8 transects to 35 species, including 25 native species along the transect and 66 species within one meter of the transect line.

6.1.3 Vegetation Monitoring Summary for Central Maritime Chaparral Transects

Vegetation Cover and Frequency in Central Maritime Chaparral Transects:

Combined mean baseline cover of a species of stump-sprouting manzanita and chamise equaled approximately 73% in the FEG MRA and 94% in the Parker Flats MRA. In the Parker Flats MRA, no obligate-seeding shrub species had mean cover values that exceeded 10% in baseline transects, in contrast to the FEG MRA, where Toro manzanita was a frequent associate (14.4%) along with co-dominants chamise and shaggy-barked manzanita and a scattering of other shrub species.

Vegetation cutting leaves the root systems of many stump-sprouting shrubs intact, and dormant shoots emerge quickly after being cut. By Year 8, shaggy-barked manzanita and chamise reached 73% mean cover in post-activity transects in the Parker Flats MRA. The dense foliage, root mass, and canopy cover result in decreased space and light for establishment of other shrubs; no other shrub species had greater than 3.5% cover in Year 8 transects in the Parker Flats MRA.

In the FEG MRA, combined mean cover of brittle-leaf manzanita and chamise was 47% in Year 8 transects, but total shrub cover was 74.5%. Regardless of location, stump-sprouting shrubs show a trajectory of steady increase over time after the initial drop due to vegetation cutting (Figures 10 and 14).

Obligate-seeding HMP shrubs such as Toro manzanita and Monterey ceanothus recolonize sites subject to vegetation cutting from seed, so post-activity cover by these shrubs is initially extremely low and gradually increases over time, especially with adequate rainfall. Frequency data represent a snapshot of shrub seedling recruitment. The HMP shrub Toro manzanita occurred in 88% of Year 5 transects in the FEG MRA (138% of the baseline frequency), indicating widespread reestablishment within just five years, with a mean of 5% cover in Year 5 transects.

In the Parker Flats MRA, shaggy-barked manzanita was the most common associated shrub species in baseline transects (56.7% mean cover and observed in 100% of the baseline transects); it continued to be present in all post-activity transects in Years 3, 5, and 8.

Overall Year 5 mean native cover was 77.4% in the FEG MRA and Year 8 mean native cover was 88.6% in the Parker Flats MRA.

Frequency data provide an effective means of assessing shrub seedling recruitment (Table 6-1 and 6-4, Figures 11 and 15). 2017 mean cover by HMP shrubs in the FEG MRA is currently below 6% (Table 6-1), but Year 5 post-activity frequency show recolonization of these obligate-seeding shrubs. Frequency of Toro manzanita recruits in Year 5 (88.2%) is above baseline frequency (64.1%), and Monterey ceanothus has 76.5% frequency in Year 5, also

exceeding baseline frequency (48.7%). In the Parker Flats MRA both mean cover and frequency of Toro manzanita has remained at zero since vegetation cutting in 2009; the lack of re-establishment of Toro manzanita in MRAs led to the Toro manzanita retention program initiated in the FEG MRA prior to munitions excavation activities in vegetation supporting Toro manzanita.

Figure 19 compares mean baseline frequencies of HMP shrubs with post-activity mean frequencies in both the FEG MRA and Parker Flats MRA, illustrating successful recruitment and post-activity establishment trends by some HMP shrubs.

Species Richness and Diversity:

In the FEG MRA, central maritime chaparral vegetation tends to be a mix of stump-sprouting shrubs with low to moderate cover by obligate seeding shrubs and herbaceous species. In contrast, shrub cover in the Parker Flats MRA is strongly dominated by two stump-sprouting shrubs, with other obligate seeding shrubs and herbaceous species widespread but with low cover, usually less than 5%. At both sites, the mean number of shrub and herbaceous species increased after vegetation cutting, a likely reflection of increased light and available space for seedling recruitment after removal of the dense chaparral canopy.

In the FEG MRA, a total of 99 native species were observed in the one-meter perimeter area surrounding the tape measure in the Year 5 transects, all considerably above the 25 species recorded in baseline conditions. Numerous native species appeared in post-activity transects in the FEG MRA that had not been previously documented during baseline surveys and included shrubs, herbaceous perennials and annuals, as well as ferns (Table 6-3). In the Parker Flats MRA, a total of 66 native species were observed in the one-meter perimeter area surrounding the tape in the Year 8 transects, much higher than the 11 native species recorded during baseline sampling.

The Shannon index reflects species composition and relative abundance of each species based on transect cover values in central maritime chaparral; a higher Shannon index value reflects not just species diversity but the proportion that each species contributes to the entire sample. In the 2017 sampling effort, the Shannon index for the FEG MRA was 1.4, higher than the baseline value of 1.1. In the Parker Flats MRA, the Shannon index values for 2017 remained steady at 0.9 in the chaparral area, similar to the baseline; this number increased to 2.0 in the Parker Flats MRA for 2017 central coastal scrub area .

The FEG MRA has the highest species richness of any of the ESCA MRAs (Table 6-3).

Figure 18 presents positive post-activity native plant re-establishment and richness trajectories in the FEG and Parker Flats MRAs in 2017.

6.2 HMP Species Monitoring in MRAs

HMP species monitoring in 2017 was conducted in the FEG MRA and Parker Flats MRA and focused primarily on three annuals -- Monterey spineflower, sand (Monterey) gilia, and

seaside bird's beak (Figures 7a, 7b, 7c, and 8). No HMP herbaceous species monitoring was conducted in 2017 in the IAR MRA since performance criteria for HMP species were met in 2015; see Appendix A.

Vegetation cutting and munitions investigation activities were conducted from 2010 to 2013. All portions of the FEG MRA subject to vegetation cutting were surveyed for HMP herbaceous species in 2017 (Figure 6a). Only one area in the FEG MRA, the former grenade range, was subject to small-scale excavation and no HMP herbaceous species had ever been recorded from that area. This area was surveyed in 2017 for HMP herbaceous species.

6.2.1 HMP Species Monitoring in Future East Garrison MRA

2017 HMP herbaceous species monitoring focused on Monterey spineflower, sand (Monterey) gilia, and seaside bird's beak. Density data for those HMP species are presented in Figures 7a, 7b, and 7c. Tables 6-7 to 6-9 present HMP herbaceous species monitoring data, providing mean densities, population estimates, and associated statistics. Figures 20 and 21 present comparative HMP herbaceous species summary data by post-activity monitoring year and species.

Munitions investigation activities took place in different locations in different years in the FEG MRA, as summarized in Section 5.2.1.1. As a result, it is possible to have more than one post-activity year represented in HMP herbaceous species monitoring data in any given year. A total of 956 grids within the FEG MRA were surveyed in areas subject to vegetation cutting between 2010 and 2013 (Section 5.2.3.1), see Figures 6a and 7a, 7b, and 7c.

Monterey spineflower: In general, Monterey spineflower is found in lower densities in the sandstone-derived substrate in the FEG MRA compared with the relatively high densities of Monterey spineflower that occupy Aeolian sandy substrates at lower elevations to the west and southwest, such as in the IAR and Parker Flats MRAs. Monterey spineflower was not found in the FEG MRA in the flora and fauna base-wide 1992 surveys (USACE 1992).

The entire FEG MRA was surveyed for HMP species in 2010 prior to munitions investigation activities, and Monterey spineflower was found only in one general concentrated area (Figure 7a). In 2010, two grids supported Monterey spineflower, one with 12 plants and one with 224 plants; these grids became one of two baseline sites. The estimated average number of Monterey spineflower in 2010 baseline grids was 118. This area was subject to vegetation cutting in 2011. A second Monterey spineflower baseline site consisting of two grids were established in 2012, a drier year than the wet year of 2010, with a total of 110 Monterey spineflower individuals and a mean density of 55 individuals/plot.

In 2017, total Monterey spineflower numbers increased between Year 5 and Year 6, from 220 individuals in the FEG MRA in Year 5 to 310 in Year 6. Monterey spineflower mean density was 20 individuals/plot in Year 6. Mean 2017 Monterey spineflower density per occupied grid in the FEG MRA was 155, which is higher than the number reported in baseline grid data (Table 6-7; Figure 7a). In 2017 there were 310 Monterey spineflower individuals in two grids in the FEG MRA, one grid with 27 individuals and one with 283 individuals. Although

the mean density of Monterey spineflower was lower in 2017 than in 2016, the total number of plants was higher because Monterey spineflower was more spread out throughout the grid and the grid-wide census captured that information.

Other than the cluster of Monterey spineflower in the FEG MRA east of Barloy Road shown in Figure 7a, no other Monterey spineflower colonies have been observed in the FEG MRA, despite extensive searches each year, including a survey of 956 grids in 2017 for potential sightings. No undisturbed Monterey spineflower reference plots were available for comparison.

Monterey spineflower was present in two baseline grids and two Year 5 grids achieving the Year 5 performance target of greater than 90% frequency compared with baseline frequency, bare ground aerial cover was higher in Year 5 than in the baseline as well (TetraTech and EcoSystems West 2015). Monterey spineflower data suggest that this HMP annual will persist in the FEG MRA over time.

Sand (Monterey) gilia: Sand (Monterey) gilia occurs in low densities in loose sandy soils with low silt content in several locations at the former Fort Ord. It was mapped in 1992 in low densities in a central swath across the former military base, with higher densities in the northwest (USACE 1992). A small area was mapped near the northeastern perimeter of the FEG MRA, and it is in this general area that low numbers of sand (Monterey) gilia continue to be observed.

In 2010, three grids supported 330 sand (Monterey) gilia in two locations. One location (in the northeast portion of the MRA; Figure 7b) encompassed two grids and included 329 sand (Monterey) gilia; this location became one of two baseline sites. The other 2010 location was in the center of the southern perimeter of the eastern habitat parcel, where only one sand (Monterey) gilia was observed in baseline surveys and small numbers were observed in some subsequent years. This entire area was subject to vegetation cutting in 2011. In 2012, the northeastern location was again sampled as a baseline since 2012 was a drier year than 2010. The 2012 baseline total was 15 sand (Monterey) gilia individuals, with 3 individuals/plot in one grid and 12 individuals/plot in the second, resulting in a mean density of 7.5 individuals/plot (Table 6-8).

The number of sand (Monterey) gilia individuals in the FEG MRA was 16 plants in 2013 in three grids, 30 individuals in one grid in 2014, 13 individuals in 3 grids in 2015, 128 individuals in 7 grids in 2016, and 54 in 5 grids in 2017 (Year 6; Tables 6-7 and Figure 7b). Mean sand (Monterey) gilia density was 5.0 individuals/plot in 2017, which is lower than the 2010 and 2012 baseline, higher than density documented in some other post-activity years, but lower than 2016 data, despite precipitation ranging between 18 inches and 22 inches for each of the last two water years (2015/2016 and 2016/2017).

Sand (Monterey) gilia distribution in the FEG MRA dropped from seven grids in 2016 to five in 2017 and was absent from one of the baseline grids in 2017 at the southeastern end of the MRA; occupation of five grids in 2017 is greater than any previous post-activity year except 2016. In 2017 there was one sand (Monterey) gilia individual/plot in two grids, and there

were 4 individuals/plot in one grid, 8 individuals/plot in one grid, and 40 individuals/plot in one grid, for a mean of 11 individuals per grid.

No undisturbed sand (Monterey) gilia reference plots were available for comparison in 2017.

Sand (Monterey) gilia was present in two or three baseline grids (2012 and 2010) and in five Year 5 grids achieving the Year 5 performance target of exhibiting greater than 90% frequency compared with baseline frequency. Bare ground aerial cover was higher in Year 5 than in the baseline as well (TetraTech and EcoSystems West 2015). Sand gilia data suggest that this HMP annual will persist in the FEG MRA over time.

Seaside bird's beak: In 1992, base-wide mapping indicated low density of seaside bird's beak in a central swath through mostly the northern half of the former Fort Ord, with a small area of low-density bird's beak in the eastern FEG MRA (USACE 1992).

Prior to 2013, seaside bird's beak had not been recorded inside the FEG MRA by ESCA RP biologists, although it had been previously documented in the southeast part of the MRA in 1992 (Figure 7c). In 2013, 187 seaside bird's beak plants were located in one grid cell located just south of the previously mapped 1992 seaside bird's beak distribution in a Year 3 post-activity vegetation-cut area. This number grew to 375 seaside bird's beak individuals in six grids in 2014, located in the same general location as the seaside bird's beak colony that was first recorded in 2013, double the 2013 number of 187 (Tables 6-8). In 2015, a total of 422 seaside bird's beak individuals were recorded in six grids in the FEG MRA; in 2016, 745 seaside bird's beak individuals were counted in the FEG MRA in nine grids; and in 2017, 1,230 seaside bird's beak individuals were counted in the FEG MRA in nine grids.

In 2017, a total of 456 seaside bird's beak individuals were counted in two Year 5 grids and 774 individuals in seven Year 6 grids, with mean densities of 30 individuals/plot for Year 5 and 18.1 plants/plot for Year 6 (Table 6-9, Figure 7c).

Seaside bird's beak distribution has expanded most years for the past five years, from one grid in 2013, to six grids in 2014 and in 2015, and nine grids in 2016 and 2017. Total individuals per grid in 2017 range from 13 to 415. In 2017 there were the following grid totals in two Year 5 grids: 41 and 415 individuals/grid; in seven Year 6 grids there were the following totals: 13, 17, 19, 40, 92, 232, and 361 individuals/grid.

Three seaside bird's beak reference plots were surveyed in 2017 in undisturbed habitat and supported a total of 80 seaside bird's beak individuals, with a mean density of 9.3 individuals per plot and an estimated 27 individuals per grid in suitable habitat.

Seaside bird's beak was absent during baseline surveys (2012 and 2010) and present in nine Year 5 grids, achieving the Year 5 performance target of exhibiting greater than 90% frequency compared with baseline frequency. Bare ground aerial cover was higher in Year 5 than in the baseline as well (TetraTech and EcoSystems West 2015). Seaside bird's beak data suggest that this HMP annual will persist in the FEG MRA over time.

6.2.2 HMP Herbaceous Species Monitoring in Parker Flats MRA

One HMP annual species, Monterey spineflower, has been observed in the Parker Flats MRA Phase II area subject to munitions investigation activities by the ESCA RP Team between 2008 and 2017. After a 2005 prescribed burn in the Phase I area, both sand (Monterey) gilia and coast wallflower were observed in the south end of the Phase I area by biologists from California State University and the Bureau of Land Management (Pierce et al. 2010).

Surveys for all HMP herbaceous species were conducted in the Phase II areas in 2017, covering a total of 336 grids (Table 6-10, Figure 8). Only Monterey spineflower was observed in Phase II areas in 2017.

Monterey spineflower: Monterey spineflower has a wide distribution at the former Fort Ord, and was mapped in 1992 as having low to medium densities over large portions of the Parker Flats MRA.

During 2008 baseline surveys for Monterey spineflower in the Phase II portion of the Parker Flats MRA, an estimated total of 1,369 plants were counted in eight grids, at a mean density of 111.3 plants per plot. This area was subject to vegetation cutting in 2009.

In 2017, an estimated total of 2,676 Monterey spineflower individuals were found in three grids in Phase II areas after vegetation cutting (Table 6-10; Figure 8). A total of 383 Monterey spineflower individuals were reported in 2013 (Year 4 post-activity), and 4,562 Monterey spineflower were reported in 2014 (Year 5). The mean density of Monterey spineflower in plots was 36.8 in 2013 (Year 4), 54.2 in Year 5 (2014), and 55.0 in Year 8 (2017). These numbers show a stable Monterey spineflower population in the Parker Flats MRA, although mean density/plot in all years is lower than baseline data.

Monterey spineflower was present in eight baseline grids, five Year 5 grids, and three Year 8 grids. During this same time interval, the total number of Monterey spineflower individuals in the monitoring area increased from 1,369 during baseline sampling to 4,562 in Year 5 and 2,676 in Year 8. These data suggest a stable and sustainable Monterey spineflower colony in this area, especially in the two grids that host the most individuals, despite not achieving the 90% frequency target compared with baseline frequency (a target that is harder to reach when there are fewer than 10 grids supporting an HMP species). Bare ground aerial cover was higher in Year 5 and in Year 8 than in the baseline as well (TetraTech and EcoSystems West 2015). Monterey spineflower data suggest that this HMP annual will persist in the Parker Flats MRA over time.

6.2.3 HMP Herbaceous Species Monitoring Summary

HMP herbaceous species presence in the FEG and Parker Flats MRAs suggest stable HMP annual populations and recovery after munitions investigation activities. In the FEG MRA, the numbers of both Monterey spineflower and seaside bird's beak per grid equal or exceed the 2012 baseline and post-activity data from previous monitoring years (Figures 20 and 21). In the Parker Flats MRA, the total number of Monterey spineflower in the MRA and the

number of Monterey spineflower individuals per grid exceed the baseline. Two grids support the highest concentrations of Monterey spineflower, and colonies of spineflower in these grids persist through the years, whereas presence is variable in grids where only a few individuals are observed in some years. Although the total density per plot in Years 5 and 8 is lower than the baseline, field observations indicate that Monterey spineflower has a widespread distribution throughout occupied grids compared with earlier years, which can result in increased total numbers but a lower density/plot; these data are captured by conducting both plot sampling and a complete grid census for each HMP annual species.

In small portions of the FEG MRA that had been cut in 2011, there were 310 Monterey spineflower and 54 sand (Monterey) gilia, and in areas cut in 2011 and 2012 there were 1,230 seaside bird's beak individuals in 2017; the total number of individuals for Monterey spineflower and seaside bird's-beak were the highest ever recorded, including during baseline surveys. HMP herbaceous species in the FEG MRA occupy limited areas with shallow sandy soils underlain by sandstone, where they often persist in fluctuating numbers year after year. These small colonies of HMP herbaceous species in the FEG MRA have exhibited resilience after vegetation cutting and are expected to increase in numbers or stabilize with sufficient rainfall, as long as suitable openings in the chaparral exist.

In the Parker Flats MRA, the total number of individuals of Monterey spineflower exceed the number recorded in baseline surveys 8 years after munitions investigation activities, suggesting a stable population that will continue to occupy this MRA over time.

6.3 Aquatic Feature Monitoring in the Future East Garrison MRA

During 2017, monitoring of aquatic features was conducted in the FEG MRA former grenade range and encompassed the following: general site reconnaissance, botanical surveys, photo documentation, California Tiger Salamander surveys, California linderiella surveys, post-munitions investigation activities work monitoring, and restoration assessment. Monitoring summaries for the FEG MRA aquatic features are provided in Appendix C.

All three of the aquatic features in the grenade range contained water at the beginning of 2017 after seasonal rains in late 2016 and early 2017. Aquatic features held water at close to 'full' levels during the relatively wet winter and spring. As the rainy season ended and the weather warmed up, these ephemerally wet features began to slowly dry out. The smallest aquatic feature dried out by April 2017, and the two larger aquatic features were dry by May/June 2017. From January through May 2017 both submergent and emergent vegetation were noted in AF09-1A and AF09-2 (Appendix C: Table C-1).

Dip netting for CTS occurred in the grenade range aquatic feature in 2017 but no CTS were observed, nor have they ever been observed in the FEG MRA former grenade range; protocol CTS surveys were conducted in 2010-2011 in the former grenade range and elsewhere in the FEG MRA (ESCA RP Team 2011a and 2012a).

Table C-2 in Appendix C compares 2017 monitoring data in the former grenade range with pre-disturbance data collected in 2010 and 2011; only AF09-1A was subject to munitions

investigation activities, which were completed in January 2013, but data from the other two pools in near proximity are included in Table C-2 as controls. The footprint of AF09-1A covers the same area prior and subsequent to munitions investigation activities. In general, site hydrology and wetland vegetation have been successfully restored in AF09-1A during the past three years. It should be noted that there were pronounced differences in annual rainfall between the water years (22.2 inches [56.4 cm] in 2009/2010, 20 inches [50.8 cm] in 2010/2011, 8.8 inches in 2013/2014 [22.4 cm], 18.2 inches [46.2 cm] in 2015/2016, and 21.76 inches [55.27 cm] in 2016/2017).

In 2017 water depth increased in January, March, and April compared with pre-remediation depths, except for the smallest aquatic feature AF09-1B in April 2017, which had a shallower depth than in 2010. Turbidity data, where available, suggest that conditions were generally more turbid in 2017 compared with earlier years, except for April 2010, which had the same level of turbidity before and after remediation.

A range of aquatic invertebrates were observed when the pool was full in 2017 (see Appendix C: Table C-1), although no California linderiella has been observed since restoration activities were complete in January 2013. California linderiella were observed in AF09-1B in 2010 but were absent in 2017 surveys of this “control” aquatic feature.

7.0 HABITAT RESTORATION IMPLEMENTATION AND MONITORING IN THE INTERIM ACTION RANGES MRA

Habitat restoration implementation and monitoring activities for 2017 are summarized in Appendix A and are based on an HRP prepared by the ESCA RP Team as an addendum to the Phase II Interim Action Work Plan for the IAR MRA (ESCA RP Team 2013a). The HRP details the methods for restoration implementation, maintenance, and monitoring of central maritime chaparral and associated plant populations in habitat parcels that were affected by munitions investigation activities in the IAR MRA. Four main activity types were associated with vegetation disturbance in these areas, each with associated remediation, monitoring, and restoration requirements: ingress/egress corridors, vegetation cutting, small-scale excavation, and large-scale excavation. These activity types are associated with the following restoration strategies: monitoring only, passive restoration, and passive and active restoration.

After soil replacement in Range 47 SCA in December 2012, site preparation activities commenced, including installation of erosion control BMPs, animal deterrent fencing around the perimeter of the site, and an irrigation system and associated infrastructure. Over 30,000 container plants representing 16 species were planted in January and early February 2013. In addition, seeding of targeted areas in the IAR MRA was also conducted to boost native species cover and re-establish HMP herbaceous species in suitable locations.

Quantitative success criteria for plant survival, species richness, and percentage cover targeted for the first seven years following site restoration are included in the HRP and results of monitoring for these criteria for Year 5 are reported in Appendix A. Restoration

monitoring will continue in 2018 in North Range 44 and South Range 44 in vegetation subject to small-scale excavation.

8.0 MANAGEMENT AND MITIGATION ACTIVITIES SUMMARY

This section summarizes the habitat management and mitigation activities required by the HMP and the BO and performed by the ESCA RP Team through 2017.

8.1 Vegetation and HMP Species Protection Measures

The ESCA RP biologists worked closely with ESCA RP Team UXO personnel to successfully design the following species-specific and MRA-specific measures to reduce impacts to native vegetation and HMP species during field activities. A brief summary of these efforts over the past two years is provided below.

Future East Garrison MRA: In order to preserve mature seed-producing individuals of HMP manzanitas in the FEG MRA, Toro manzanita shrubs were preserved and limbed up and all Hooker's manzanita were preserved during vegetation cutting and associated target-specific investigations, where possible, between 2011 and 2012. High survival of Toro and Hooker's manzanitas was documented in 2012, 2013, and 2014 monitoring. Of the 548 Toro manzanitas recorded in sampled grid cells in 2012 only six plants had died after three years, a survival rate of 98.9%.

In addition, a "step-out" approach was employed to minimize the areas that were initially cut and investigated. When it became necessary to do munitions investigation in a larger area, successive grid step-outs were performed on an as-needed basis in order to reduce vegetation cutting to only that required for munitions investigation activities.

Parker Flats MRA: In order to preserve almost all coast live oak trees in the Parker Flats MRA Level 2 Residential Quality Assurance areas, oak tree retention was coordinated by the ESCA RP arborist and field biologists in approximately 10.3 acres (4.2 ha) of coast live oak woodland in 2013. Special measures were taken to preserve coast live oak trees greater than six inches (15.2 cm) dbh. Prior to munitions investigation activities, the ESCA RP arborist and field biology team measured the dbh, number of trunks per tree, and tree health of all trees in the work area. Approximately 885 coast live oak trees were evaluated; most oak trees were in good health and approximately ten trees were dead, diseased, or seriously damaged (bark removed and cambium damaged). Healthy trees greater than six inches dbh (15.2 cm) were left standing. Low-hanging limbs that presented a safety hazard for the munitions investigation team were removed if there was no overall threat to tree health. Coast live oak trees were qualitatively monitored in 2016, and oak tree health was excellent overall. Native understory has also regrown vigorously in this area.

Interim Action Ranges MRA: Munitions investigation activities in intact central maritime chaparral vegetation were minimized to the maximum extent feasible. Ingress/egress corridors were restricted to existing roads and every effort was made to minimize any

additional widening or creation of new access routes. As a result, actual munitions investigation activities affected only 0.4 acres (0.2 ha) instead of the anticipated 5.5 acres (2.0 ha).

With the information gained from initial Design Study investigations, vegetation cutting and subsurface investigations in NCAs and SCAs in South Range 44 were confined primarily to 10-foot-wide (3-m-wide) linear transects that traversed grids in a north-south linear alignment in the study areas; see Section 5.1.5. As a result, out of 17.7 acres (7.2 ha) of intact central maritime chaparral, only 4.5 acres (1.8 ha) of native vegetation were disturbed during this effort and 13.2 acres (5.3 ha) of central maritime vegetation (75 %) was left intact, preserving central maritime chaparral in an area that supports numerous HMP species.

8.2 Wildlife Relocation

ESCA RP Team members perform animal rescue and/or relocation as needed to avoid or reduce impacts of the fieldwork on wildlife. No CTS were observed in 2017 in any MRA. No wildlife were relocated in 2017 in any MRA.

8.3 Environmental Awareness Training

Environmental awareness training (EAT) is conducted by a QB for field personnel prior to initiation of fieldwork in all MRAs, placing special emphasis on CTS awareness, requirements, and mitigation measures. During the training personnel are advised of the locations of ponds, vernal pools, and aquatic features within 2 km (1.24 miles) that may be potential breeding habitats for CTS, including aquatic features in and near the FEG, Parker Flats, SEA, and IAR MRAs (Figure 5). Trainings also introduce work crews to the HMP, the relevant habitats in the MRAs, measures to comply with the federal ESA, protection of HMP species and their habitats, and minimization of environmental impacts during munitions investigation. Site requirements are reviewed, including restricting site access to established roads and paths whenever possible and limiting vegetation cutting and soil disturbance to the minimum feasible area required to conduct the field task. Where appropriate, the ESCA RP biologists communicate and/or mark out locations of HMP plant species and/or their habitats to assist avoidance by field crews. EAT was conducted to new field crew members and CTS-specific refresher training was given to previously trained field crew on April 26, 2017.

8.4 Weed Management Activities

Monitoring and management activities for target weeds are routinely conducted in ESCA RP parcels, consistent with the requirements of the HMP (USACE 1997) and the BO (USFWS 2015). The goal of weed management is to avoid degradation of ecological communities and especially sensitive species populations as a result of weed invasion in parcels not designated for development.

During 2017, weed monitoring occurred periodically, particularly in areas where weeds could easily spread from a development parcel to a habitat parcel. Most weed abatement was conducted in September 2017, when a crew sprayed 3% glyphosate herbicide on target weeds

using backpack sprayers. Pesticide was applied in the IAR MRA Range 47 SCA, in FEG MRA east habitat parcel and along Barloy Canyon Road, in the MOUT Site MRA, in the Parker Flats Bat Wing, and in Seaside MRA between the blue line road and the NRMA boundary.

All weed monitoring and removal activities are summarized in Appendix D.

8.5 Erosion Control Monitoring and Mitigation

Ongoing erosion control monitoring and installation of erosion control BMPs are implemented as needed in ESCA RP parcels, consistent with the requirements of the HMP (USACE 1997) and BOs relevant to ESCA RP activities (USFWS 1999, 2002, and 2005); the 2005 BO (USFWS 2005, pp. 14-15) and the ESCA RP Soil Management Field Implementation Plans for each MRA (ESCA RP Team 2011, 2012a) describe erosion control measures in detail.

Future East Garrison MRA - There were no erosion issues in FEG during 2017. Broadcast and hydro-seeding efforts in 2013 and 2014 have been successful at vegetating much of the former grenade range, particularly on the steep eastern slope where native herbaceous and woody species have become widely established (Figure 9a). No erosion control BMP maintenance was needed in 2017.

Interim Action Ranges MRA - There were no major erosion issues in the IAR during 2017. No erosion control BMP maintenance was needed (Figure 9b).

ESCA RP erosion monitoring activities are summarized in Appendix E.

9.0 CONCLUSION

No munitions investigation activities were conducted in any ESCA MRAs during 2017. Biological monitoring in 2017 included completion of 43 vegetation transects, 11 herbaceous species quadrats (IAR MRA only, see Appendix A), and 18 HMP herbaceous species plots, along with surveys on 295 acres (119 ha) for HMP herbaceous species; these monitoring events and associated data provide the ESCA RP Team with valuable information to guide in ongoing site management.

Baseline vegetation and herbaceous transects were installed by the ESCA RP Team in the FEG, Parker Flats, and IAR MRAs between 2008 and 2012 to document native shrub cover prior to munitions investigation activities. Recovery of native vegetation cover after vegetation cutting has been rapid in central maritime chaparral, exceeding 77% in Year 5 transects in the FEG MRA and 88% in the Parker Flats MRA. A range of native recruits of obligate-seeding shrubs in these vegetation-cut areas contribute to shrub diversity in chaparral stands in all areas, as evidenced by frequency and diversity data, including HMP shrubs.

Central maritime chaparral in Parker Flats is dominated by shaggy-barked manzanita. Baseline cover by shaggy-barked manzanita averaged 57% and Year 8 mean cover was 33.9%, or 60% of baseline cover, achieving the Year 8 success criteria of greater than 30% relative cover compared with the baseline for this species. No sensitive ceanothus species occurred in these transects during baseline or post-disturbance monitoring.

HMP herbaceous species presence in the FEG and Parker Flats MRAs suggest stable HMP annual populations and recovery after munitions investigation activities. In the FEG MRA, the numbers of both Monterey spineflower and seaside bird's beak per grid equal or exceed the 2012 baseline and post-activity data from previous monitoring years. Monterey spineflower, sand (Monterey) gilia, and seaside bird's beak all meet Year 5 success criteria (greater than 90% frequency compared with baseline frequency) and HMP annual monitoring is considered complete in the FEG MRA.

In the Parker Flats MRA, the total number of Monterey spineflower in the MRA and the number of Monterey spineflower individuals per grid exceed the baseline. Two grids support the highest concentrations of Monterey spineflower, and colonies of Monterey spineflower in these grids persist through the years. Although Monterey spineflower frequency in the Parker Flats MRA does not achieve Year 5 performance target, the higher population totals and persistence in grids with historically higher densities suggest a stable and sustainable population in this area. We respectfully request that HMP annual monitoring in the Parker Flats MRA be considered complete, based on the provided data.

Vegetation cover and species diversity data indicate recovery of all sensitive vegetation types subject to munitions response actions in ESCA MRAs. A combination of committed stewardship, including reductions in acreages potentially subject to vegetation cutting; retention of an average of 20.9 Toro manzanitas per acre in the FEG MRA; retention of over 880 coast live oak trees in the Parker Flats MRA development parcel; habitat restoration (see Appendix A); steady post-activity increases in vegetation cover, species diversity, and number of individual HMP herbaceous species; and weed and erosion control management activities all combine to promote habitat recovery after munitions investigation activities. The enhanced native species diversity and cover observed at all sites, along with wildlife usage and other indications of elevated ecological functionality, suggest all areas are on trajectories toward self-sustaining native plant communities equitable with the species richness and relative cover of species that were present on the site prior to the FORA ESCA RP Team munitions investigation and remedial efforts.

Appendix A provides details on the monitoring activities in the IAR MRA in 2017.

Planned activities in FEG, IAR, and Parker Flats MRAs in 2018 include weed and erosion control monitoring and abatement. Habitat monitoring activities expected in 2018 are listed below.

FEG MRA:

- Six Year 8 Vegetation Transects in areas cut in 2010
- Herbaceous Quadrats, if needed with Vegetation Transects

- Species Diversity Documentation
- Year 5 Aquatic Feature Monitoring

IAR MRA (small-scale excavation areas in SCAs and NCAs):

- Year 6 and Year 7 Vegetation Transects in central maritime chaparral areas subject to small-scale excavation in 2011 and 2012
- Herbaceous Quadrats, if needed with Vegetation Transects
- Species Diversity Documentation

Parker Flats MRA: All transect and HMP species monitoring in the Parker Flats MRA are considered complete as of 2017.

There are no biological monitoring requirements for the remaining ESCA MRAs (Seaside MRA, CSUMB Off-Campus MRA, County North MRA (property transferred to County of Monterey), Laguna Seca Parking MRA, MOUT Site MRA, and Del Rey Oaks/Monterey MRA.

10.0 REFERENCES

- Baldwin, B. G., Goldman, D. H., Keil, D. J., Patterson, R., Rosatti, T. J., and Wilken, D. H. (eds.). 2012. The Jepson Manual. Vascular plants of California. (2nd ed.). Univ. Calif. Press, Berkeley, CA. xxii+1568 pp. January.
- Burleson Consulting Inc. (Burleson). 2006. Wetlands Monitoring and Restoration Plan for Munitions and Contaminated Soil Remedial Activities at Former Fort Ord. (Fort Ord Administrative Record No. BW-2453)
- . 2009. Protocol for Conducting Vegetation Monitoring in Compliance with the Installation-Wide Multispecies Habitat Management Plan at Former Fort Ord. March. (Fort Ord Administrative Record No. BW-2454a)
- California Department of Fish and Wildlife (CDFW, then CDFG). 2003. Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander. Sacramento, California.
- California Department of Fish and Wildlife (CDFW). 2010. List of Vegetation Alliances and Associations. Vegetation Classification and Mapping Program. Sacramento, CA. September.
- . 2017. Natural Diversity Data Base (CNDDDB) RareFind Version 4. Sacramento, California.
- California Invasive Plant Council. 2006. California Invasive Plant Inventory. 39 pp.
- California Native Plant Society (CNPS). 2017. Inventory of Rare and Endangered Plants (online edition). Rare Plant Scientific Advisory Committee. California Native Plant Society. Sacramento, CA. www.cnps.org/inventory
- CH2M Hill and HydroGeoLogic, Inc. 2005. Operable Unit 1 (OU1) – Result of 2005 Monterey Spineflower and Sand Gilia Surveys, OU1, Former Fort Ord (Fort Ord Administrative Record No. OU1-0533)
- Detka, Jon R. and Susan C. Lambrecht. 2010. Effects of Fire on Germination of *Ericameria fasciculata* (Asteraceae), a Rare Maritime Chaparral Shrub. *Madroño* 57(2):77-84.
- Environmental Services Cooperative Agreement Remediation Program Team (ESCA RP Team). 2009. 2008 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California. 12 June. (Fort Ord Administrative Record No. ESCA-0160)
- . 2010a. 2009 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California. 5 February. (Fort Ord Administrative Record No. ESCA-0248)

- . 2010b. ESCA Weed Management Plan, Former Fort Ord, Monterey County, California.
- . 2010c. Group 4, Remedial Investigation / Feasibility Study Work Plan, Volume 1 - Work Plan, Future East Garrison Munitions Investigation Area. 8 October. (Fort Ord Administrative Record No. ESCA-0233C).
- . 2011a. 2010 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 29 March. (Fort Ord Administrative Record No. ESCA-0253.1)
- . 2011b. Final Phase II Interim Action Work Plan, Interim Action Ranges Munitions Investigation Area, Former Fort Ord, Monterey County, California. May 24. (Fort Ord Administrative Record No. ESCA-0252B)
- . 2012a. 2011 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 25 May. (Fort Ord Administrative Record No. ESCA-0258)
- . 2012b. FVF G4WP-005 modifies the Final Group 4 RI/FS Work Plan, Future East Garrison Munitions Investigation Area, Former Fort Ord, Volume 2, Appendix C. Addition of Standard Operating Procedures for Soil and Vegetation Handling in Aquatic Features. September 27, 2012 (Fort Ord Administrative Record No. ESCA-0233C.6)
- . 2013a. Phase II Interim Action Work Plan Addendum Habitat Restoration Plan, Interim Action Ranges Munitions Investigation Area, Former Fort Ord, Monterey County, California. February 2013. (Fort Ord Administrative Record No. ESCA-0261)
- . 2013b. 2012 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 29 March. (Fort Ord Administrative Record No. ESCA-0266)
- . 2014. 2013 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 28 March. (Fort Ord Administrative Record No. ESCA-0283)
- . 2015. 2014 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 15 April. (Fort Ord Administrative Record No. ESCA-0300)
- . 2016. 2015 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 18 March. (Fort Ord Administrative Record No. ESCA-0325)

- . 2017. 2016 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 18 April. (Fort Ord Administrative Record No. ESCA-0325)
- Flora of North America Editorial Committee, eds. 1993+. *Flora of North America North of Mexico*. 12+ vols. New York and Oxford. Vol. 1, 1993; vol. 2, 1993; vol. 3, 1997; vol. 4, 2003; vol. 5, 2005; vol. 19, 2006; vol. 20, 2006; vol. 21, 2006; vol. 22, 2000; vol. 23, 2002; vol. 25, 2003; vol. 26, 20.
- Harding Lawson Associates (HLA). 1996. 1996 Annual Monitoring Report, Biological Baseline Studies and Follow-up Monitoring at Unexploded Ordnance Sites 10 East, 10 West, 11, 12, and 16 Presidio of Monterey Annex. 1 December. (Fort Ord Administrative Record No. OE-0212)
- . 1998. 1998 Annual Monitoring Report, Biological Baseline Studies and Follow-up Monitoring at Unexploded Ordnance Sites on Former Fort Ord, Presidio of Monterey Annex, Monterey, California. 10 December. (Fort Ord Administrative Record No. OE-0431)
- . 2001. 2000 Annual Monitoring Report, Biological Baseline Studies and Follow-up Monitoring, Former Fort Ord, Monterey County, California. 19 January. (Fort Ord Administrative Record No. BW-2235)
- . 2003. 2002 Annual Monitoring Report, Biological Baseline Studies and Follow-up Monitoring, Former Fort Ord, Monterey, California. 28 January. (Fort Ord Administrative Record No. BW-2237)
- Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. Nongame-Heritage Program, The Resources Agency, California Department of Fish and Game. Sacramento, California. iii + 156 pp.
- Holland, V.L. and David J. Keil. 1995. *California Vegetation*. Kendall-Hunt Publishing Company. Dubuque, Iowa. 516 pp.
- Hunt, Lawrence E. 1993. Origin, Maintenance and Land Use of Aeolian Sand Dunes of the Santa Maria Basin, California. Prepared for The Nature Conservancy, San Luis Obispo, California.
- Jones & Stokes Associates, Inc. (Jones & Stokes). 1995a. Fort Ord 1994 Annual Monitoring Report for Biological Baseline Studies at Unexploded Ordnance Sites. 1 January. (Fort Ord Administrative Record No. OE-0208)
- . 1995b. 1995 Annual Biological Monitoring Report for Unexploded Ordnance Removal Sites at Former Fort Ord. 1 September. (Fort Ord Administrative Record No. OE-0209)

- MACTEC Engineering and Consulting, Inc. (MACTEC). 2006. Final Track 2 Munitions investigation Remedial Investigation / Feasibility Study, Parker Flats Munitions Investigation Area, Former Fort Ord, California. August 31. (Fort Ord Administrative Record No. OE-0523N)
- Natural Resources Conservation Service (NRCS). 2013. United States Department of Agriculture. Web Soil Survey. <http://websoilsurvey.nrcs.usda.gov/>.
- Parsons. 2005. 2005 Annual Biological Monitoring Report, Ranges 43-48, Former Fort Ord, Monterey County, California. 28 November. (Fort Ord Administrative Record No. OE-0577)
- Pielou, E.C. 1974. Population and Community Ecology: Principles and Methods. Gordon and Breach, New York.
- Sawyer, John O., Todd Keeler-Wolf, and Julie M. Evens. 2009. Manual of California Vegetation. California Native Plant Society. Sacramento, California. 1300 pp.
- Smith, D., Curry, B., Kozlowski, D., Williams, R., Watson, F., Turrini-Smith, L., and Newman, W. 2002. Watershed and Riparian Assessment Report (WRAR) Bureau of Land Management Lands, Former Fort Ord, Monterey County, CA. Report No. WI-2002-01 (February 2002). The Watershed Institute. California State University Monterey Bay, Seaside, CA.
- Tetra Tech, Inc. and Ecosystems West Consulting Group (Tetra Tech and Ecosystems West). 2015. Revisions of Protocol for Conducting Vegetation Monitoring for Compliance with the Installation-Wide Multispecies Habitat Management Plan Former Fort Ord. April. (Fort Ord Administrative Record No. BW-2745)
- U.S. Army Corps of Engineers (USACE) (with Technical Assistance from Jones & Stokes Associates). 1992. Flora and Fauna Baseline Study of Fort Ord, California. Sacramento District. Sacramento, California. (Fort Ord Administrative Record No. BW-1938)
- . 1997. Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, CA, U.S. Army Corps of Engineers, Sacramento District. April. (Fort Ord Administrative Record No. BW-1787)
- U.S. Department of the Army (Army). 2002. Record of Decision, Interim Action for Ordnance and Explosives at Ranges 43-48, Range 30A, and Site OE-16, Former Fort Ord, California. September 20. (Fort Ord Administrative Record No. OE-0414)
- . 2008. Record of Decision, Parker Flats Munitions Investigation Area, Track 2 Munitions investigation Site, Former Fort Ord, California. June 24. (Fort Ord Administrative Record No. OE-0661)

- _____. 2017. Record of Decision, Interim Action Ranges Munitions Response Area, Former Fort Ord, California. January 18. (Fort Ord Administrative Record No. ESCA-0331)
- United States Fish and Wildlife Service (USFWS). 1999. Biological Opinion on the Closure and Reuse of Fort Ord, Monterey County, California (1-8-99-F/C-39R). March 30. (Fort Ord Administrative Record No. BW-2232A)
- _____. 2002. Biological Opinion on the Closure and Reuse of Fort Ord, Monterey County, California, as it affects Monterey Spineflower Critical Habitat (1-8-01-F-70R). October 22. (Fort Ord Administrative Record No. BW-2233)
- _____. 2005. Cleanup and Reuse of Former Fort Ord, Monterey County, California, as it affects California Tiger Salamander and Critical Habitat for Contra Costa Goldfields (1-8-04-F-25R). March 14. (Fort Ord Administrative Record No. BW-2334)
- _____. 2008a. Endangered and Threatened Wildlife and Plants; Designation of Critical habitat for the Monterey Spineflower (*Chorizanthe pungens* var. *pungens*). Federal Register Vol. 73, No. 6. 1525. January 9 (73 FR 1525).
- _____. 2008b. Sand (Monterey) gilia (*Gilia tenuiflora* subsp. *arenaria*) 5-Year Review: Summary and Evaluation. Ventura Fish and Wildlife Office, Ventura, California. March.
- _____. 2017. Reinitiation of Formal Consultation of Cleanup and Property Transfer Actions Conducted at the Former Fort Ord, Monterey County, California (Original Consultation 8-8-09-F-74, 81440-2009-F-0334). June 7. (Fort Ord Administrative Record No. BW-2747A)
- Zander Associates (Zander). 2002. Assessment East Garrison – Parker Flats Land Use Modifications, Fort Ord, California. May 1. (Fort Ord Administrative Record No. BW-2180).

Table 1-1
Vegetation Monitoring Activities in Habitat Parcels of MRAs
2008 - 2017

ESCA RP 2017 Annual Natural Resource Report

Munitions Response Area	Monitoring Activity	Number of Monitoring Events per Year															Total Baseline Transects and HMP Annuals Plots	Post-activity Transects, HMP Annuals Plots and Surveys	Total Transects, HMP Annuals Plots, and Surveys
		2008		2009		2010		2011		2012		2013 ¹	2014 ¹	2015 ¹	2016 ¹	2017 ¹			
		Baseline	Post-activity	Baseline	Post-activity	Baseline	Post-activity	Baseline	Post-activity	Baseline	Post-activity	Post-activity	Post-activity	Post-activity	Post-activity	Post-activity			
Future East Garrison	Vegetation transects	-	-	-	-	-	-	39	-	2	-	6	17	32	23	19	41	97	138
	Herbaceous quadrats	-	-	-	-	-	-	-	-	-	-	-	18	18	6	0	0	42	42
	HMP herbaceous species plots	-	-	-	-	5	-	-	-	-	5	6	15	14	21	15	5	76	81
	HMP annual surveys (acres)*	-	-	-	-	-	-	-	-	-	-	64.7	71.6	138.2	227.1	217.6	0	719	719.2
	Toro manzanita surveys (acres)*	-	-	-	-	-	-	-	-	-	29	26.4	26.4	0	0	0	0	82	81.8
Interim Action Ranges-Army Remediation Areas	Vegetation transects	-	30	-	-	-	20	-	-	-	-	-	-	0	0	0	0	50	50
	Herbaceous quadrats	-	12	-	-	-	-	-	-	-	-	-	-	0	0	0	0	12	12
	HMP herbaceous species plots	-	63	-	-	-	63	-	-	-	-	-	-	0	0	0	0	126	126
Interim Action Ranges-ESCA Remediation Areas (SCAs/NCAs)	Vegetation transects	-	-	-	-	17	-	2	-	-	16	28	28	38	20	13	19	143	162
	Herbaceous quadrats	-	-	-	-	-	-	-	6	-	53	96	96	6	6	11	0	274	274
	HMP herbaceous species plots	-	-	-	-	187	-	-	-	-	44	173	161	263	0	0	187	641	828
	HMP annual surveys (acres)*	-	-	-	-	-	-	-	-	-	-	27.5	30.8	57.6	0	0	0	116	115.9

Table 1-1
Vegetation Monitoring Activities in Habitat Parcels of MRAs
2008 - 2017

ESCA RP 2017 Annual Natural Resource Report

Munitions Response Area	Monitoring Activity	Number of Monitoring Events per Year															Total Baseline Transects and HMP Annuals Plots	Post- activity Transects, HMP Annuals Plots and Surveys	Total Transects, HMP Annuals Plots, and Surveys
		2008		2009		2010		2011		2012		2013 ¹	2014 ¹	2015 ¹	2016 ¹	2017 ¹			
		Baseline	Post- activity	Baseline	Post- activity	Baseline	Post- activity	Baseline	Post- activity	Baseline	Post- activity	Post- activity	Post- activity	Post- activity	Post- activity	Post- activity			
Parker Flats Phase II	Vegetation transects	11	-	-	-	-	-	-	-	-	11	-	11	0	0	11	11	33	44
	Herbaceous quadrats	-	-	-	-	-	-	-	-	-	6	-	6	0	0	0	0	12	12
	HMP herbaceous species plots	10	-	-	-	-	-	-	10	-	10	6	5	0	0	3	10	34	44
	HMP annual surveys (acres)*	-	-	-	-	-	-	-	-	-	-	16.8	87.5	0	0	77	0	181	181.4
Parker Flats Phase I	Vegetation transects	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0
	Herbaceous quadrats	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0
	HMP annual plots	-	-	-	-	-	-	-	-	-	-	-	32	0	0	0	0	32	32
	HMP annual surveys (acres)*	-	-	-	-	-	-	-	-	-	-	-	93.2	0	0	0	0	93	93.2
County North	HMP herbaceous species plots	-	-	15	-	-	-	-	-	-	-	-	-	0	0	0	15	0	15
Total Vegetation Transects		11	30	0	0	17	20	41	0	2	27	34	56	70	43	43	71	323	394
Total Herbaceous Quadrats		0	12	0	0	0	0	0	6	0	59	96	120	24	12	11	0	329	329
Total HMP Herbaceous Species Plots		10	63	15	0	192	63	0	10	0	59	185	181	277	21	18	217	877	1094
Total Acres for HMP Herbaceous Species Surveys*		-	-	-	-	-	-	-	-	-	-	109	283	196	227	295	-	1110	1110
Total Acres for Toro Manzanita Surveys*		-	-	-	-	-	-	-	-	-	29	26	26	0	0	0	-	82	82

*Survey acreages are approximate, based on number of grid cells surveyed

¹ no baseline surveys conducted during this reporting period

HMP = Habitat Monitoring Plan; SCA = Special Case Area; NCA = Non-completed Area

Table 2-1
HMP Species Occurrence within Habitat Parcels of Munition Response Areas

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Current Regulatory Status	Habitat	Recorded as Present or Habitat Present in MRAs ¹	Observed by ESCA RP
Animals					
Amphibians					
<i>Ambystoma californiense</i>	California tiger salamander	Federally Endangered/ California Threatened	Open woodlands and grasslands, ponds and vernal pools from Sonoma to Santa Barbara Counties, inland to portions of the Sierra Nevada.	CN, FEG, IAR, LS	2010-2011 FEG
<i>Rana draytonii</i>	California red-legged frog	Federally Threatened/ California Species of Concern	Coldwater ponds or river pools with emergent and submergent vegetation, often with riparian vegetation at margins from Humboldt to San Diego Counties and in portions of the Sierra Nevada.	CN, IAR, LS	None
Birds					
<i>Charadrius nivosus nivosus</i>	western snowy plover	Federally Threatened/ California Species of Concern	Flat sandy beach above the high tide level from Washington to Baja California.	None	None
Invertebrates					
<i>Euphilotes enoptes smithi</i>	Smith's blue butterfly	Federally Endangered	Coastal sand dunes and ravines associated with coast and seacliff buckwheat in Monterey, Santa Cruz, and San Mateo Counties.	None	None
<i>Linderiella occidentalis</i>	California linderiella	Not listed	Vernal pools and ponds from Lake to Riverside Counties and in the Great Central Valley.	CN, IAR, LS	2010 FEG

Table 2-1
HMP Species Occurrence within Habitat Parcels of Munition Response Areas

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Current Regulatory Status	Habitat	Recorded as Present or Habitat Present in MRAs ¹	Observed by ESCA RP
Mammals					
<i>Sorex ornatus salarius</i>	Monterey ornate shrew	California Species of Concern	Riparian, woodland, and upland communities where there is thick duff or downed logs. Endemic to Monterey region.	CN, CSUMB, FEG, IAR, MOUT, PF	None
Reptiles					
<i>Anniella pulchra nigra</i>	California black legless lizard	California Species of Concern	Various coastal plant communities where loose sandy soil and abundant invertebrate populations are available. Presently found in Monterey County and possibly extirpated from Santa Cruz and San Luis Obispo Counties	CN, CSUMB, DRO/M, IAR, PF, SEA	2009-2010 PF, 2012 IAR
Plants					
Annuals					
<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	Federally Threatened/CNPS 1B.2	Sandy soils in coastal strand, coastal scrub, maritime chaparral, and disturbed sites in grassland, below 450 meters elevation. Endemic to Monterey and Santa Cruz Counties.	CN, CSUMB, DRO/M, FEG, IAR, MOUT, PF, SEA	2009 CN, 2010-2017 FEG, 2008-2017 IAR, 2008-2017 PF, 2012-2016 SEA
<i>Chorizanthe robusta</i> var. <i>robusta</i>	robust spineflower	Federally Endangered/CNPS 1B.1	Coastal strand, coastal scrub areas below 300 meters elevation from Marin to Monterey Counties.	None	None
<i>Cordylanthus rigidus</i> ssp. <i>littoralis</i>	seaside bird's beak	California Endangered/CNPS 1B.1	Coastal dunes, coastal scrub, and maritime chaparral, below 425 meters; root parasite, dependent on nearby host plant. Endemic to Monterey and Santa Barbara Counties.	DRO/M, FEG, IAR, PF, SEA	2013-2017 FEG, 2008-2017 IAR

Table 2-1
HMP Species Occurrence within Habitat Parcels of Munition Response Areas

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Scientific Name	Common Name	Current Regulatory Status	Habitat	Recorded as Present or Habitat Present in MRAs ¹	Observed by ESCA RP
Annuals					
<i>Gilia tenuiflora</i> subsp. <i>arenaria</i>	Monterey (sand) gilia	Federally Endangered/ California Threatened/CNPS 1B.2	Open sandy soils in coastal dunes and maritime chaparral. Endemic to Monterey and Santa Cruz Counties.	CN, FEG, IAR, MOUT, PF, SEA	2008-2017 IAR, 2010-2017 FEG, 2010 SEA
Herbaceous Perennials					
<i>Erysimum ammophilum</i>	coast wallflower	CNPS 1B.2	Coastal dunes below 60 meters in San Mateo, Santa Cruz, Monterey, Santa Barbara, and San Diego Counties and on Santa Rosa Island.	IAR, SEA	2013-2017 IAR, 2013-2014 SEA
<i>Piperia yadoni</i>	Yadon's piperia	Federally Endangered/CNPS 1B.1	Sandy soil or sandstone coastal shrubland, Monterey pine forest and maritime chaparral below 510 meters. Restricted to Monterey region.	None	None
Shrubs					
<i>Arctostaphylos hookeri</i> subsp. <i>hookeri</i>	Hooker's manzanita	CNPS 1B.2	Sandy soils, sandy shales, sandstone outcrops, chaparral, below 536 meters elevation. Endemic to Monterey and Santa Cruz Counties.	FEG, IAR, LS, MOUT, PF	2012-2017 FEG, 2012, 2014, 2016, 2017 PF
<i>Arctostaphylos montereyensis</i>	Toro manzanita	CNPS 1B.2	Chaparral in sandy soils below 730 meters elevation, especially on Aromas formation sandstone. Endemic to Monterey County.	FEG, IAR, LS, MOUT, PF, SEA	2010-2017 FEG, 2008-2014 PF
<i>Arctostaphylos pumila</i>	sandmat manzanita	CNPS 1B.2	Sandy soils, hills, chaparral, woodland, coniferous forest below 205 meters elevation. Endemic to Monterey County.	CN, DRO/M, FEG, IAR, LS, PF, SEA	2008-2017 IAR, 2008-2014 SEA

Table 2-1
HMP Species Occurrence within Habitat Parcels of Munition Response Areas

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Scientific Name	Common Name	Current Regulatory Status	Habitat	Recorded as Present or Habitat Present in MRAs ¹	Observed by ESCA RP
Shrubs					
<i>Ceanothus rigidus</i>	Monterey ceanothus	CNPS 4.2	Sandy hills, flats, chaparral, close-coned-pine forest below 550 meters elevation. Restricted to Monterey County; historic collections in Santa Cruz County.	DRO/M, FEG, IAR, LS, MOUT, PF, SEA	2010-2017 FEG, 2008-2017 IAR, 2013-2014 PF
<i>Ericameria fasciculata</i>	Eastwood's ericameria	CNPS 1B.1	Sandy soils, chaparral, closed-cone pine forest, northern coastal scrub, elevation 29-275 meters. Endemic to Monterey County.	DRO/M, FEG, IAR, MOUT, PF, SEA	2010-2017 FEG, 2008-2017 IAR

¹ Occurrence records from 1992 Fort Ord Baseline Flora and Fauna

CNPS = California Native Plant Society

MRA Abbreviations (* habitat parcel present)

CN = County North*

CSUMB = California State University Monterey Bay

DRO/M = Del Rey Oaks/ Monterey*

FEG = Future East Garrison*

IAR = Interim Action Ranges*

LS = Laguna Seca Parking

MOUT = Military Operations Urban Training Site

PF = Parker Flats*

SEA = Seaside

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2017
ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	HMP species	CNPS Listing status (Rare Plant Ranking)	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 47	FEG MRA	Parker Flats MRA	Seaside MRA	County North MRA
Trees										
<i>Acacia baileyana</i>	Cootamundra wattle, Bailey's acacia						x			
<i>Acacia melanoxylon</i>	blackwood acacia			lim			x		x	
<i>Acacia saligna</i>	orange wattle						x			
<i>Arbutus menziesii</i>	Pacific madrone					x	x	x		
<i>Eucalyptus camaldulensis</i>	red river gum			lim			x			
<i>Hesperocyparis macrocarpa</i>	Monterey cypress		1B.2			x	x	x	x	
<i>Juniperus</i> sp.	Juniper						x			
<i>Myoporum laetum</i>	myoporum			mod			x		x	
<i>Pinus radiata</i>	Monterey pine		1B.1			x	x	x	x	x
<i>Populus trichocarpa</i>	black cottonwood					x	x			
<i>Quercus agrifolia</i>	coast live oak				x	x	x	x	x	x
<i>Quercus wislizenii</i> var. <i>wislizenii</i>	interior live oak						x			
<i>Salix lasiolepis</i>	arroyo willow				x	x	x	x	x	
Shrubs and Subshrubs										
<i>Acmispon glaber</i>	deerweed				x	x	x	x	x	x
<i>Adenostoma fasciculatum</i>	chamise				x	x	x	x	x	x
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita						x	x		
<i>Arctostaphylos hookeri</i>	Hooker's manzanita	HMP	1B.2				x	x		x
<i>Arctostaphylos montereyensis</i>	Toro manzanita	HMP	1B.2				x	x		x
<i>Arctostaphylos pajaroensis</i>	Pajaro manzanita						x			
<i>Arctostaphylos pumila</i>	sandmat manzanita	HMP	1B.2		x	x		x	x	x
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita				x	x		x	x	x
<i>Artemisia californica</i>	California sagebrush				x	x	x	x	x	x
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote bush, coyote brush				x	x	x	x	x	x
<i>Baccharis pilularis</i> subsp. <i>pilularis</i>	coyote brush					x				
<i>Ceanothus dentatus</i>	dwarf ceanothus				x	x	x	x	x	x
<i>Ceanothus incanus</i>	coast whitethorn						x			
<i>Ceanothus rigidus</i>	Monterey ceanothus	HMP	4.2		x	x	x	x	x	x
<i>Ceanothus thyrsiflorus</i>	blue blossom						x	x		
<i>Cistus incanus</i>	hairy rock-rose						x	x		x
<i>Cistus salvifolius</i>	rock-rose								x	
<i>Crocanthemum scoparium</i>	rush-rose				x	x	x	x	x	x

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2017
ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	HMP species	CNPS Listing status (Rare Plant Ranking)	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 47	FEG MRA	Parker Flats MRA	Seaside MRA	County North MRA
Shrubs and Subshrubs										
<i>Ericameria ericoides</i>	dune-heather, mock-heather				x	x	x	x	x	x
<i>Ericameria fasciculata</i>	Eastwood's ericameria, Eastwood's goldenbush	HMP	1B.1		x	x	x	x	x	x
<i>Eriodictyon californicum</i>	California yerba santa						x	x		
<i>Eriogonum fasciculatum</i> var. <i>foliolosum</i>	California buckwheat							x		
<i>Eriophyllum confertiflorum</i>	golden yarrow				x	x	x	x	x	x
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry				x	x	x	x	x	x
<i>Frangula californica</i> subsp. <i>tomentella</i>	California coffeeberry				x	x	x	x	x	x
<i>Garrya elliptica</i>	coast silk-tassel				x	x	x	x	x	
<i>Genista monspessulana</i>	French broom			high			x	x	x	
<i>Heteromeles arbutifolia</i>	toyon				x	x	x	x	x	x
<i>Lepechinia calycina</i>	pitcher sage				x	x	x	x		
<i>Lupinus arboreus</i>	coastal bush lupine				x	x	x	x	x	x
<i>Lupinus chamissonis</i>	silver bush lupine				x	x	x	x	x	x
<i>Mimulus aurantiacus</i>	bush monkeyflower				x	x	x	x	x	x
<i>Pyracantha</i> sp.	firethorn			lim				x		
<i>Ribes malvaceum</i>	chaparral currant				x	x	x	x	x	x
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry				x	x	x	x	x	x
<i>Rosa californica</i>	California wild rose						x			
<i>Rosa gymnocarpa</i> var. <i>gymnocarpa</i>	dwarf wood rose						x			
<i>Rubus ursinus</i>	California blackberry						x	x	x	
<i>Salvia mellifera</i>	black sage				x	x	x	x	x	x
<i>Solanum umbelliferum</i>	blue witch nightshade				x	x		x	x	
<i>Symphoricarpos mollis</i>	creeping snowberry				x	x	x	x	x	
<i>Toxicodendron diversilobum</i>	poison-oak				x	x	x	x	x	x
<i>Vaccinium ovatum</i>	California huckleberry, evergreen huckleberry						x			
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
<i>Acaena pinnatifida</i> var. <i>californica</i>	biddy biddy							x		
<i>Achillea millefolium</i>	common yarrow				x	x	x	x	x	x
<i>Acmispon americanus</i> var. <i>americanus</i>	Spanish lotus							x		
<i>Acmispon heermannii</i> var. <i>orbicularis</i>	wooly lotus				x	x	x	x	x	
<i>Acmispon parviflorus</i>	hill lotus						x			
<i>Acmispon strigosus</i>	Bishop's lotus				x	x	x	x	x	
<i>Agoseris apargioides</i>	seaside dandelion						x	x		

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2017
ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	HMP species	CNPS Listing status (Rare Plant Ranking)	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 47	FEG MRA	Parker Flats MRA	Seaside MRA	County North MRA
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
<i>Agrostis exarata</i> var. <i>pacifica</i>	spike bentgrass						x	x		
<i>Agoseris grandiflora</i> var. <i>leptophylla</i>	giant mountain dandelion						x			
<i>Agrostis pallens</i>	thin grass						x	x	x	
<i>Aira caryophyllea</i>	common silver-hair grass				x	x	x	x	x	
<i>Allium hickmanii</i>	Hickman's onion	1B.2					x			
<i>Alopecurus saccatus</i>	Pacific foxtail						x			
<i>Amblyopappus pusillus</i>	amblyopappus				x	x				
<i>Amsinckia intermedia</i>	common fiddleneck				x	x				
<i>Amsinckia spectabilis</i> var. <i>microcarpa</i>	small fruited seaside fiddleneck						x			
<i>Anagallis arvensis</i>	scarlet pimpernel				x	x	x	x	x	x
<i>Antirrhinum kelloggii</i>	Kellogg's snapdragon						x			
<i>Antirrhinum majus</i>	snapdragon					x				
<i>Apiastrum angustifolium</i>	wild celery				x	x	x	x		x
<i>Armeria maritima</i> subsp. <i>californica</i>	California sea pink, sea thrift				x					
<i>Artemisia douglasiana</i>	mugwort					x	x			
<i>Artemisia dracunculus</i>	tarragon								x	
<i>Artemisia pycnocephala</i>	sandhill sagebrush, beach sagewort								x	
<i>Avena barbata</i>	slender wild oat			mod	x	x	x	x	x	x
<i>Avena fatua</i>	wild oat			mod			x	x		
<i>Briza maxima</i>	rattlensnake grass			lim		x	x	x	x	x
<i>Briza minor</i>	little rattlesnake grass						x	x		
<i>Brodiaea terrestris</i> subsp. <i>terrestris</i>	dwarf brodiaea						x			
<i>Bromus carinatus</i>	California brome						x	x	x	
<i>Bromus diandrus</i>	ripgut brome			mod	x	x	x	x	x	x
<i>Bromus hordeaceus</i>	soft chess			lim	x	x	x	x	x	x
<i>Bromus madritensis</i> subsp. <i>rubens</i>	red brome			high	x	x	x	x	x	x
<i>Calandrinia ciliata</i>	red maids				x	x	x	x	x	
<i>Callitriche</i>	water starwort						x			
<i>Calochortus albus</i> var. <i>albus</i>	fairy lanterns, globe lily				x	x	x	x	x	
<i>Calyptridium monandrum</i>	pussy paws				x	x				
<i>Calystegia subacaulis</i>	hill morning -glory				x		x	x		
<i>Camissonia contorta</i>	contorted suncups				x	x	x	x	x	

Table 3-1

Observed Plant Species in Munitions Response Areas 2008-2017

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Scientific Name	Common Name	HMP species	CNPS Listing status (Rare Plant Ranking)	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 47	FEG MRA	Parker Flats MRA	Seaside MRA	County North MRA
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
<i>Camissonia strigulosa</i>	strigose suncups				x		x			
<i>Camissoniopsis cheiranthifolia</i> subsp. <i>cheiranthifolia</i>	beach evening- primrose					x				
<i>Camissoniopsis micrantha</i>	small suncups				x	x	x	x	x	
<i>Cardionema ramosissimum</i>	sand mat				x	x	x	x	x	
<i>Carduus pycnocephalus</i>	Italian thistle			mod					x	
<i>Carex brevicaulis</i>	short-stemmed sedge						x			
<i>Carex globosa</i>	round-fruited sedge				x	x	x	x	x	
<i>Carex subbracteata</i>	small bract sedge						x			
<i>Carpobrotus edulis</i>	hottentot fig/ice plant			high	x	x	x	x	x	x
<i>Castilleja affinis</i> subsp. <i>affinis</i>	coast Indian paint-brush							x		
<i>Castilleja attenuata</i>	valley tassels						x			
<i>Castilleja exserta</i> subsp. <i>latifolia</i>	wideleaf purple owl's clover				x	x			x	
<i>Castilleja foliolosa</i>	wooly paintbrush								x	
<i>Caulanthus lasiophyllus</i>	California mustard				x	x				
<i>Centaurea melitensis</i>	toocalote			mod	x	x	x	x	x	x
<i>Cerastium glomeratum</i>	mouse-eared chickweed						x	x		
<i>Chenopodium californicum</i>	California goosefoot					x	x	x	x	
<i>Chlorogalum pomeridianum</i> var. <i>divaricatum</i>	soap plant/amole						x	x		
<i>Chorizanthe diffusa</i>	diffuse chorizanth				x	x	x	x	x	
<i>Chorizanthe douglasii</i>	Douglas' spineflower						x			
<i>Chorizanthe c.f. minutiflora</i>	small-flowered spineflower							x		
<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spine-flower	HMP	1B.1		x	x	x	x	x	
<i>Cicendia quadrangularis</i>	Oregon timwort						x			
<i>Cirsium brevifolium</i>	clustered thistle, Indian thistle						x			
<i>Cirsium occidentale</i> var. <i>occidentale</i>	cobweb thistle				x	x	x		?	
<i>Cirsium occidentale</i> var. <i>venustum</i>	Venus thistle								x	
<i>Cirsium vulgare</i>	bull thistle			mod		x	x		x	
<i>Clarkia lewisii</i>	Lewis' clarkia		4.3					x		
<i>Clarkia amoenea</i>	farewell-to-spring					x				
<i>Clarkia purpurea</i>	wine cup clarkia							x		
<i>Claytonia perfoliata</i>	miner's lettuce				x	x				
<i>Clinopodium douglasii</i>	yerba buena						x	x		
<i>Collinsia heterophylla</i>	Chinese houses					x				

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2017
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Scientific Name	Common Name	HMP species	CNPS Listing status (Rare Plant Ranking)	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 47	FEG MRA	Parker Flats MRA	Seaside MRA	County North MRA
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
<i>Conium maculatum</i>	poison-hemlock			mod			x			x
<i>Cordylanthus rigidus</i> subsp. <i>littoralis</i>	seaside bird's-beak	HMP	1B.1		x	x	x		x	
<i>Corethrogyne filaginifolia</i>	California aster				x	x	x	x	x	x
<i>Cortaderia jubata</i>	pampas grass, jubata grass			high	x	x	x	x	x	x
<i>Cotula coronopifolia</i>	brass buttons			lim			x			
<i>Crassula aquatica</i>	water pygmyweed						x			
<i>Crassula connata</i>	pygmy weed				x	x	x	x	x	
<i>Croton californicus</i>	California croton				x	x	x	x	x	x
<i>Cryptantha clevelandii</i> var. <i>florosa</i>	coastal cryptantha				x	x	x		x	
<i>Cryptantha micromeres</i>	small-flowered cryptantha				x	x	x	x		
<i>Cryptantha microstachys</i>	Tejon cryptantha				x	x		x		
<i>Danthonia californica</i>	California oat grass						x			
<i>Cyperus eragrostis</i>	tall flatsedge						x			
<i>Danthonia californica</i>	California oat grass						x	x		
<i>Daucus pusillus</i>	rattlesnake weed				x	x	x	x		
<i>Deinandra [Hemizonia] corymbosa</i> subsp. <i>corymbosa</i>	tarplant						x			
<i>Deinandra increscens</i> subsp. <i>increscens</i>	coast tarplant				x	x	x	x	x	x
<i>Delphinium parryi</i> subsp. <i>maritimum</i>	seaside larkspur							x		
<i>Deschampsia danthonioides</i>	annual hairgrass						x		x	
<i>Dichelostemma capitatum</i>	blue dicks, wild hyacinth				x	x	x	x		
<i>Distichlis spicata</i>	saltgrass						x			
<i>Dodecatheon clevelandii</i> var. <i>sanctarum</i>	padre's shooting stars						x			
<i>Drymocallis glandulosa</i> var. <i>glandulosa</i>	sticky cinquefoil				x	x	x	x	x	
<i>Dudleya lanceolata</i>	lance-leaved live-forever						x	x	x	
<i>Eleocharis acicularis</i> var. <i>acicularis</i>	slender spikerush						x			
<i>Eleocharis macrostachya</i>	common spikerush						x	x		
<i>Elymus glaucus</i>	western ryegrass				x	x	x	x	x	x
<i>Elymus triticoides</i>	alkali rye							x		
<i>Epilobium brachycarpus</i>	tall annual willowherb					x			x	
<i>Epilobium canum</i>	California-fuchsia					x	x			
<i>Epilobium ciliatum</i> var. <i>ciliatum</i>	northern willowherb					x				
<i>Eriastrum virgatum</i>	wand woollystar		4.3		x	x	x			

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2017
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Scientific Name	Common Name	HMP species	CNPS Listing status (Rare Plant Ranking)	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 47	FEG MRA	Parker Flats MRA	Seaside MRA	County North MRA
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
<i>Erigeron canadensis</i>	horseweed				x	x	x	x	x	x
<i>Erigeron foliosus</i> var. <i>foliosus</i>	leafy daisy				x					
<i>Erigeron sumatrensis</i>	tropical horseweed					x				
<i>Eriogonum latifolium</i>	coast buckwheat							x		
<i>Eriogonum nudum</i> var. <i>auriculatum</i>	nude buckwheat						x			
<i>Erodium botrys</i>	long-beaked filaree				x	x	x	x	x	x
<i>Erodium cicutarium</i>	red-stemmed filaree			lim	x	x		x		
<i>Eryngium armatum</i>	coyote thistle						x			
<i>Erysimum ammophilum</i>	coast wallflower	HMP	1B.2		x				x	
<i>Eschscholzia californica</i>	California poppy				x	x	x	x	x	
<i>Euphorbia peplus</i>	petty spurge					x				
<i>Euthamia occidentalis</i>	western goldenrod						x	x		
<i>Festuca bromoides</i>	brome fescue						x			
<i>Festuca microstachya</i>	small fescue				x	x	x			
<i>Festuca myuros</i>	rattail fescue			mod	x	x	x	x	x	
<i>Festuca octoflora</i>	six-weeks fescue				x	x	x	x	x	
<i>Festuca perennis</i>	Italian rye grass			mod			x			
<i>Fritillaria affinis</i>	checker lily, Mission bells				x		x		x	
<i>Galium aparine</i>	bedstraw							x		
<i>Galium californicum</i> subsp. <i>californicum</i>	California bedstraw				x	x	x	x	x	
<i>Galium porrigens</i> var. <i>porrigens</i>	climbing bedstraw				x	x	x	x	x	x
<i>Gamochaeta ustulata</i>	purple cudweed				x	x	x	x		
<i>Gastidium phleoides</i>	nit grass						x			
<i>Geranium dissectum</i>	cut-leaved geranium			lim			x	x		
<i>Gilia achilleaefolia</i> var. <i>achilleaefolia</i>	California gilia						x			
<i>Gilia capitata</i> subsp. <i>abrotanifolia</i>	ball gilia					x	x			
<i>Gilia capitata</i> subsp. <i>capitata</i>	ball gilia					x				
<i>Gilia tenuiflora</i> subsp. <i>arenaria</i>	sand [Monterey] gilia	HMP	1B.2		x	x	x		x	
<i>Gilia tricolor</i>	bird's eyes gilia					x				
<i>Helminthotheca echioides</i>	bristly ox-tongue			lim		x				
<i>Heliotropium curassivicum</i>	wild heliotrope							x	x	
<i>Herniaria hirsuta</i> subsp. <i>cinerea</i>	hairy rupturewort					x		x		

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Scientific Name	Common Name	HMP species	CNPS Listing status (Rare Plant Ranking)	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 47	FEG MRA	Parker Flats MRA	Seaside MRA	County North MRA
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
<i>Hesperevax acaulis</i> var. <i>ambusticola</i>	fire evax, stemless dwarf cudweed							x		
<i>Heterotheca grandifolia</i>	telegraph weed				x	x	x	x	x	x
<i>Holcus lanatus</i>	velvet grass			mod				x		
<i>Hordeum brachyantherum</i> subsp. <i>brachyantherum</i>	meadow barley					x				
<i>Hordeum marinum</i> subsp. <i>gussoneanum</i>	Mediterranean barley			mod			x			
<i>Hordeum murinum</i>	foxtail barley			mod						
<i>Horkelia californica</i> var. <i>frondosa</i>	Californica horkelia					x				
<i>Horkelia cuneata</i> var. <i>cuneata</i>	coast horkelia, wedge-leaved horkelia				x	x	x	x	x	x
<i>Hypochaeris glabra</i>	smooth cat's ears			lim	x	x	x	x		
<i>Hypochaeris radicata</i>	cat's ears			mod	x	x	x			
<i>Juncus bufonius</i> var. <i>occidentalis</i>	toad rush						x			
<i>Juncus capitatus</i>	leafy-bract dwarf rush						x			
<i>Juncus effusus</i> var. <i>pacificus</i>	bog rush					x				
<i>Juncus mexicanus</i>	Mexican rush						x	x		
<i>Juncus occidentalis</i>	western rush						x			
<i>Juncus patens</i>	common rush							x		
<i>Juncus phaeocephalus</i> var. <i>phaeocephalus</i>	brown-headed rush						x	x		
<i>Koeleria macrantha</i>	June grass				x		x	x	x	
<i>Lagurus ovatus</i>	hare's tail grass						x	x		
<i>Lasthenia glaberrima</i>	smooth goldfields						x			
<i>Lasthenia gracilis</i>	slender goldfields						x			
<i>Lathyrus vestitus</i> var. <i>vestitus</i>	wild sweet pea, Pacific pea							x		x
<i>Layia hieracioides</i>	tall layia						x			
<i>Layia platyglossa</i>	tidy tips				x	x				
<i>Lamarckia aurea</i>	goldentop grass						x			
<i>Lastarriaea coriacea</i>	leather spineflower							x		
<i>Lemna minor</i>	least duckweed						x			
<i>Leontodon saxatilis</i>	hawkbit								x	
<i>Lepidium nitidum</i>	common peppergrass				x	x				
<i>Leptochloa fusca</i> subsp. <i>fascicularis</i>	bearded sprangletop					x				
<i>Leptosiphon parviflorus</i>	common linanthus					x				
<i>Leptosiphon pygmaeus</i> subsp. <i>continentalis</i>	pygmy linanthus						x			

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Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
<i>Lessingia pectinata</i> var. <i>pectinata</i>	common lessingia				x	x	x	x		
<i>Limonium sinuatum</i>	wavyleaf sea-lavender, statice						x			
<i>Lithophragma species</i>	woodland star						x			
<i>Logfia gallica</i>	narrow-leaved filago				x	x	x	x	x	x
<i>Logfia filaginoides</i>	California filago				x	x	x	x	x	
<i>Lomatium parvifolium</i>	coastal biscuitroot		4.2		x		x		x	
<i>Lupinus bicolor</i>	miniature lupine				x		x			
<i>Lupinus concinnus</i>	elegant lupine					x	x			
<i>Lupinus nanus</i>	sky lupine				x	x	x	x		
<i>Lupinus truncatus</i>	blunt-leaved lupine					x	x		x	
<i>Luzula comosa</i>	Pacific wood rush						x	x		
<i>Lysimachia (Centunculus) minima</i>	chaff weed						x			
<i>Lythrum hyssopifolium</i>	hyssop-leaved loosestrife			lim			x			
<i>Madia exigua</i>	small tarplant				x	x	x			
<i>Madia gracilis</i>	grassy tarweed							x		
<i>Madia sativa</i>	coast tarplant							x		
<i>Malva pseudolavatera</i>	Cretan mallow						x			
<i>Malvella leprosa</i>	alkali mallow						x			
<i>Marah fabaceus</i>	wild cucumber				x	x	x			
<i>Medicago polymorpha</i>	bur-clover			lim			x			
<i>Melica imperfecta</i>	Coast Range melic				x	x	x			
<i>Melilotus indicus</i>	yellow sweet-clover					x	x		x	
<i>Micropus californicus</i> var. <i>californicus</i>	cottontop				x					
<i>Mimulus cardinalis</i>	scarlet monkeyflower					x				
<i>Monardella sinuata</i> subsp. <i>nigrescens</i>	northern curly-leaved monardella		4.2		x	x				
<i>Monardella villosa</i> subsp. <i>obispoensis</i>	San Luis Obispo coyote mint						x	x		
<i>Muilla maritima</i>	sea muilla							x		
<i>Navarretia hamata</i> subsp. <i>parviloba</i>	hooked navarretia				x	x	x		x	
<i>Navarretia intertexta</i>	needle-leaved navarretia				x		x			
<i>Navarretia squarrosa</i>	skunkweed				x		x	x		
<i>Nemophila menziesii</i>	baby blue-eyes					x				
<i>Nuttallanthus texanus</i>	toad-flax				x	x	x	x	x	

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Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
<i>Orobanche bulbosa</i>	chaparral broomrape				x					
<i>Orobanche californica</i> var. <i>grandis</i>	California broomrape				x					
<i>Orobanche fasciculata</i>	clustered broomrape						x			
<i>Oxalis micrantha</i>	dwarf woodsorrel							x		
<i>Oxalis pilosa</i>	hairy woodsorrel					x				
<i>Papaver californicum</i>	fire poppy						x			
<i>Parapholis incurva</i>	sicklegrass					x				
<i>Pectocarya penicillata</i>	winged combseed				x	x	x	x	x	
<i>Pedicularis densiflora</i>	Indian warrior						x		x	
<i>Petrorhagia dubia</i>	hairypink				x	x	x	x		
<i>Phacelia campanularia</i>	desert bluebells					x				
<i>Phacelia distans</i>	wild heliotrope				x					
<i>Phacelia douglasii</i>	Douglas' phacelia				x	x				
<i>Phacelia malvifolia</i>	stinging phacelia							x		
<i>Phacelia ramosissima</i>	branching phacelia								x	
<i>Piperia michaelii</i>	Michael's rein-orchid		4.2		x		x		x	
<i>Plagiobothrys canescens</i>	valley popcorn flower							x		
<i>Plagiobothrys collinus</i> var. <i>fulvescens</i>	rusty-haired popcorn flower				x	x				
<i>Plantago coronopus</i>	cut-leaved plantain				x		x	x	x	
<i>Plantago erecta</i>	California plantain				x	x	x	x	x	
<i>Plantago lanceolata</i>	English plantain			lim			x			
<i>Poa annua</i>	annual bluegrass					x				
<i>Poa howellii</i>	Howell's bluegrass						x			
<i>Poa secunda</i>	one-sided bluegrass, pine bluegrass				x			x		x
<i>Pogogyne serpylloides</i>	thymeleaf mesamint						x	x		
<i>Polycarpon depressum</i>	California polycarp						x			
<i>Polygala californica</i>	California milkwort						x			
<i>Polypogon interruptus</i>	ditch beard grass					x				
<i>Polypogon monspeliensis</i>	rabbitsfoot grass			lim		x	x			
<i>Polypogon viridis</i>	water beard grass					x				
<i>Pseudognaphalium beneolens</i>	fragrant everlasting				x	x	x			
<i>Pseudognaphalium californicum</i>	California everlasting				x	x	x		x	

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Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
<i>Pseudognaphalium canescens</i>	white everlasting							x	x	
<i>Pseudognaphalium ramosissimum</i>	pink everlasting				x	x	x	x	x	x
<i>Pseudognaphalium stramineum</i>	cottonbatting plant				x	x	x			
<i>Psilocarphus tenellus</i>	slender woolly marbles					x	x	x	x	
<i>Pterostegia drymarioides</i>	fairy mist				x	x	x	x	x	
<i>Ranunculus californicus</i>	California buttercup							x		
<i>Rumex acetosella</i>	sheep sorrel			mod	x	x	x	x	x	x
<i>Rumex crispus</i>	curly dock			lim			x			
<i>Rumex salicifolius</i> subsp. <i>salicifolius</i>	willow dock						x	x		
<i>Sagina apetela</i>	sticky pearlwort					x				
<i>Sanicula arctopoides</i>	footsteps of spring						x			
<i>Sanicula crassicaulis</i>	Pacific sanicle						x	x		
<i>Sanicula laciniata</i>	coast sanicle						x	x		
<i>Schismus arabicus</i>	Mediterranean grass			lim			x			
<i>Scutellaria tuberosa</i>	scull cap						x	x		
<i>Senecio c.f. aphanactis</i>	chaparral ragwort		2B.2		x					
<i>Senecio glomeratus</i>	cut-leaved fireweed			mod		x	x	x	x	x
<i>Senecio vulgaris</i>	common ragwort					x	x			
<i>Sidalcea malviflora</i> subsp. <i>malviflora</i>	checkerbloom							x		
<i>Silene gallica</i>	windmill pink				x	x	x			
<i>Silybum marianum</i>	milk thistle			lim					x	
<i>Sisymbrium orientale</i>	Indian hedgemustard					x				
<i>Sisyrinchium bellum</i>	blue-eyed grass					x	x			
<i>Solanum americanum</i> (herbaceous)	American nightshade					x				
<i>Solidago californica</i>	California goldenrod							x		
<i>Soliva sessilis</i>	South American soliva						x			
<i>Sonchus asper</i> subsp. <i>asper</i>	prickly sow-thistle				x	x	x	x	x	
<i>Sonchus oleraceus</i>	common sow-thistle				x	x	x	x	x	x
<i>Spiranthes romanzoffiana</i>	hooded ladies tresses						x			
<i>Spergula arvensis</i>	corn spurrey					x		x	x	
<i>Spergularia rubra</i>	red sand-spurrey					x	x			
<i>Stachys bullata</i>	wood mint				x		x			x
<i>Stephanomeria virgata</i> subsp. <i>virgata</i>	tall milk aster							x		

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Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
<i>Stipa cernua</i>	nodding needlegrass				x			x		
<i>Stipa lepida</i>	foothill needlegrass						x	x		
<i>Stipa pulchra</i>	purple needlegrass				x	x	x	x		
<i>Stylocline gnaphaliodes</i>	everlasting neststraw				x	x	x			
<i>Taraxia [Camissonia] ovata</i>	suncups				x	x	x	x		
<i>Thysanocarpus curvipes</i>	lace pod						x			
<i>Toxicoscordion fremontii</i>	Fremont's star lily				x		x		x	
<i>Tribolium obliterum</i> *	cape grass						x			
<i>Trichostema lanceolatum</i>	vinegar weed						x			
<i>Trifolium angustifolium</i>	narrow-leaved crimson clover						x	x		x
<i>Trifolium ciliolatum</i>	foothill clover				x					
<i>Trifolium dubium</i>	shamrock clover						x	x		
<i>Trifolium gracilentum</i>	pinpoint clover				x		x			
<i>Trifolium hirtum</i>	rose clover			mod		x	x	x	x	
<i>Trifolium microcephalum</i>	hairy clover, small-headed clover				x	x		x		
<i>Trifolium wormskoldii</i>	tomcat clover						x			
<i>Triteleia hyacinthina</i>	white brodiaea							x		
<i>Triteleia ixioides</i> subsp. <i>ixioides</i>	golden brodiaea, prettyface						x			
<i>Triglochin scillioides</i>	flowering quillwort						x			
<i>Triodanis perfoliata</i>	Venus' looking-glass						x	x		
<i>Typha domingensis</i>	southern cattail						x			
<i>Uropappus lindleyi</i>	silver puffs				x	x	x	x		
<i>Vicia americana</i> subsp. <i>americana</i>	American vetch						x	x		
<i>Vicia sativa</i> var. <i>nigra</i>	narrow-leaved vetch						x			
<i>Viola</i> cultivar	pansy					x				
<i>Viola pedunculata</i>	Johnny jump-ups						x	x		
<i>Zeltnera davyi</i>	Davy's centaury						x			

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Observed Plant Species in Munitions Response Areas 2008-2017

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Ferns and Fern-relatives										
<i>Dryopteris arguta</i>	coastal wood fern						x	x		
<i>Pellea mucronata</i> var. <i>mucronata</i>	bird's nest fern						x			
<i>Pentagramma triangularis</i> subsp. <i>triangularis</i>	goldenback fern						x	x		
<i>Pteridium aquilinum</i> var. <i>pubescens</i>	western bracken fern				x		x	x	x	

Notes:

Native species in bold

Species and locations noted in this table are for work areas, including monitoring areas and ingress/egress routes; this is not a comprehensive list

Status Codes:

California Native Plant Society (CNPS)

Rare Plant Rank (RPR)

RPR 1B: Plants Rare, Threatened, or Endangered in California and Elsewhere

RPR 2A: Plants Presumed Extirpated in California, but More Common Elsewhere

RPR 2B: Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere

RPR 3: Plants About Which More Information is Needed - A Review List

RPR 4: Plants of Limited Distribution - A Watch List

Extensions to List Categories

0.1 - Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)

0.2 – Moderately threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)

0.3 – Not very threatened in California (<20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

California Invasive Plant Council (Cal-IPC) ratings:

- high – severe ecological impacts, high rates of dispersal and establishment.
- moderate (mod) – substantial and apparent ecological impacts , moderate to high rates of dispersal, establishment dependent upon
- limited (lim) – invasive but impacts not widespread statewide, low to moderate rates of dispersal, may be locally persistent and

Table 3-2
Observed Wildlife Species in Munitions Response Areas 2008 - 2017

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Scientific Name	Common Name	HMP species	IAR MRA Range 44	IAR MRA Range 47	IAR MRA	FEG MRA	Parker Flats MRA	Seaside MRA	County North MRA
MAMMALS									
<i>Canis latrans</i>	Coyote		x	x	x	x	x	x	x
<i>Dipodomys heermanni</i>	Heermann's kangaroo rat							x	
<i>Lepus californicus</i>	Black-tailed jackrabbit		x	x	x	x	x	x	x
<i>Lynx rufus</i>	Bobcat		x	x	x	x	x	x	x
<i>Mus musculus</i>	House mouse				x				
<i>Neotoma fuscipes</i>	Dusky-footed wood rat		x		x	x	x	x	
<i>Odocoileus hemionus</i>	Mule deer		x	x	x	x	x	x	x
<i>Procyon lotor</i>	Raccoon					x		x	
<i>Sorex ornatus salarius</i>	Monterey ornate shrew	x							
<i>Spermophilus beecheyi</i>	California ground squirrel							x	
<i>Sylvilagus audubonii</i>	Desert cottontail		x	x				x	
<i>Sylvilagus bachmani</i>	Brush rabbit							x	
<i>Thomomys bottae</i>	Botta's pocket gopher			x				x	
<i>Urocyon cinereoargenteus</i>	Gray fox					x		x	
REPTILES AND AMPHIBIANS									
<i>Ambystoma californiense</i>	California tiger salamander	x				x			
<i>Aneides lugubris</i>	Arboreal salamander				x				
<i>Anniella pulchra nigra</i>	California black legless lizard	x	x				x		
<i>Bufo boreas</i>	Western toad					x			
<i>Crotalus oreganus oreganus</i>	Northern Pacific rattlesnake		x	x	x	x	x		
<i>Ensatina eschscholtzii eschscholtzii</i>	Monterey ensatina		x		x				
<i>Lampropeltis getulus</i>	Common kingsnake					x			
<i>Phrynosoma blainvillii</i>	coast horned lizard		x	x	x	x			
<i>Pituophis melanoleucus</i>	Gopher snake		x	x	x	x	x		
<i>Pseudacris regilla</i>	Pacific treefrog					x			
<i>Rana catesbeiana</i>	Bullfrog					x			
<i>Sceloporus occidentalis</i>	Western fence lizard		x	x	x	x	x	x	x
<i>Thamnophis sirtalis</i>	Common garter snake					x			
<i>Uta stansburiana</i>	Side-blotched lizard							x	

Table 3-2
Observed Wildlife Species in Munitions Response Areas 2008 - 2017

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Scientific Name	Common Name	HMP species	IAR MRA Range 44	IAR MRA Range 47	IAR MRA	FEG MRA	Parker Flats MRA	Seaside MRA	County North MRA
BIRDS									
<i>Accipiter cooperii</i>	Cooper's hawk					x		x	
<i>Amphispiza belli</i>	Bell's sage sparrow			x				x	
<i>Anas platyrhynchos</i>	Mallard duck					x			
<i>Aphelocoma californica</i>	Western scrub jay		x	x	x	x	x	x	
<i>Asio otus</i>	Long-eared owl			x					
<i>Baeolophus inornatus</i>	Oak titmouse					x		x	
<i>Buteo lineatus</i>	Red-shouldered hawk					x			
<i>Buteo jamaicensis</i>	Red-tailed hawk		x	x	x	x	x	x	
<i>Callipepla californica</i>	California quail		x	x	x	x	x	x	
<i>Calypte anna</i>	Anna's hummingbird		x	x	x	x	x	x	
<i>Carduelis psaltria</i>	Lesser goldfinch		x	x	x	x	x		
<i>Carpodacus mexicanus</i>	House finch					x		x	
<i>Carpodacus purpureus</i>	Purple finch					x			
<i>Cathartes aura</i>	Turkey vulture		x	x	x	x			
<i>Chamaea fasciata</i>	Wrentit		x	x	x	x	x	x	
<i>Charadrius alexandrinus nivosus</i>	Western snowy plover	x							
<i>Charadrius vociferus</i>	Killdeer		x	x	x	x	x		
<i>Circus cyaneus</i>	Northern harrier		x	x	x				
<i>Colaptes auratus</i>	Northern flicker		x		x	x		x	
<i>Corvus brachyrhynchos</i>	American crow		x	x	x	x	x	x	x
<i>Dendroica coronata</i>	Yellow-rumped warbler							x	
<i>Dendroica occidentalis</i>	Hermit warbler							x	
<i>Dendroica townsendi</i>	Townsend's warbler							x	
<i>Empidonax difficilis</i>	Pacific-slope flycatcher					x			
<i>Falco sparverius</i>	American kestrel		x	x	x	x	x		
<i>Gallinago gallinago</i>	Common snipe					x			
<i>Geococcyx californianus</i>	Greater roadrunner		x	x	x				
<i>Hirundo rustica</i>	Barn swallow		x	x	x	x			
<i>Junco hyemalis</i>	Dark-eyed junco					x		x	
<i>Lanius ludovicianus</i>	Loggerhead shrike							x	
<i>Meleagris gallapavo</i>	Wild turkey					x	x		

Table 3-2
Observed Wildlife Species in Munitions Response Areas 2008 - 2017

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	HMP species	IAR MRA Range 44	IAR MRA Range 47	IAR MRA	FEG MRA	Parker Flats MRA	Seaside MRA	County North MRA
BIRDS									
<i>Mimus polyglottos</i>	Northern mockingbird							x	
<i>Myiarchus cinerascens</i>	Ash-throated flycatcher					x			
<i>Petrochelidon pyrrhonota</i>	Cliff swallow					x			
<i>Phalacrocorax auritus</i>	Double-crested cormorant								
<i>Phalaenoptilus nuttallii</i>	Common poorwill					x			
<i>Phalaropus lobatus</i>	Red-necked phalarope					x			
<i>Picoides nuttallii</i>	Nuttall's woodpecker							x	
<i>Pipilo crissalis</i>	California towhee		x	x	x	x		x	
<i>Pipilo maculatus</i>	Spotted towhee		x		x	x		x	
<i>Poecile rufescens</i>	Chestnut-backed chickadee							x	
<i>Psaltiriparus minimus</i>	Bushtit					x		x	
<i>Sayornis saya</i>	Say's phoebe							x	
<i>Sturnella neglecta</i>	Western meadowlark							x	
<i>Tachycineta bicolor</i>	Tree swallow							x	
<i>Thryomanes bewickii</i>	Bewick's wren					x		x	
<i>Toxostoma redivivum</i>	California thrasher		x	x	x			x	
<i>Vireo huttoni</i>	Hutton's vireo					x		x	
<i>Vermivora ruficapilla</i>	Nashville warbler								
<i>Zenaida macroura</i>	Mourning dove		x	x	x	x	x	x	
<i>Zonotrichia atricapilla</i>	Golden-crowned sparrow							x	
INVERTEBRATES									
<i>Linderiella occidentalis</i>	California linderiella	x				x			

Table 3-3
Future East Garrison MRA Grenade Range
Observed Plant Species in or Around Aquatic Features
2011-2017

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Wetland Indicator Status ¹	Aquatic Features		
			AF09-1	AF09-1B	AF09-2
<i>Acmispon glaber</i>	deerweed	NL	x	x	x
<i>Agrostis exarata</i> var. <i>pacifica</i>	spike bentgrass	FACW	x		x
<i>Aira caryophyllea</i>	common silver-hair grass	FACU			x
<i>Alopecurus saccatus</i>	Pacific foxtail	OBL	x		
<i>Anagallis arvensis</i>	scarlet pimpernel	NL	x	x	x
<i>Arctostaphylos montereyensis</i>	Toro manzanita	NL			x
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	NL	x	x	x
<i>Briza minor</i>	little rattlesnake grass	NL			x
<i>Bromus diandrus</i>	ripgut brome	NL	x		
<i>Bromus hordeaceus</i>	soft chess	NL	x		
<i>Bromus madritensis</i> subsp. <i>rubens</i>	red brome	NL	x		
<i>Callitriche</i> species	water starwort	OBL	x		
<i>Carex c.f. brevicaulis</i>	short-stemmed sedge	NL		x	
<i>Cicendia quadrangularis</i>	Oregon timwort	FAC			x
<i>Crassula connata</i>	pygmy weed	FAC		x	
<i>Crassula aquatica</i>	water pygmyweed	OBL			x
<i>Deschampsia danthonioides</i>	annual hairgrass	FACW	x		x
<i>Eleocharis acicularis</i> var. <i>acicularis</i>	slender spikerush	OBL	x	x	
<i>Eleocharis bella</i>	beautiful spikerush	FACW	x		x
<i>Eleocharis macrostachya</i>	common spikerush	OBL	x		x
<i>Euthamia occidentalis</i>	western goldenrod	FACW	x		
<i>Festuca myuros</i>	rattail fescue	NL		x	x
<i>Festuca perenne</i>	annual wild rye	NL			x

Table 3-3
Future East Garrison MRA Grenade Range
Observed Plant Species in or Around Aquatic Features
2011-2017

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Wetland Indicator Status ¹	Aquatic Features		
			AF09-1	AF09-1B	AF09-2
<i>Gamochaeta ustulata</i>	purple cudweed	NL	x	x	x
<i>Gastidium phleoides</i>	nit grass	FACU			x
<i>Geranium dissectum</i>	cut-leaved geranium	NL	x		
<i>Helianthemum scoparium</i>	rush-rose	NL			x
<i>Hypochaeris glabra</i>	smooth cat's ear	NL	x		x
<i>Juncus bufonius</i> var. <i>occidentalis</i>	toad rush	FACW	x	x	x
<i>Juncus occidentalis</i>	western rush	FACW	x	x	x
<i>Juncus phaeocephalus</i> var. <i>phaeocephalus</i>	brown-headed rush	FACW	x	x	x
<i>Lasthenia glaberrima</i>	smooth goldfields	OBL			x
<i>Lasthenia gracilis</i>	slender goldfields	NL			x
<i>Lemna minuta</i>	least duckweed	OBL	x		x
<i>Logfia [Filago] gallica</i>	narrow-leaved filago	NL	x	x	x
<i>Luzula comosa</i>	Pacific wood rush	FAC			x
<i>Lysimachia (Centunculus) minima</i>	chaff weed	FACW			x
<i>Lythrum hyssopifolium</i>	hyssop-leaved loosestrife	OBL	x	x	x
<i>Madia exigua</i>	small tarweed	NL	x	x	x
<i>Medicago polymorpha</i>	bur-clover	NL	x		
<i>Navarretia hamata</i> subsp. <i>parviloba</i>	hooked navarretia	NL		x	
<i>Plantago coronopus</i>	cut-leaved plantain	FACW	x		x
<i>Plantago erecta</i>	California plantain	NL	x		x
<i>Polypogon monspeliensis</i>	rabbitsfoot grass	FACW	x	x	x
<i>Psilocarphus brevissimus</i> var. <i>brevissimus</i>	woolly marbles	FACW	x	x	
<i>Psilocarphus tenellus</i>	slender woolly marbles	OBL		x	x
<i>Quercus agrifolia</i>	coast live oak	NL			x

Table 3-3
Future East Garrison MRA Grenade Range
Observed Plant Species in or Around Aquatic Features
2011-2017

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Wetland Indicator Status ¹	Aquatic Features		
			AF09-1	AF09-1B	AF09-2
<i>Rubus ursinus</i>	California blackberry	FACU	x		
<i>Salix lasiolepis</i>	arroyo willow	FACW	x		
<i>Soliva sessilis</i>	South American soliva	FACU	x		
<i>Sonchus asper</i> subsp. <i>asper</i>	prickly sow-thistle	FACU	x		
<i>Spiranthes romanzoffiana</i>	hooded ladies tresses	FACW			x
<i>Triglochin scillioides</i>	flowering quillwort	OBL	x	x	
<i>Tribolium oblitterum</i>	cape grass	NL	x	x	
<i>Typha latifolia</i>	broadleaf cattail	OBL			x

Native species in bold

1. Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. The National Wetland Plant List: 2016 wetland ratings. Phytoneuron 2016-30: 1-17. Published 28 April 2016. ISSN 2153 733X

Wetland indicator status -- OBL: obligate wetland species, occurs almost always in wetlands (99% of time or more); FACW: facultative wetland species, usually occurs in wetlands (66 to 99% of time); FAC: facultative species, equally likely to occur in wetlands or nonwetlands (33 to 66% of time); FACU: facultative upland species, found in wetlands 1 to 33% of the time, but usually found in upland habitats. NL: no listing.

Table 6-1
Future East Garrison MRA
Vegetation Cover in Areas Subject to Vegetation Cutting in 2011

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Baseline Data 2010 - 2011				
		Thirty-nine Transects				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.7%	3.5%	0.9%	0.7%	12.8%
Total Mean Percent Native Tree Cover		0.7%			0.7%	
Shrub and Sub-shrub Species						
<i>Adenostoma fasciculatum</i>	chamise	27.4%	22.4%	6.0%	25.0%	100%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	45.8%	32.3%	8.7%	41.8%	89.7%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	2.2%	4.1%	1.1%	2.0%	48.7%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	14.4%	19.8%	5.3%	13.1%	64.1%
<i>Salvia mellifera</i>	black sage	7.2%	15.5%	4.2%	6.6%	56.4%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.0%	0.1%	0.0%	0.0%	5.1%
<i>Acmispon glaber</i>	deerweed	0.1%	0.4%	0.1%	0.1%	2.6%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	2.1%	4.1%	1.1%	1.9%	59.0%
<i>Crocanthemum scoparium</i>	rush-rose	0.0%	0.0%	0.0%	0.0%	5.1%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.3%	0.1%	0.0%	2.6%
<i>Ceanothus rigidus</i>	Monterey ceanothus	1.5%	2.2%	0.6%	1.4%	48.7%
<i>Toxicodendron diversilobum</i>	poison-oak	0.4%	1.4%	0.4%	0.4%	10.3%
<i>Ceanothus thyrsiflorus</i>	blue blossom	0.3%	1.8%	0.5%	0.3%	5.1%
<i>Garrya elliptica</i>	coast silk tassel	1.5%	3.9%	1.0%	1.4%	28.2%
<i>Artemisia californica</i>	California sagebrush	0.3%	1.4%	0.4%	0.2%	5.1%
<i>Heteromeles arbutifolia</i>	toyon	1.0%	2.7%	0.7%	1.0%	17.9%
<i>Ribes malvaceum</i>	chaparral currant	0.1%	0.6%	0.2%	0.1%	5.1%
<i>Symphoricarpos mollis</i>	creeping snowberry	0.0%	--	--	0.0%	0.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.0%	0.1%	0.0%	0.0%	2.6%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.0%	--	--	0.0%	0.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	1.3%	3.5%	0.9%	1.2%	20.5%
<i>Arctostaphylos hookeri</i>	Hooker's manzanita	0.0%	--	--	0.0%	0.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.7%	3.9%	1.1%	0.6%	5.1%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.0%	0.2%	0.0%	0.0%	2.6%
<i>Quercus wislizenii</i> var. <i>wislizenii</i>	interior live oak	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Rosa gymnocarpa</i> var. <i>gymnocarpa</i>	wood rose	0.0%	--	--	0.0%	0.0%
<i>Rubus ursinus</i>	California blackberry	0.0%	--	--	0.0%	0.0%
<i>Croton californicus</i>	California croton	0.1%	0.3%	0.1%	0.1%	5.1%
<i>Solanum umbelliferum</i>	blue witch nightshade	0.0%	--	--	0.0%	0.0%
Total Mean Percent Native Shrub and Subshrub Cover		106.3%			97.5%	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		2.0%	4.4%	1.2%	--	
Total Mean Cover of Target Weed Species (<i>Carpobrotus edulis</i>)		0.4%	2.7%	0.7%	0.4%	
Total Mean Non-native Herbaceous Species Cover		na	na	na	na	
Total Mean Percent Native Vegetative Cover		109.0%				
Total Bare Ground (Including Masticated Vegetation)		7.1%				
Total Mean Percent Masticated Vegetation		na				
Total Mean Percent Bare Ground		7.1%	10.7%	--	--	84.6%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values reported here.

Table 6-1
Future East Garrison MRA
Vegetation Cover in Areas Subject to Vegetation Cutting in 2011

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2015* (Year 3)				
		24 Transects (in Grid Cells Veg Cut in 2012)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.9%	2.7%	0.9%	1.3%	29.2%
Total Mean Percent Native Tree Cover		0.9%			1.4%	
Shrub and Sub-shrub Species						
<i>Adenostoma fasciculatum</i>	chamise	16.2%	11.3%	4.0%	24.1%	100.0%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	24.4%	15.1%	5.3%	36.3%	95.8%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	2.3%	4.1%	1.4%	3.4%	54.2%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	2.9%	5.3%	1.9%	4.2%	54.2%
<i>Salvia mellifera</i>	black sage	1.8%	4.4%	1.6%	2.6%	45.8%
<i>Eriophyllum confertiflorum</i>	golden yarrow	2.0%	3.7%	1.1%	2.8%	45.8%
<i>Acmispon glaber</i>	deerweed	0.4%	0.9%	0.3%	0.5%	25.0%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	0.0%	--	--	0.0%	87.5%
<i>Crocanthemum scoparium</i>	rush-rose	1.5%	2.4%	0.8%	2.1%	62.5%
<i>Lepechinia calycina</i>	pitcher sage	0.4%	1.2%	0.4%	0.7%	29.2%
<i>Ceanothus rigidus</i>	Monterey ceanothus	0.5%	0.9%	0.3%	0.8%	54.2%
<i>Toxicodendron diversilobum</i>	poison-oak	0.6%	1.7%	0.6%	0.8%	25.0%
<i>Ceanothus thyrsiflorus</i>	blue blossom	0.4%	1.7%	0.6%	0.6%	8.3%
<i>Garrya elliptica</i>	coast silk tassel	0.5%	1.6%	0.6%	0.8%	16.7%
<i>Artemisia californica</i>	California sagebrush	0.1%	0.4%	0.1%	0.1%	4.2%
<i>Heteromeles arbutifolia</i>	toyon	1.1%	3.0%	1.1%	1.6%	16.7%
<i>Ribes malvaceum</i>	chaparral currant	0.2%	0.7%	0.2%	0.3%	20.8%
<i>Symphoricarpos mollis</i>	creeping snowberry	0.3%	1.1%	0.4%	0.4%	6.7%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.0%	0.1%	0.1%	0.1%	8.3%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.0%	--	--	0.0%	8.3%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.5%	1.1%	0.4%	0.7%	20.8%
<i>Arctostaphylos hookeri</i>	Hooker's manzanita	0.0%	--	--	0.0%	0.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.1%	0.3%	0.1%	0.1%	4.2%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Quercus wislizenii</i> var. <i>wislizenii</i>	interior live oak	3.1%	3.5%	1.2%	4.7%	4.2%
<i>Rosa gymnocarpa</i> var. <i>gymnocarpa</i>	wood rose	0.0%	--	--	0.0%	4.2%
<i>Rubus ursinus</i>	California blackberry	0.7%	3.2%	1.1%	1.0%	4.2%
<i>Croton californicus</i>	California croton	0.0%	--	--	0.0%	0.0%
<i>Solanum umbelliferum</i>	blue witch nightshade	0.0%	--	--	0.0%	0.0%
Total Mean Percent Native Shrub and Subshrub Cover		59.7%			94.9%	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		2.3%	2.4%	0.8%	3.4%	
Total Mean Cover of Target Weed Species (<i>Carpobrotus edulis</i>)		1.0%	4.2%	1.5%	1.5%	
Total Mean Non-native Herbaceous Species Cover		4.9%	7.5%	2.6%	7.2%	
Total Mean Percent Native Vegetative Cover		62.9%				
Total Bare Ground (Including Masticated Vegetation)		38.3%				
Total Mean Percent Masticated Vegetation		19.2%	11.6%	4.1%		95.8%
Total Mean Percent Bare Ground		19.1%	13.2%	4.6%		87.5%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values reported here.

Table 6-1
Future East Garrison MRA
Vegetation Cover in Areas Subject to Vegetation Cutting in 2011

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2016 (Year 5)				
		23 Transects (in Grid Cells Veg Cut in 2011)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.8%	2.5%	0.9%	0.8%	26.1%
Total Mean Percent Native Tree Cover		0.8%			0.9%	
Shrub and Sub-shrub Species						
<i>Adenostoma fasciculatum</i>	chamise	12.8%	11.6%	4.2%	12.5%	91.3%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	29.4%	21.9%	7.8%	28.5%	87.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	2.6%	4.1%	1.5%	2.5%	56.5%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	2.8%	6.9%	2.5%	2.7%	34.8%
<i>Salvia mellifera</i>	black sage	6.6%	9.2%	3.3%	6.4%	56.5%
<i>Eriophyllum confertiflorum</i>	golden yarrow	1.1%	1.2%	0.4%	1.1%	73.9%
<i>Acmispon glaber</i>	deerweed	3.6%	7.5%	2.7%	3.5%	43.5%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	2.5%	2.9%	1.0%	2.4%	69.6%
<i>Crocanthemum scoparium</i>	rush-rose	2.3%	3.0%	1.1%	2.3%	87.0%
<i>Lepechinia calycina</i>	pitcher sage	0.5%	1.2%	0.4%	0.5%	30.4%
<i>Ceanothus rigidus</i>	Monterey ceanothus	0.6%	1.3%	0.5%	0.6%	39.1%
<i>Toxicodendron diversilobum</i>	poison-oak	1.0%	2.3%	0.8%	0.9%	30.4%
<i>Ceanothus thyrsiflorus</i>	blue blossom	0.0%	--	--	0.0%	0.0%
<i>Garrya elliptica</i>	coast silk tassel	0.4%	0.7%	0.3%	0.4%	26.1%
<i>Artemisia californica</i>	California sagebrush	0.0%	--	--	0.0%	0.0%
<i>Heteromeles arbutifolia</i>	toyon	0.8%	1.6%	0.6%	0.8%	30.4%
<i>Ribes malvaceum</i>	chaparral currant	0.0%	0.2%	0.1%	0.0%	4.3%
<i>Symphoricarpos mollis</i>	creeping snowberry	1.0%	3.4%	1.2%	1.0%	17.4%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.7%	1.7%	0.6%	0.7%	30.4%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.0%	--	--	0.0%	0.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	2.2%	4.0%	1.4%	2.1%	34.8%
<i>Arctostaphylos hookeri</i>	Hooker's manzanita	0.0%	--	--	0.0%	0.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.9%	2.9%	1.0%	0.9%	13.0%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.1%	0.2%	0.1%	0.1%	8.7%
<i>Quercus wislizenii</i> var. <i>wislizenii</i>	interior live oak	0.0%	--	--	0.0%	0.0%
<i>Rosa gymnocarpa</i> var. <i>gymnocarpa</i>	wood rose	0.1%	0.6%	0.2%	0.1%	4.3%
<i>Rubus ursinus</i>	California blackberry	0.9%	4.0%	1.4%	0.9%	13.0%
<i>Croton californicus</i>	California croton	0.0%	--	--	0.0%	0.0%
<i>Solanum umbelliferum</i>	blue witch nightshade	0.0%	--	--	0.0%	4.3%
Total Mean Percent Native Shrub and Subshrub Cover		73.1%			84.9%	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		12.3%	15.3%	5.5%	11.9%	
Total Mean Cover of Target Weed Species (<i>Carpobrotus edulis</i>)		1.3%	3.3%	1.2%	1.2%	
Total Mean Non-native Herbaceous Species Cover						
Total Mean Percent Native Vegetative Cover		86.2%				
Total Bare Ground (Including Masticated Vegetation)		21.3%				
Total Mean Percent Masticated Vegetation		11.7%	9.9%	3.5%		78.3%
Total Mean Percent Bare Ground		9.6%	7.3%	2.6%		96%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values reported here.

Table 6-1
Future East Garrison MRA
Vegetation Cover in Areas Subject to Vegetation Cutting in 2011

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2017 (Year 5)				
		17 Transects (in Grid Cells Veg Cut in 2012)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	2.4%	4.3%	1.8%	2.5%	35%
Total Mean Percent Native Tree Cover		2.4%			3.0%	
Shrub and Sub-shrub Species						
<i>Adenostoma fasciculatum</i>	chamise	24.3%	15.2%	6.4%	26.0%	94.1%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	22.7%	15.3%	6.5%	24.3%	94.1%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	5.2%	7.7%	3.3%	5.5%	76.5%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	5.0%	5.1%	2.1%	5.3%	88.2%
<i>Salvia mellifera</i>	black sage	3.9%	7.2%	3.1%	4.2%	70.6%
<i>Eriophyllum confertiflorum</i>	golden yarrow	2.8%	5.2%	2.2%	3.0%	58.8%
<i>Acmispon glaber</i>	deerweed	2.5%	5.7%	2.4%	2.7%	47.1%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	2.1%	2.6%	1.1%	2.3%	88.2%
<i>Crocanthemum scoparium</i>	rush-rose	1.2%	1.4%	0.6%	1.2%	76.5%
<i>Lepechinia calycina</i>	pitcher sage	0.8%	1.6%	0.7%	0.9%	58.8%
<i>Ceanothus rigidus</i>	Monterey ceanothus	0.7%	0.8%	0.3%	0.8%	76.5%
<i>Toxicodendron diversilobum</i>	poison-oak	0.7%	1.5%	0.6%	0.7%	29.4%
<i>Ceanothus thyrsiflorus</i>	blue blossom	0.6%	2.2%	0.9%	0.7%	17.6%
<i>Garrya elliptica</i>	coast silk tassel	0.6%	1.5%	0.7%	0.6%	17.6%
<i>Artemisia californica</i>	California sagebrush	0.5%	2.1%	0.9%	0.5%	5.9%
<i>Heteromeles arbutifolia</i>	toyon	0.3%	0.8%	0.4%	0.4%	23.5%
<i>Ribes malvaceum</i>	chaparral currant	0.3%	0.6%	0.3%	0.3%	35.3%
<i>Symphoricarpos mollis</i>	creeping snowberry	0.2%	0.6%	0.3%	0.2%	11.8%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.1%	0.3%	0.1%	0.1%	23.5%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.0%	0.2%	0.1%	0.1%	11.8%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	0.0%	0.0%	0.0%	5.9%
<i>Arctostaphylos hookeri</i>	Hooker's manzanita	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Quercus wislizenii</i> var. <i>wislizenii</i>	interior live oak	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Rosa gymnocarpa</i> var. <i>gymnocarpa</i>	wood rose	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Rubus ursinus</i>	California blackberry	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Croton californicus</i>	California croton	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Solanum umbelliferum</i>	blue witch nightshade	0.0%	0.0%	0.0%	0.0%	0.0%
Total Mean Percent Native Shrub and Subshrub Cover		74.5%			96.3%	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		0.5%	2.1%	0.9%	0.6%	
Total Mean Cover of Target Weed Species (<i>Carpobrotus edulis</i>)		0.3%	0.7%	0.3%	0.3%	
Total Mean Non-native Herbaceous Species Cover		12.8%				
Total Mean Percent Native Vegetative Cover		77.4%				
Total Bare Ground (Including Masticated Vegetation)		17.7%				
Total Mean Percent Masticated Vegetation		8.7%	5.7%	2.4%		94.1%
Total Mean Percent Bare Ground		9.1%	5.9%	2.5%		100.0%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values reported here.

Table 6-2
Future East Garrison MRA
Vegetation Cover in Areas Subject to Small-scale Excavation Conducted in 2012

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Baseline Data 2012				
		Two Transects in Small-scale Excavation in 2012				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	37.2%	15.6%	69.5%	46.6%	100%
Total Mean Percent Native Tree Cover		37.2%			46.6%	
Shrub and Sub-Shrub Species						
<i>Acniphon glaber</i>	deerweed	2.1%	1.8%	8.0%	2.6%	100%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	11.3%	14.7%	65.7%	14.1%	100%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	2.6%	3.4%	15.2%	3.3%	100%
<i>Rubus ursinus</i>	California blackberry	12.1%	6.3%	28.2%	15.2%	100%
<i>Adenostoma fasciculatum</i>	chamise	1.1%	1.5%	6.8%	1.4%	50%
<i>Heteromeles arbutifolia</i>	toyon	0.0%	--	--	0.0%	0%
<i>Toxicodendron diversilobum</i>	poison-oak	1.8%	1.5%	6.7%	2.3%	100%
<i>Crocanthemum scoparium</i>	rush-rose	0.0%	0.0%	0.0%	0.0%	0%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	3.5%	1.6%	7.1%	4.4%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	2.7%	1.1%	5.1%	3.4%	100%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	0.0%	0.0%	0.0%	0.0%	0%
<i>Salvia mellifera</i>	black sage	0.0%	0.0%	0.0%	0.0%	0%
<i>Garrya elliptica</i>	coast silk tassel	0.0%	--	--	0.0%	0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.0%	--	--	0.0%	0%
Total Mean Percent Native Shrub and Subshrub Cover		37.1%			46.6%	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		5.4%	6.3%	28.2%	15.2%	100%
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		0.0%	0.0%	0.0%	0.0%	0%
Total Mean Non-native Herbaceous Species Cover		na	na	na	na	na
Total Mean Percent Native Vegetative Cover		79.8%				
Total Bare Ground (Including Masticated Vegetation)		61.8%	23.2%	--		
Total Mean Percent Masticated Vegetation		--	--			
Total Mean Percent Bare Ground		61.8%	23.2%	--		100%

HMP Species in Bold

Table 6-2
Future East Garrison MRA
Vegetation Cover in Areas Subject to Small-scale Excavation Conducted in 2012

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2015 (Year 3)				
		Two Transects in Small-scale Excavation in 2012				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	12.3%	15.8%	70.6%	21.6%	100.0%
Total Mean Percent Native Tree Cover		12.3%			27.9%	
Shrub and Sub-Shrub Species						
<i>Acropson glaber</i>	deerweed	11.3%	9.7%	3.0%	19.9%	100%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	6.8%	0.3%	0.1%	12.0%	100%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.8%	1.1%	0.3%	1.4%	50%
<i>Rubus ursinus</i>	California blackberry	0.6%	0.0%	0.1%	1.1%	100%
<i>Adenostoma fasciculatum</i>	chamise	0.5%	0.8%	0.2%	0.9%	50%
<i>Heteromeles arbutifolia</i>	toyon	0.3%	0.4%	0.1%	0.5%	50%
<i>Toxicodendron diversilobum</i>	poison-oak	1.0%	1.5%	6.6%	1.8%	50%
<i>Crocanthemum scoparium</i>	rush-rose	1.7%	0.2%	0.7%	3.1%	100%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	0.9%	0.6%	2.8%	1.7%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	4.0%	5.4%	1.7%	7.0%	100%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	0.2%	0.2%	0.1%	0.4%	100%
<i>Salvia mellifera</i>	black sage	0.1%	0.2%	0.7%	0.2%	50%
<i>Garrya elliptica</i>	coast silk tassel	0.8%	1.1%	0.3%	1.4%	50%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.0%	0.1%	0.0%	0.1%	50%
Total Mean Percent Native Shrub and Subshrub Cover		29.1%			66.4%	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		2.5%	2.4%	10.9%	4.4%	100%
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		1.6%	2.2%	0.7%	2.8%	50%
Total Mean Non-native Herbaceous Species Cover		14.6%	15.3%	68.5%	25.0%	100%
Total Mean Percent Native Vegetative Cover		43.9%				
Total Bare Ground (Including Masticated Vegetation)		41.5%				
Total Mean Percent Masticated Vegetation		6.1%	4.8%	21.3%	--	100%
Total Mean Percent Bare Ground		35.4%	0.0%	0.0%	--	100%

HMP Species in Bold

Table 6-2
Future East Garrison MRA
Vegetation Cover in Areas Subject to Small-scale Excavation Conducted in 2012

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2017 (Year 5)				
		Two Transects in Small-scale Excavation in 2012				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	20.9%	29.5%	131.6%	23.5%	50.0%
Total Mean Percent Native Tree Cover		20.9%			32.3%	
Shrub and Sub-Shrub Species						
<i>Acniphon glaber</i>	deerweed	16.0%	15.1%	67.2%	18.0%	100%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	8.4%	9.7%	43.2%	9.4%	100%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	3.1%	4.1%	18.3%	3.5%	100%
<i>Rubus ursinus</i>	California blackberry	2.8%	2.5%	11.4%	3.2%	100%
<i>Adenostoma fasciculatum</i>	chamise	2.8%	3.9%	17.4%	3.1%	50%
<i>Heteromeles arbutifolia</i>	toyon	2.6%	3.7%	16.4%	2.9%	50%
<i>Toxicodendron diversilobum</i>	poison-oak	2.0%	2.8%	12.6%	2.3%	50%
<i>Crocanthemum scoparium</i>	rush-rose	1.5%	1.6%	7.3%	1.6%	100%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	1.3%	1.6%	6.9%	1.5%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	1.1%	0.5%	2.2%	1.2%	100%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	0.6%	0.8%	3.8%	0.7%	50%
<i>Salvia mellifera</i>	black sage	0.3%	0.4%	1.9%	0.3%	50%
<i>Garrya elliptica</i>	coast silk tassel	0.0%	0.0%	0.0%	0.0%	0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.0%	0.0%	0.0%	0.0%	0%
Total Mean Percent Native Shrub and Subshrub Cover		42.3%			65.4%	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		1.5%	2.1%	9.5%	2.3%	100%
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		0.0%				
Total Mean Non-native Herbaceous Species Cover		22.4%				
Total Mean Percent Native Vegetative Cover		64.6%				
Total Bare Ground (Including Masticated Vegetation)		19.0%				
Total Mean Percent Masticated Vegetation		0.0%	0.0%	0.0%	--	0%
Total Mean Percent Bare Ground		19.0%	7.1%	31.9%	--	100%

HMP Species in Bold

Table 6-3
Future East Garrison MRA
2017 Species Richness and Diversity

ESCA RP 2017 Annual Natural Resource Report

Future East Garrison MRA										
	Vegetation Cutting in Central Maritime Chaparral					Small-scale Excavation in Oak Woodland				
Activity Year	Baseline (2011)	Year 3 (2014)	Year 3 with surrounding species included (2014)	Year 5 (2017)	Year 5 with surrounding species included (2017)	Baseline (2012)	Year 3 (2015)	Year 3 with surrounding species included (2015)	Year 5 (2017)	Year 5 with surrounding species included (2017)
Number of Transects/Quadrats	39 Transects	17 Transects and 18 Quadrats		17 transects		2 Transects	2 Transects and 6 Quadrats		2 Transects	
Total Number of Native Species	25	28	94	68	99	14	25	38	30	41
Total Number of HMP Species Present	3	3	5	2	5	0	1	1	2	3
Total Number of HMP Herbaceous Species Present	0	0	2	0	2	0	0	0	0	0
Total Native Tree Species in All Transects	1	1	1	1	1	1	1	1	1	1
Total Shrub Species in All Transects	22	22	27	22	29	11	15	17	17	18
Total Native Herbaceous Species in All Transects or Related Herbaceous Plots	1	5	64	46	68	1	9	20	12	22
Total Native Ferns and Fern Allies in All Transects or Related Herbaceous Plots	1	0	2	1	2	0	0	0	0	0
Mean Number Tree Species per Transect	0.1	0.3	0.6	0.4	0.6	0.5	1.0	1.0	0.5	1.0
Mean Number Shrub Species per Transect	5.7	8.4	11.6	9.6	11.7	5.5	10.5	13.0	12.0	14.0
Mean Number of Native Herbaceous Species in All Transects or Related Herbaceous Plots	0.05	0.3	10.7	6.9	10.8	0.0	5.0	14.0	6.5	11.0
Mean number of Native Ferns and Fern Allies per Transect	0.1	0.0	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Diversity - Shannon Index	1.1	1.5	--	1.4	--	1.5	1.6	--	1.4	--
Evenness	0.2	0.2	--	0.2	--	0.2	0.1	--	0.1	--
Total Percent Mean Native Cover (Transects)	109.0%	66.5%	--	77.4%	--	79.8%	43.9%	--	64.6%	--
Total Percent Mean Native Shrub Cover (Transects)	106.3%	57.8%	--	74.5%	--	37.1%	29.1%	--	42.3%	--
Total Percent Mean Native Herbaceous Species Cover (Transects)	2.0%	8.4%	--	0.5%	--	5.4%	2.5%	--	1.5%	--
Total Percent Mean Native Cover (Herbaceous Quadrats)	0% ¹	6.3%	--	--	--	0% ¹	15.5%	--	--	--

¹Quadrat data were not collected in baseline, due to lack of herbaceous cover

Table 6-4
Parker Flats MRA Phase II
Vegetation Cover in Areas Subject to Vegetation Cutting in 2009 in Central Maritime Chaparral

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Baseline Data 2008				
		Eight Transects Central Maritime Chaparral in Cut Vegetation				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.9%	2.5%	1.7%	0.8%	12.5%
Total Mean Percent Native Tree Cover		0.9%			0.8%	
<i>Adenostoma fasciculatum</i>	chamise	37.2%	30.5%	20.4%	32.5%	88%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	56.7%	22.8%	15.3%	49.5%	100.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.9%	1.7%	1.2%	0.7%	25.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	1.2%	2.2%	1.5%	1.0%	37.5%
<i>Salvia mellifera</i>	black sage	6.2%	8.6%	5.8%	5.4%	75.0%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	0.0%	--	--	--	0.0%
<i>Heteromeles arbutifolia</i>	toyon	0.6%	1.2%	0.8%	0.5%	25.0%
<i>Symphoricarpus mollis</i>	creeping snowberry	0.0%	--	--	--	0.0%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.1%	0.3%	0.2%	0.1%	12.5%
<i>Acmipson glaber</i>	deerweed	0.0%	--	--	--	0.0%
<i>Ceanothus thyrsiflorus</i>	blue blossom	0.7%	2.1%	1.4%	0.6%	12.5%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.0%	--	--	--	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	--	0.0%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	3.5%	6.9%	4.6%	3.1%	25.0%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	0.0%	--	--	--	0.0%
<i>Artemisia californica</i>	California sagebrush	0.0%	--	--	--	0.0%
<i>Eriodictyon californicum</i>	California yerba santa	0.0%	--	--	--	0.0%
<i>Ribes malvaceum</i>	chaparral currant	0.0%	--	--	--	0.0%
Total Mean Percent Native Shrub and Subshrub Cover		107.0%			97.0%	
Total Combined Mean Cover Between Shrubs and Subshrubs		2.5%	7.0%	4.7%	2.2%	12.5%
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		0.0%	--	--	--	0..0%
Total Mean Percent Native Vegetative Cover		110.3%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)*		4.2%				
Total Mean Percent Masticated Vegetation (Calculated Beginning in 2014)*		--	--	--	--	--
Total Mean Percent Bare Ground*		4.2%	4.7%	3.2%	--	75.0%

HMP Species in Bold

*Calculation and reporting error found in 2017; updated values shown

Table 6-4
Parker Flats MRA Phase II
Vegetation Cover in Areas Subject to Vegetation Cutting in 2009 in Central Maritime Chaparral

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2012 (Year 3)				
		Eight Transects Central Maritime Chaparral in Cut Vegetation				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.1%	0.1%	0.1%	0.1%	25.0%
Total Mean Percent Native Tree Cover		0.1%			0.1%	
<i>Adenostoma fasciculatum</i>	chamise	37.4%	25.2%	16.9%	33.7%	88%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	39.1%	24.6%	16.5%	35.2%	100.0%
<i>Toxicodendron diversilobum</i>	poison-oak	1.3%	3.5%	2.4%	1.2%	25.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	1.7%	3.5%	2.3%	1.6%	62.5%
<i>Salvia mellifera</i>	black sage	3.7%	7.2%	4.8%	3.3%	62.5%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	1.0%	1.6%	1.0%	0.9%	37.5%
<i>Heteromeles arbutifolia</i>	toyon	0.9%	2.5%	1.6%	0.8%	12.5%
<i>Symphorocarpus mollis</i>	creeping snowberry	0.0%	--	--	--	0.0%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.5%	1.4%	0.9%	0.5%	25.0%
<i>Acmipson glaber</i>	deerweed	2.7%	2.4%	1.6%	2.4%	75.0%
<i>Ceanothus thyrsiflorus</i>	blue blossom	0.2%	0.7%	0.4%	0.2%	12.5%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.2%	0.4%	0.3%	0.2%	25.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	--	0.0%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	0.0%	--	--	--	0.0%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	0.3%	0.9%	0.6%	0.3%	12.5%
<i>Artemisia californica</i>	California sagebrush	0.0%	--	--	--	0.0%
<i>Eriodictyon californicum</i>	California yerba santa	0.0%	--	--	--	0.0%
<i>Ribes malvaceum</i>	chaparral currant	0.0%	0.1%	0.0%	0.0%	12.5%
Total Mean Percent Native Shrub and Subshrub Cover		89.1%			98.2%	
Total Combined Mean Cover Between Shrubs and Subshrubs		1.6%	4.3%	2.9%	1.4%	25.0%
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		0.0%	--	--	--	0.0%
Total Mean Percent Native Vegetative Cover		90.7%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)*		20.4%				
Total Mean Percent Masticated Vegetation (Calculated Beginning in 2014)*		--	--	--	--	--
Total Mean Percent Bare Ground*		20.4%	6.6%	4.4%	--	100.0%

HMP Species in Bold

*Calculation and reporting error found in 2017; updated values shown

Table 6-4
Parker Flats MRA Phase II
Vegetation Cover in Areas Subject to Vegetation Cutting in 2009 in Central Maritime Chaparral

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2014 (Year 5)				
		Eight Transects Central Maritime Chaparral in Cut Vegetation				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.7%	1.3%	0.9%	0.8%	25.0%
Total Mean Percent Native Tree Cover		0.7%			0.8%	
<i>Adenostoma fasciculatum</i>	chamise	34.8%	19.3%	12.9%	41.7%	88%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	39.8%	21.9%	14.7%	47.8%	100.0%
<i>Toxicodendron diversilobum</i>	poison-oak	1.2%	2.0%	1.3%	1.4%	50.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	1.0%	2.0%	1.4%	1.2%	37.5%
<i>Salvia mellifera</i>	black sage	2.1%	4.0%	2.7%	2.5%	37.5%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	0.2%	0.6%	0.4%	0.2%	12.5%
<i>Heteromeles arbutifolia</i>	toyon	0.9%	2.6%	1.8%	1.1%	12.5%
<i>Symphoricarpus mollis</i>	creeping snowberry	0.2%	0.6%	0.4%	0.3%	12.5%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.2%	0.3%	0.2%	0.3%	37.5%
<i>Acmipson glaber</i>	deerweed	0.0%	--	--	0.0%	0.0%
<i>Ceanothus thyrsiflorus</i>	blue blossom	0.0%	--	--	0.0%	0.0%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.0%	--	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.1%	0.1%	0.1%	0.1%	25.0%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	0.0%	--	--	0.0%	0.0%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	0.0%	--	--	0.0%	0.0%
<i>Artemisia californica</i>	California sagebrush	0.0%	--	--	0.0%	0.0%
<i>Eriodictyon californicum</i>	California yerba santa	0.0%	--	--	0.0%	0.0%
<i>Ribes malvaceum</i>	chaparral currant	0.0%	--	--	0.0%	0.0%
Total Mean Percent Native Shrub and Subshrub Cover		80.5%			96.6%	
Total Combined Mean Cover Between Shrubs and Subshrubs		2.2%	5.8%	3.9%	2.6%	25.0%
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		0.0%	--	--	0.0%	0.0%
Total Mean Percent Native Vegetative Cover		83.3%	--	--	--	--
Total Mean Percent Bare Ground (Including Masticated Vegetation)*		22.5%				
Total Mean Percent Masticated Vegetation (Calculated Beginning in 2014)*		15.5%	5.6%	3.8%		100%
Total Mean Percent Bare Ground*		7.0%	4.6%	3.1%		100%

HMP Species in Bold

*Calculation and reporting error found in 2017; updated values shown

Table 6-4
Parker Flats MRA Phase II
Vegetation Cover in Areas Subject to Vegetation Cutting in 2009 in Central Maritime Chaparral

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2017 (Year 8)				
		Eight Transects Central Maritime Chaparral in Cut Vegetation				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.4%	0.7%	0.5%	0.4%	25.0%
Total Mean Percent Native Tree Cover		0.4%			0.5%	
<i>Adenostoma fasciculatum</i>	chamise	39.5%	21.8%	14.6%	43.0%	88%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	33.9%	24.6%	16.5%	36.9%	100.0%
<i>Toxicodendron diversilobum</i>	poison-oak	3.3%	6.4%	4.3%	3.6%	37.5%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	2.5%	4.8%	3.2%	2.7%	25.0%
<i>Salvia mellifera</i>	black sage	2.0%	4.8%	3.2%	2.1%	50.0%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	1.2%	2.7%	1.8%	1.3%	25.0%
<i>Heteromeles arbutifolia</i>	toyon	1.2%	3.3%	2.2%	1.3%	12.5%
<i>Symphoricarpus mollis</i>	creeping snowberry	0.9%	2.7%	1.8%	1.0%	12.5%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.4%	0.8%	0.5%	0.4%	25.0%
<i>Acmipson glaber</i>	deerweed	0.2%	0.3%	0.2%	0.2%	50.0%
<i>Ceanothus thyrsiflorus</i>	blue blossom	0.2%	0.4%	0.3%	0.2%	12.5%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.1%	0.4%	0.2%	0.1%	25.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.1%	0.0%	0.0%	12.5%
<i>Arctostaphylos montereyensis</i>	Toro manzanita	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Arctostaphylos crustacea</i> subsp. <i>crustacea</i>	brittleleaf manzanita	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Artemisia californica</i>	California sagebrush	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Eriodictyon californicum</i>	California yerba santa	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Ribes malvaceum</i>	chaparral currant	0.0%	0.0%	0.0%	0.0%	0.0%
Total Mean Percent Native Shrub and Subshrub Cover		85.3%			96.2%	
Total Combined Mean Cover Between Shrubs and Subshrubs		2.9%				
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		0.0%	--	--	0.0%	0.0%
Total Mean Percent Native Vegetative Cover		88.6%	--	--	--	--
Total Mean Percent Bare Ground (Including Masticated Vegetation)*		16.4%				
Total Mean Percent Masticated Vegetation (Calculated Beginning in 2014)*		1.6%	1.9%	1.3%	--	75%
Total Mean Percent Bare Ground*		14.9%	8.3%	5.6%	--	100%

HMP Species in Bold

*Calculation and reporting error found in 2017; updated values shown

Table 6-5
Parker Flats
Vegetation Cover in Central Coastal Scrub Areas Subject to Vegetation Cutting Conducted in 2009

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Baseline Data 2008				
		Three Transects in Cut Central Coastal Scrub Vegetation				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	2.2%	3.1%	5.3%	2.0%	66.7%
Total Mean Percent Native Tree Cover		2.2%			2.8%	
Shrub and Sub-shrub Species						
<i>Salvia mellifera</i>	black sage	33.0%	11.6%	19.6%	30.3%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	14.2%	12.5%	21.1%	13.0%	100%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	7.5%	3.3%	5.6%	6.8%	100%
<i>Toxicodendron diversilobum</i>	poison-oak	7.1%	9.1%	15.3%	6.5%	100%
<i>Artemisia californica</i>	California sagebrush	6.9%	11.9%	20.1%	6.3%	33.3%
<i>Eriodictyon californicum</i>	California yerba santa	5.1%	3.9%	6.6%	4.6%	100%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	1.3%	2.2%	3.7%	1.2%	33.3%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.9%	1.5%	2.5%	0.8%	33.3%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.0%	--	--	0.0%	0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	0.0%	0%
<i>Acmipson glaber</i>	deerweed	0.0%	--	--	0.0%	0%
Total Mean Percent Native Shrub and Subshrub Cover		75.9%			96.9%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		0.2%	0.2%	0.3%	0.2%	66.7%
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		0.0%	--	--	0.0%	0%
Total Mean Percent Native Vegetative Cover		78.3%				
Total Mean Percet Bare Ground (Including Masticated Vegetation)		30.8%				
Total Mean Percent Masticated Vegetation		--	--	--	--	--
Total Mean Percent Bare Ground		30.8%	14.0%	23.7%	28.2%	100%

HMP Species in Bold Note: Not all species observed along transects listed in this table
*Calculation and reporting error found in 2017; updated values shown

Table 6-5
Parker Flats
Vegetation Cover in Central Coastal Scrub Areas Subject to Vegetation Cutting Conducted in 2009

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2012 (Year 3)				
		Three Transects in Cut Central Coastal Scrub Vegetation				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	3.4%	3.1%	5.2%	3.1%	66.7%
Total Mean Percent Native Tree Cover		3.4%			3.9%	
Shrub and Sub-shrub Species						
<i>Salvia mellifera</i>	black sage	3.43%	4.1%	7.0%	3.1%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	13.61%	7.5%	12.7%	12.4%	100%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	14.35%	13.2%	22.2%	13.1%	100%
<i>Toxicodendron diversilobum</i>	poison-oak	3.11%	1.9%	3.3%	2.8%	100%
<i>Artemisia californica</i>	California sagebrush	0.77%	1.3%	2.2%	0.7%	33.3%
<i>Eriodictyon californicum</i>	California yerba santa	6.95%	4.5%	7.6%	6.3%	100%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.00%	--	--	0.0%	0.0%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.07%	0.1%	0.2%	0.1%	33.3%
<i>Eriophyllum confertiflorum</i>	golden yarrow	1.10%	1.6%	2.6%	1.0%	67%
<i>Lepechinia calycina</i>	pitcher sage	0.07%	0.1%	0.2%	0.1%	33%
<i>Acmipson glaber</i>	deerweed	13.51%	7.7%	13.0%	12.3%	100%
Total Mean Percent Native Shrub and Subshrub Cover		57.0%			64.9%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		27.4%	19.6%	33.0%	25.1%	100%
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		0.0%	--	--	0.0%	0%
Total Mean Percent Native Vegetative Cover		87.8%				
Total Mean Percet Bare Ground (Including Masticated Vegetation)		21.6%				
Total Mean Percent Masticated Vegetation		--	--	--	--	--
Total Mean Percent Bare Ground		21.6%	8.1%	13.7%	19.8%	100%

HMP Species in Bold Note: Not all species observed alor

*Calculation and reporting error found in 2017; updated values shown

Table 6-5
Parker Flats
Vegetation Cover in Central Coastal Scrub Areas Subject to Vegetation Cutting Conducted in 2009

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2014 (Year 5)				
		Three Transects in Cut Central Coastal Scrub Vegetation				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	1.9%	1.7%	0.7%	2.8%	66.7%
Total Mean Percent Native Tree Cover		1.9%			2.7%	
Shrub and Sub-shrub Species						
<i>Salvia mellifera</i>	black sage	4.3%	4.9%	2.1%	6.5%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	10.3%	6.9%	2.9%	15.4%	100%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	11.3%	10.6%	4.5%	16.9%	66.7%
<i>Toxicodendron diversilobum</i>	poison-oak	3.7%	4.2%	1.8%	5.5%	66.7%
<i>Artemisia californica</i>	California sagebrush	2.3%	4.0%	1.7%	3.5%	33.3%
<i>Eriodictyon californicum</i>	California yerba santa	2.9%	2.7%	1.1%	4.3%	66.7%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	2.3%	4.0%	1.7%	3.5%	33%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	0.2%	0.3%	0.1%	0.3%	33.3%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.3%	0.5%	0.2%	0.4%	33.3%
<i>Lepechinia calycina</i>	pitcher sage	0.2%	0.3%	0.1%	0.3%	33.3%
<i>Acmipson glaber</i>	deerweed	0.0%	--	--	0.0%	0%
Total Mean Percent Native Shrub and Subshrub Cover		37.7%			54.6%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		29.5%	21.4%	9.0%	44.2%	100%
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		0.0%	--	--	0.0%	0%
Total Mean Percent Native Vegetative Cover		69.1%				
Total Mean Percet Bare Ground (Including Masticated Vegetation)		26.9%				
Total Mean Percent Masticated Vegetation		19.3%	5.2%	2.2%	--	100%
Total Mean Percent Bare Ground		7.6%	7.2%	3.1%	--	66.7%

HMP Species in Bold Note: Not all species observed alor

*Calculation and reporting error found in 2017; updated values shown

Table 6-5
Parker Flats
Vegetation Cover in Central Coastal Scrub Areas Subject to Vegetation Cutting Conducted in 2009

ESCA RP 2017 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2017 (Year 8)				
		Three Transects in Cut Central Coastal Scrub Vegetation				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	3.0%	3.1%	5.1%	3.2%	66.7%
Total Mean Percent Native Tree Cover		3.0%			3.7%	
Shrub and Sub-shrub Species						
<i>Salvia mellifera</i>	black sage	12.4%	1.4%	2.3%	12.9%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	14.6%	5.7%	9.7%	15.2%	100%
<i>Mimulus aurantiacus</i>	sticky monkeyflower	11.8%	4.3%	7.3%	12.3%	100.0%
<i>Toxicodendron diversilobum</i>	poison-oak	9.8%	6.9%	11.6%	10.2%	100.0%
<i>Artemisia californica</i>	California sagebrush	3.0%	4.0%	6.8%	3.1%	66.7%
<i>Eriodictyon californicum</i>	California yerba santa	3.2%	4.5%	7.7%	3.3%	100.0%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.3%	0.5%	0.9%	0.3%	33%
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry	2.8%	1.4%	2.4%	2.9%	100.0%
<i>Eriophyllum confertiflorum</i>	golden yarrow	1.8%	1.6%	2.7%	1.9%	100.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Acmipson glaber</i>	deerweed	9.6%	3.9%	6.5%	10.1%	100%
Total Mean Percent Native Shrub and Subshrub Cover		69.2%			84.6%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		9.6%	--	--	10.0%	100%
Target Mean Weed Total (<i>Carpobrotus edulis</i>)		0.0%	--	--	0.0%	0%
Total Mean Percent Native Vegetative Cover		81.8%				
Total Mean Percet Bare Ground (Including Masticated Vegetation)		16.4%				
Total Mean Percent Masticated Vegetation		5.7%	7.3%	12.4%	--	100%
Total Mean Percent Bare Ground		10.6%	4.5%	7.6%	--	100.0%

HMP Species in Bold Note: Not all species observed alor

*Calculation and reporting error found in 2017; updated values shown

Table 6-6
Parker Flats MRA Phase II
2017 Plant Species Richness and Diversity

ESCA RP 2017 Annual Natural Resource Report

	Parker Flats MRA - Phase II					
Habitat	Central Maritime Chaparral in Cut Vegetation					
Activity Year	Baseline (2008)	Year 3 (2012)	Year 5 (2014)	Year 5 with surrounding species included (2014)	Year 8 (2017)	Year 8 with surrounding species included (2017)
Number of Transects/Quadrats	8 Transects					
Total Number of Native Species	11	17	14	65	40	73
Total Number of HMP Species Present	1	0	0	0	0	0
Total Number of HMP Herbaceous Species Present	0	0	0	0	0	0
Total Native Tree Species in All Transects	1	1	1	1	1	1
Total Shrub Species in All Transects	8	14	11	16	12	19
Total Native Herbaceous Species in All Transects or Related Herbaceous Plots	2	2	2	48	27	53
Total Native Ferns and Fern Allies in All Transects or Related Herbaceous Plots	0	0	0	0	0	0
Mean Number Tree Species perTransect	0.1	0.3	0.3	0.3	0.3	0.5
Mean Number Shrub Species per Transect	3.0	5.5	4.3	6.3	4.6	7.3
Mean Number of Native Herbaceous Species per Transect ²	0.3	0.3	0.3	11.5	11.9	12.3
Mean number of Native Ferns and Fern Allies per Transect	0.0	0.0	0.0	0.0	0.0	0.0
Diversity - Shannon Index	0.9	0.9	0.8	--	0.9	--
Evenness	0.2	0.2	0.2	--	0.2	--
Total Percent Mean Native Cover (Transects)	110.3%	90.7%	83.3%	--	88.6%	--
Total Percent Mean Native Shrub Cover (Transects)	107.0%	89.1%	80.5%	--	85.3%	--
Total Percent Mean Native Herbaceous Species Cover (Transects)	2.5%	1.6%	2.2%	--	2.9%	--
Total Percent Mean Native Cover (Herbaceous Quadrats)	0%	0%	0%	--	--	--

¹No herbaceous plots monitored in 2011, due to low herbaceous cover in project area

²Data collected from those transects in which herbaceous plots were monitored

Table 6-6
Parker Flats MRA Phase II
2017 Plant Species Richness and Diversity

ESCA RP 2017 Annual Natural Resource Report

	Parker Flats MRA - Phase II					
Habitat	Central Coastal Scrub in Cut Vegetation					
Activity Year	Baseline (2008)	Year 3 (2012)	Year 5 (2014)	Year 5 with surrounding species included (2014)	Year 8 (2017)	Year 8 with surrounding species included (2017)
Number of Transects/Quadrats	3 Transects					
Total Number of Native Species	11	14	21	58	35	66
Total Number of HMP Species Present	0	0	0	0	0	1
Total Number of HMP Herbaceous Species Present	0	0	0	0	0	1
Total Native Tree Species in All Transects	1	1	1	2	1	2
Total Shrub Species in All Transects	8	10	11	12	9	13
Total Native Herbaceous Species in All Transects or Related Herbaceous Plots	1	3	9	43	25	50
Total Native Ferns and Fern Allies in All Transects or Related Herbaceous Plots	1	0	0	1	0	1
Mean Number Tree Species perTransect	0.7	0.7	0.3	1.3	0.7	1.0
Mean Number Shrub Species per Transect	6.0	7.7	6.0	9.0	8.3	9.7
Mean Number of Native Herbaceous Species per Transect ²	0.3	1.0	3.0	24.7	21.0	15.0
Mean number of Native Ferns and Fern Allies per Transect	0.3	0	0.0	0.3	0.3	0.3
Diversity - Shannon Index	1.5	1.6	1.4	--	2.0	--
Evenness	0.2	0.2	0.3	--	0.2	--
Total Percent Mean Native Cover (Transects)	78.3%	87.8%	69.1%	--	81.8%	--
Total Percent Mean Native Shrub Cover (Transects)	75.9%	57.0%	37.7%	--	69.2%	--
Total Percent Mean Native Herbaceous Species Cover (Transects)	0.2%	27.4%	29.5%	--	9.6%	--
Total Percent Mean Native Cover (Herbaceous Quadrats)	--	--	--	--	--	--

¹No herbaceous plots monitored in 2011, due to low herbaceous cover in project area

²Data collected from those transects in which herbaceous plots were monitored

Table 6-7
Future East Garrison MRA
2013-2017 Total Presence and Density of Monterey Spineflower
after Vegetation Cutting

ESCA RP 2017 Annual Natural Resource Report

	Total Plants in Surveyed Grids (Occupied Grids)	Mean Number of Plants per Occupied Grid	Total Number of All Plants in Plots	Mean Density per Plot	Standard Deviation	90% Confidence Interval	Total Surveyed Grids	Percentage of Occupied Grid Compared to Baseline ¹
Post Activity Data 2013 - 2017								
Vegetation Cut/Target Specific Excavation								
Post-activity Year 1 (2014)	0 (0)	0	0	0.0	--	--	6	0%
Post-activity Year 2 (2013)	138 (1)	138	138	138.0	--	--	2	50%
Post-activity Year 2 (2014)	0 (0)	0	0	0.0	--	--	46	0%
Post-activity Year 3 (2014)	377 (3)	126	92	30.7	38.9	66	307	100%*
Post-activity Year 3 (2015)	0 (0)	0	0	0.0	--	--	346	0%
Post-activity Year 3 (2016)	0 (0)	0	0	0.0	--	--	8	0%
Post-activity Year 4 (2014)	0 (0)	0	0	0.0	--	--	20	0%
Post-activity Year 4 (2015)	12 (2)	6	3	1.5	0.7	3	47	100%
Post-activity Year 4 (2016)	0 (0)	0	0	0.0	--	--	349	0%
Post-activity Year 5 (2015)	0 (0)	0	0	0.0	--	--	26	0%
Post-activity Year 5 (2016)	220 (2)	110	58	29.0	19.8	88	599	100%
Post-activity Year 5 (2017)	0 (0)	0	0	0.0	--	--	349	0%
Post-activity Year 6 (2017)	310 (2)	155	40	20.0	14.1	63	599	100%
2017 Sampling Totals	310 (2)	155	40	--	--	--	948	100%
Baseline Pre-disturbance								
2010	236 (2)	118	236	118.0	106.0	473.2	2	--
2012	110 (2)	55	110	55.0	52.3	233.6	2	--

*exceeds number of baseline grids sampled

¹2012 baseline used for comparison because 2010 was an above-average rainfall year.

Table 6-8
Future East Garrison MRA
2013-2017 Total Presence and Density of Sand (Monterey) Gilia
after Vegetation Cutting

ESCA RP 2017 Annual Natural Resource Report

	Total Plants (Occupied Grids)	Mean Number of Plants per Occupied Grid	Total Number of All Plants in Plots	Mean Density per Plot	Standard Deviation	90% Confidence Interval	Total Surveyed Grids	Percentage of Occupied Grid Compared to Baseline ¹
Post Activity Data 2013 - 2017								
Vegetation Cut/Target Specific Excavation								
Post-activity Year 1 (2014)	0 (0)	0	0	0.0	--	--	6	0%
Post-activity Year 2 (2013)	11 (1)	11	11	11.0	--	--	39	100%
Post-activity Year 2 (2014)	0 (0)	0	0	0.0	--	--	46	0%
Post-activity Year 3 (2013)	5 (2)	3	4	2.0	0.0	--	37	100%*
Post-activity Year 3 (2014)	30 (1)	30	9	9.0	--	--	307	100%
Post-activity Year 3 (2015)	0 (0)	0	0	0.0	--	--	346	0%
Post-activity Year 3 (2016)	0 (0)	0	0	0.0	--	--	8	0%
Post-activity Year 4 (2014)	0 (0)	0	0	0.0	--	--	20	0%
Post-activity Year 4 (2015)	13 (3)	4	11	3.7	3.8	6	47	100%*
Post-activity Year 4 (2016)	0 (0)	0	0	0.0	--	--	349	0%
Post-activity Year 5 (2015)	0 (0)	0	0	0.0	--	--	26	0%
Post-activity Year 5 (2016)	128 (7)	18	128	18.3	23.7	17	599	100%*
Post-activity Year 5 (2017)	0 (0)	0	0	0.0	--	--	349	0%
Post-activity Year 6 (2017)	54 (5)	11	27	5.0	6.1	7	599	100%*
2016 Sampling Totals	54 (5)	11	27	--	--	--	948	100%*
Baseline Pre-Activity								
2010	330 (3)	110	90	30.0	22.9	38.6	3	--
2012	15 (1)	15	15	7.5	6.4	28.4	2	--

*exceeds number of baseline grids sampled

¹2012 baseline used for comparison because 2010 was an above-average rainfall year.

Table 6-9
Future East Garrison MRA
2013-2017 Total Presence and Density of Seaside Bird's-beak
after Vegetation Cutting

ESCA RP 2017 Annual Natural Resource Report

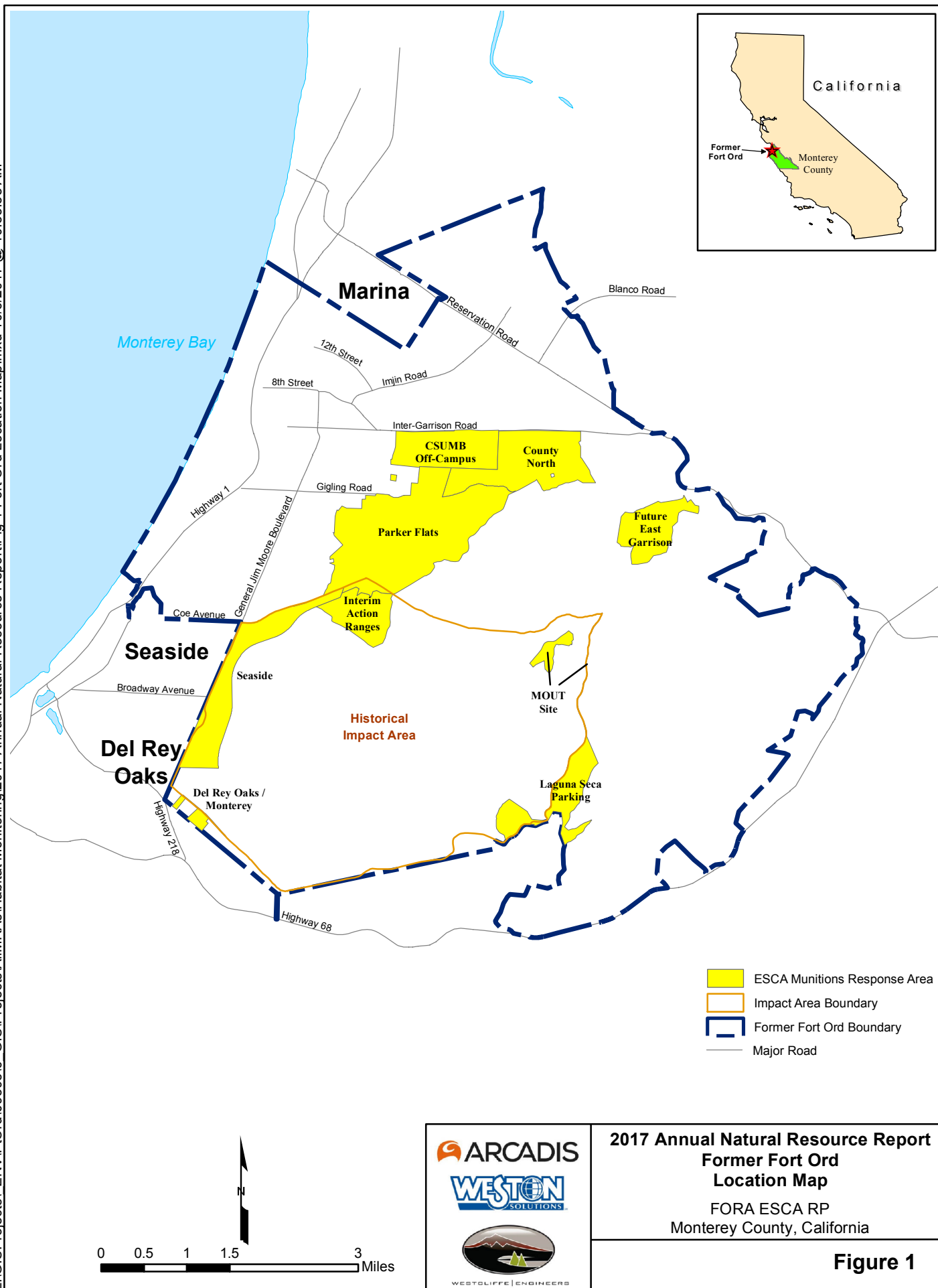
	Total Plants in Occupied Grids	Mean Number of Plants per Occupied Grid	Total Number of All Plants in Plots	Mean Density per Plot	Standard Deviation	90% Confidence Interval	Total Surveyed Grids	Percentage of Occupied Grids Compared to Baseline
Post-Activity Data 2013 -2017								
Vegetation Cut/Target Specific Excavation								
Post-activity Year 1 (2014)	0 (0)	--	--	--	--	--	6	--
Post-activity Year 2 (2014)	132 (2)	66	38	19.0	1.4	6	46	100%*
Post-activity Year 3 (2013)	187 (1)	187	61	61.0	0.0	--	37	100%*
Post-activity Year 3 (2014)	243 (4)	61	46	11.5	10.2	12	307	100%*
Post-activity Year 3 (2015)	202 (2)	101	19	9.5	12.0	54	346	100%*
Post-activity Year 3 (2016)	0 (0)	0	0	0.0	--	--	8	--
Post-activity Year 4 (2014)	0 (0)	0	0	--	--	--	20	--
Post-activity Year 4 (2015)	220 (4)	44	47	9.4	7.4	7	47	100%*
Post-activity Year 4 (2016)	188 (2)	94	33	16.5	10.6	47	349	100%*
Post-activity Year 5 (2015)	0 (0)	0	0	0.0	--	--	26	--
Post-activity Year 5 (2016)	557 (7)	93	80	13.7	13.5	11	599	100%*
Post-activity Year 5 (2017)	456 (2)	228	60	30.0	33.9	152	349	--
Post-activity Year 6 (2017)	774 (7)	110	127	18.1	13.4	10	599	100%*
2017 Sampling Totals	1,230 (9)	338	187	--	--	--	948	100%*
Baseline Pre-disturbance								
2010	--	--	--	--	--	--	--	--
2012	--	--	--	--	--	--	--	--
Reference Plots								
2014 Survey	139 (3)	46	15	5.0	1.7	2.9	4	100%*
2015 Survey	112 (3)	37	16	5.3	2.1	3.5	3	100%*
2016 Survey	24 (3)	8	16	5.3	2.1	3.5	3	100%*
2017 Survey	80 (3)	27	28	9.3	7.8	13.1	3	100%*

*exceeds number of baseline grids sampled

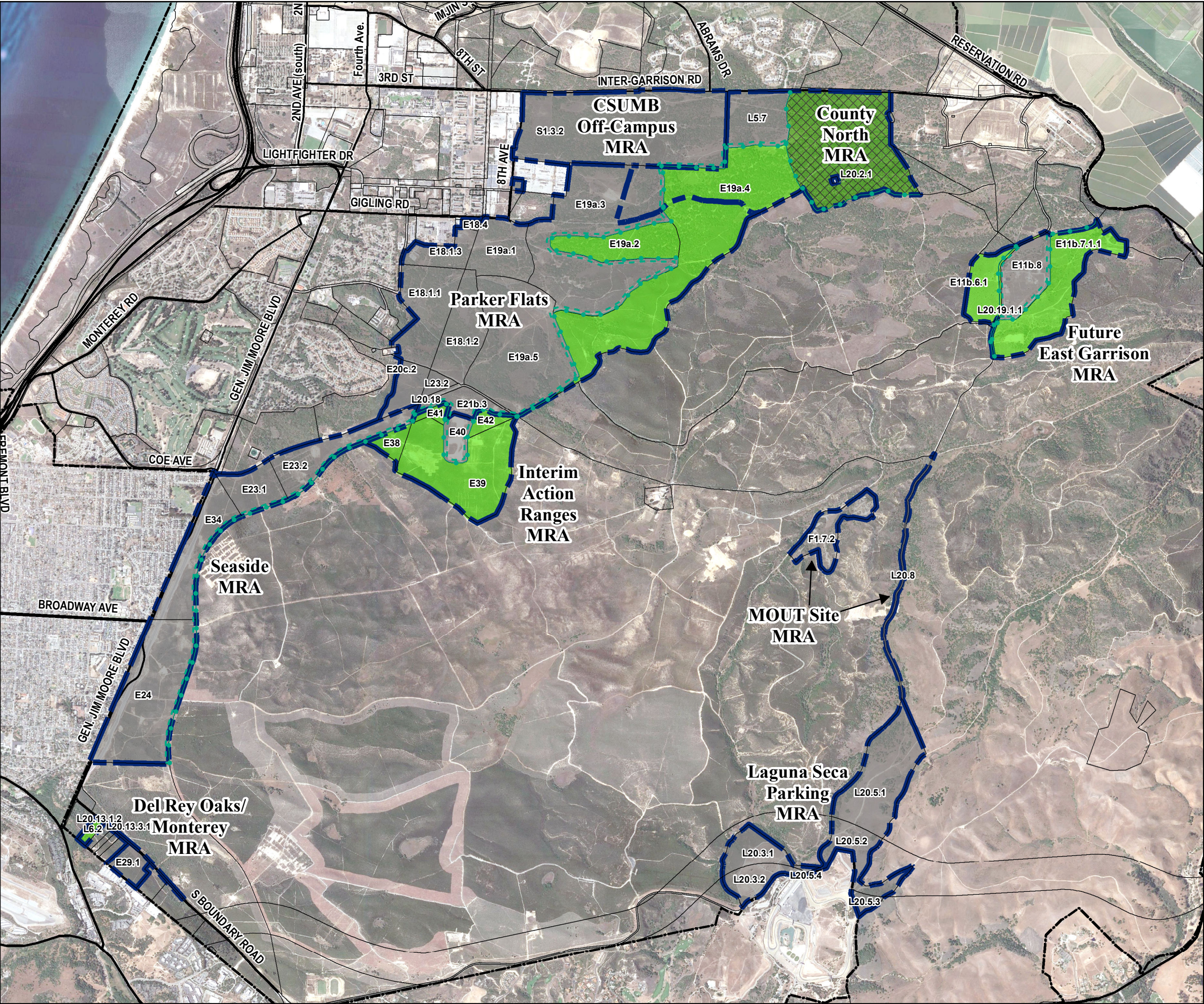
Table 6-10
Parker Flats MRA Phase II
2013-2017 Presence and Density of Monterey Spineflower after Vegetation Cutting

ESCA RP 2017 Annual Natural Resource Report

	Total Plants in Occupied Grids	Mean Number of Plants per Occupied Grid	Total Number of All Plants in Plots	Mean Density per Plot	Standard Deviation	90% Confidence Interval	Total Surveyed Grids	Percentage of Occupied Grids Compared to Baseline
Phase II - Post-activity Data 2013 - 2017 (Year 8)								
Vegetation Cutting/Target Specific Excavation								
Post-activity Year 4 (2013)	383 (5)	77	184	36.8	67.4	64.3	336	63%
Post-activity Year 5 (2014)	4,562 (5)	912	271	54.2	76.4	72.9	336	63%
Post-activity Year 8 (2017)	2,676 (3)	892	165	55.0	34.0	57.2	336	38%
2017 Sampling Totals	2,676 (3)	892	165	55.0			336	
Baseline Pre-disturbance								
2008	1,369 (8)	171	1,369	111.3	96.1	64.4	8	--



Document Path: Z:\GIS\Projects\ENVI\Ord\095956 GIS\Projects\AIMRA\Habitat Monitoring\2017 Annual Natural Resource Report\Fig 2 ALLMRA ESCA Property Proposed Future Land Use.mxd



Legend

- Munitions Response Area
- Major Road
- Borderland Interface
- 100-Foot Buffer from Borderland Interface
- E11b.8 USACE Parcel
- Former Fort Ord Boundary
- Development Parcel
- Habitat Reserve
- Habitat Corridor

Former Fort Ord Location Map

0 100 200 Miles

Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

0 3,000 6,000 Feet

2017 Annual Natural Resource Report

ESCA RP
2017 Designated Future Land Use

FORA ESCA RP
Monterey County, California

Figure 2

Former Fort Ord Location Map

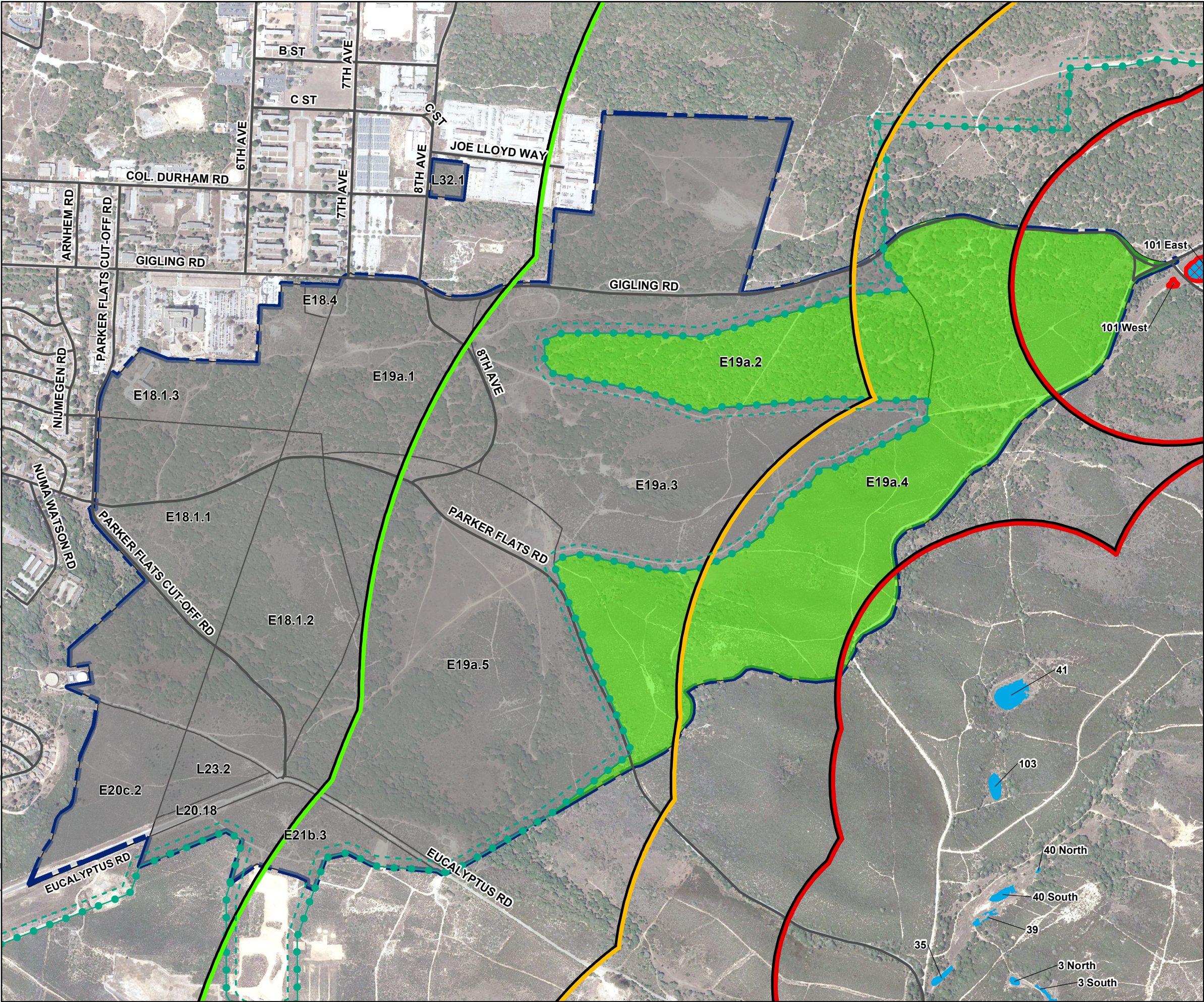
This map shows the geographical layout of the former Fort Ord area. The map is bounded by Monterey Bay to the west and Highway 1 to the north. Key locations include the Marina, OSUMB Off-Campus World, County World, Parker Flats, Interim Action Ranges, Seaside, Del Rey Oaks, Del Rey Oaks Monterey, Historical Town of Fort Ord, MOUT Site, Laguna Seca, and the Pacific. The map also shows the location of the former Fort Ord, which is a large, irregularly shaped area outlined in green. The map includes a scale bar indicating 0 to 3 miles.



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Monterey County, California

Figure 3a

Document Path: Z:\GIS\Projects\ENVI\Fort Ord\Habitat Monitoring\2017 Annual Natural Resource Report\Fig 3b Parker Flats MRA Phase I and II Areas.mxd



Legend

- Munitions Response Area
- Major Road
- E23.1 USACE Parcel
- Aquatic Features
- Aquatic Feature with Documented CTS Presence
- Habitat Reserve
- Development Parcels
- Borderland Interface
- 100-Foot Buffer from Borderland Interface

California Tiger Salamander Buffer

- 500 m
- 1 km
- 2 km

Former Fort Ord Location Map

0 3 Miles

Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

0 1,000 2,000 Feet

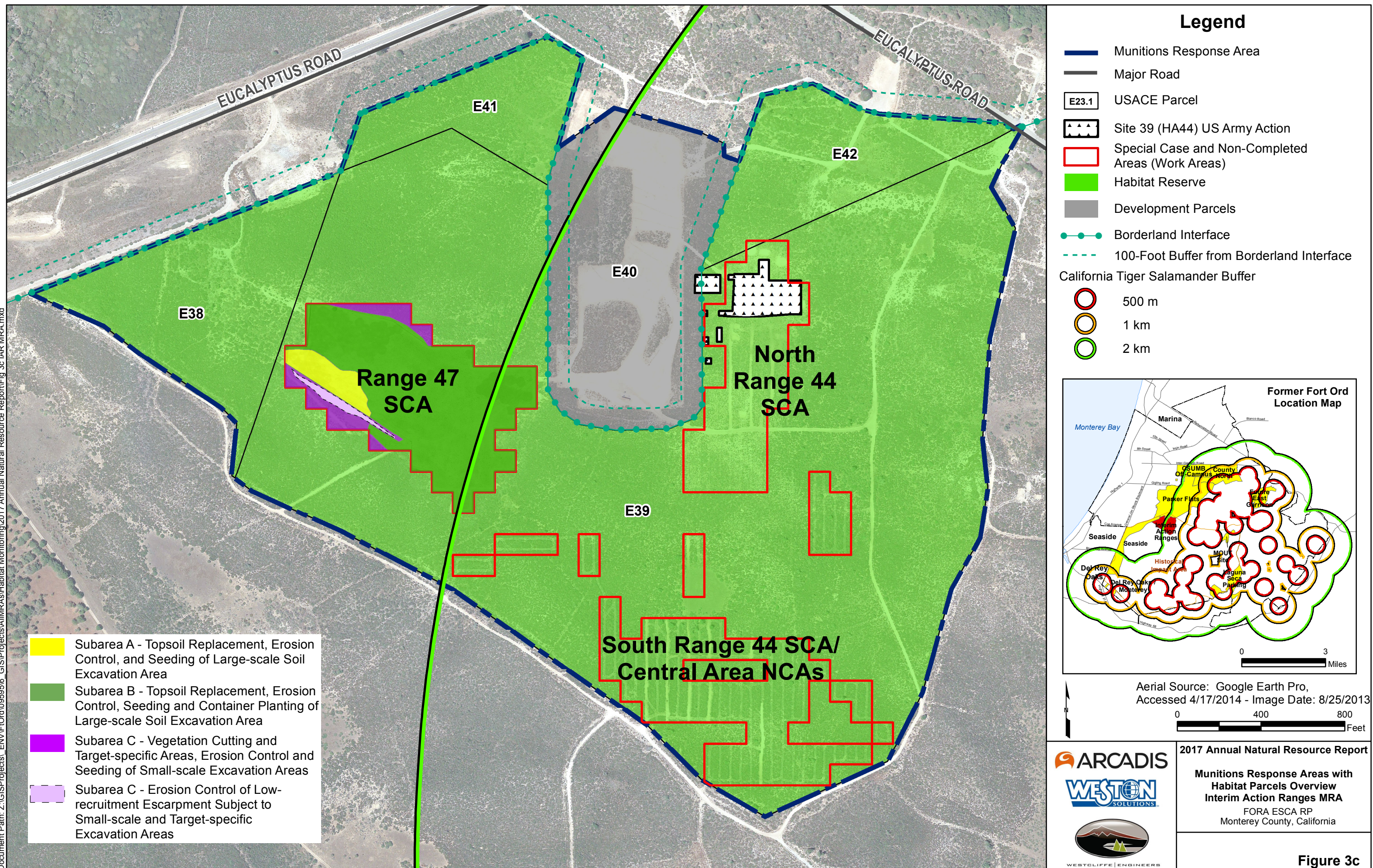
2017 Annual Natural Resource Report

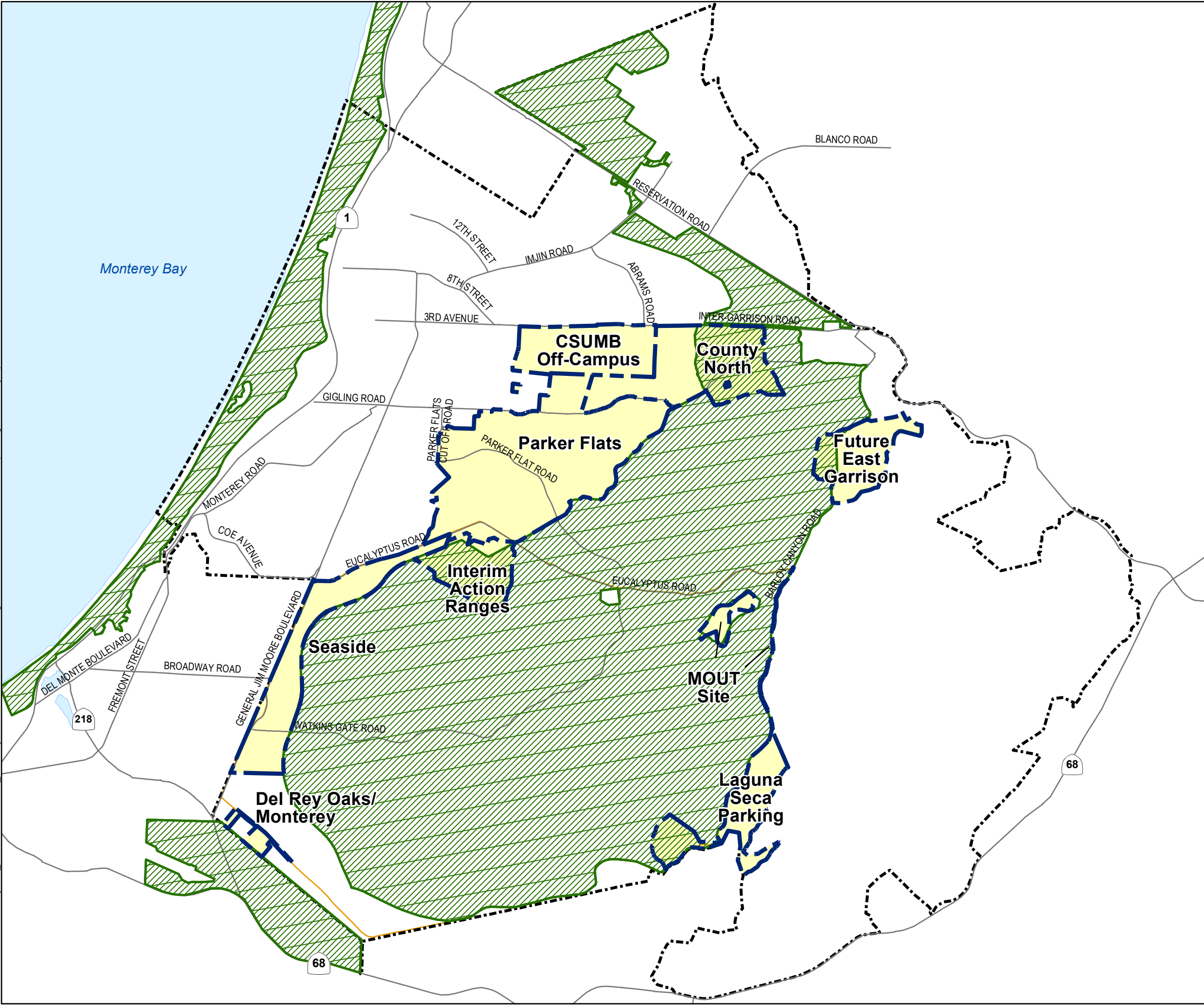
**Munitions Response Areas with
Habitat Parcels Overview
Parker Flats MRA**

FORA ESCA RP
Monterey County, California

Figure 3b

Document Path: Z:\GIS\Projects\ENVI\Fort Ord\095956_GIS\Projects\JIMRA\Habitat Monitoring\2017 Annual Natural Resource Report\Fig 3c IAR MRA.mxd

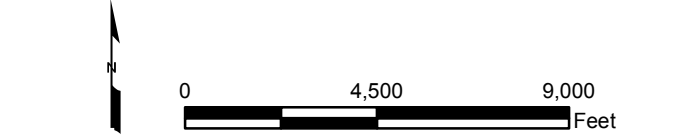
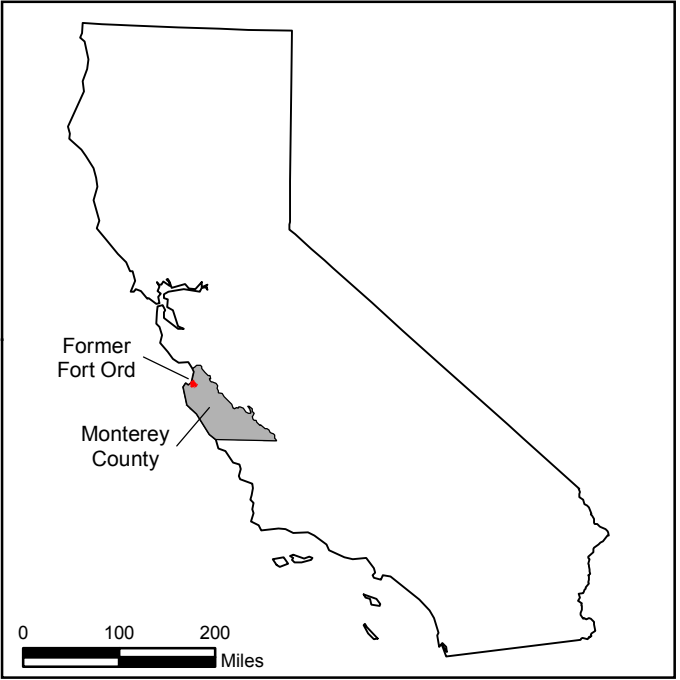




Legend

- Major Roads
- Former Fort Ord Boundary
- ESCA Munitions Response Areas
- Impact Area Boundary
- U.S. Fish and Wildlife Designated Monterey Spineflower Critical Habitat

Source: USFWS. 2002. Biological Opinion on the Closure and Reuse of Fort Ord, Monterey County, California as it affects California Tiger Salamander and Critical Habitat for Contra Costa Goldfields (1-8-04-F25-R)



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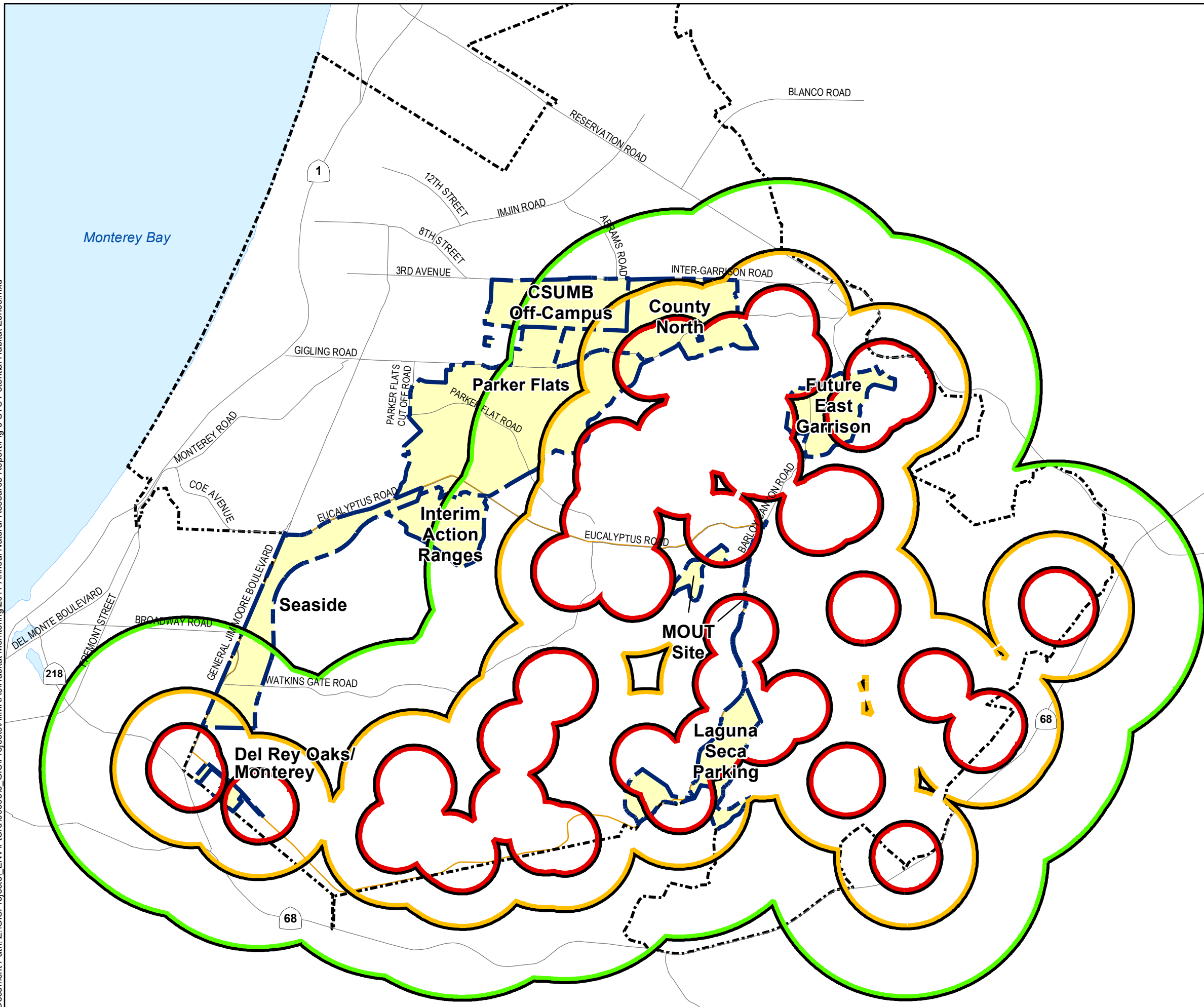
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2017 Annual Natural Resource Report

Former Fort Ord Monterey Spineflower Critical Habitat Locations

FORA ESCA RP
Monterey County, California

Figure 4



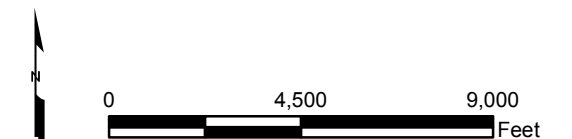
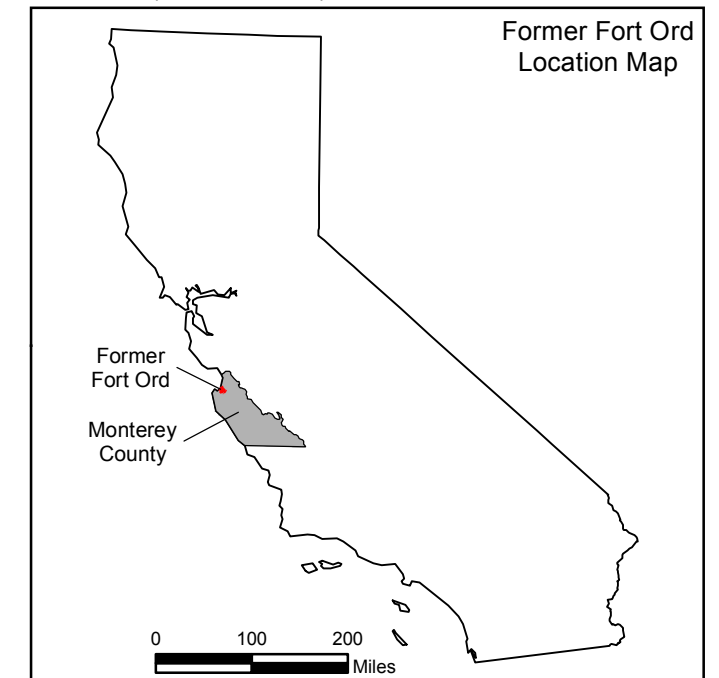
Legend

- Major Roads
- Former Fort Ord Boundary
- ESCA Munitions Response Areas
- Historical Impact Area Boundary

California Tiger Salamander - Habitat Zones

- 500 M
- 1 KM
- 2 KM

Source: USFWS. 2005. Cleanup and Reuse of Former Fort Ord. Monterey County, California as it affects California Tiger Salamander and Critical Habitat for Contra Costa Goldfields (1-8-04-F25-R)



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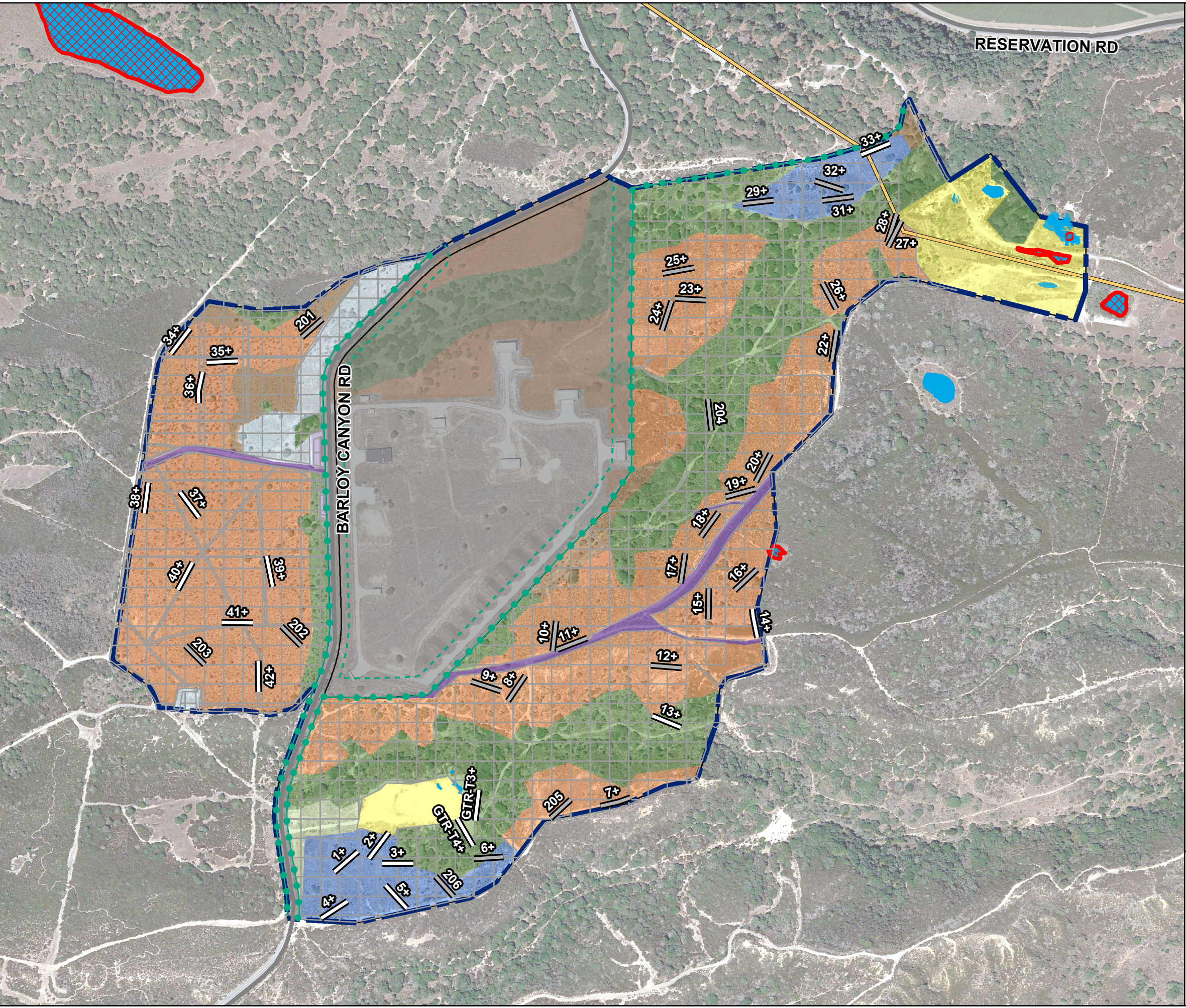
2017 Annual Natural Resource Report

California Tiger Salamander
Habitat Buffer Zones

FORA ESCA RP
Monterey County, California

Figure 5

Z:\GIS\Projects\ENV\FortOrd\095956_GIS\Projects\AllMRAs\Habitat Monitoring\2017 Annual Natural Resource Report\Fig 6a FEG Monitoring Location and Veg Comm.mxd @ 1:52:54 PM



Legend

Munitions Response Area

Major Road

Natural Gas Pipeline

Development Parcel

2017 Vegetation Transects

Previously Monitored Transects + = baseline transect

Borderland Interface

100-Foot Buffer from Borderland Interface

2017 HMP Herbaceous Species Survey Areas
(Survey areas shown outside of MRA habitat boundaries serve as reference locations)

Aquatic Features

Aquatic Feature with Documented CTS Presence

Vegetation Types

Central Maritime Chaparral

Chamise-dominated Chaparral

Low Quality Disturbed Chaparral

Coast Live Oak Woodland

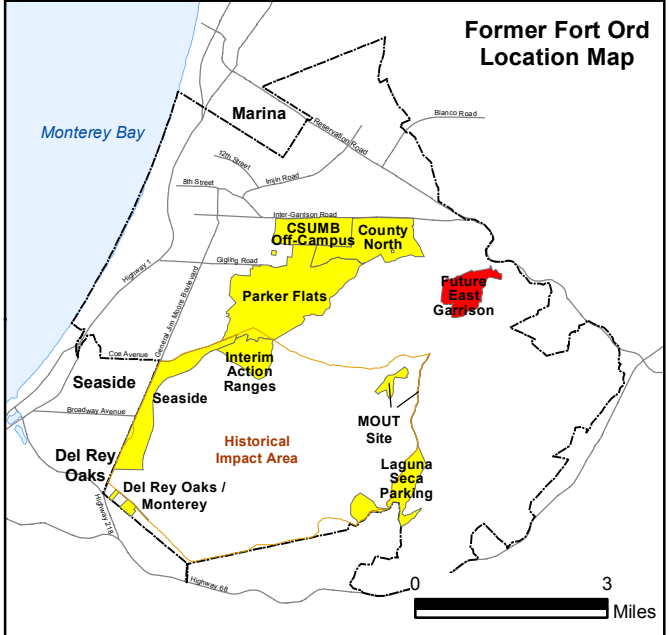
Grassland

Ruderal and Cleared Areas

Low Recruitment Area

Roadways and Fuel Breaks

Note: Vegetation mapping modified from 2011 Annual Natural Resource Report.



Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

0 500 1,000 Feet

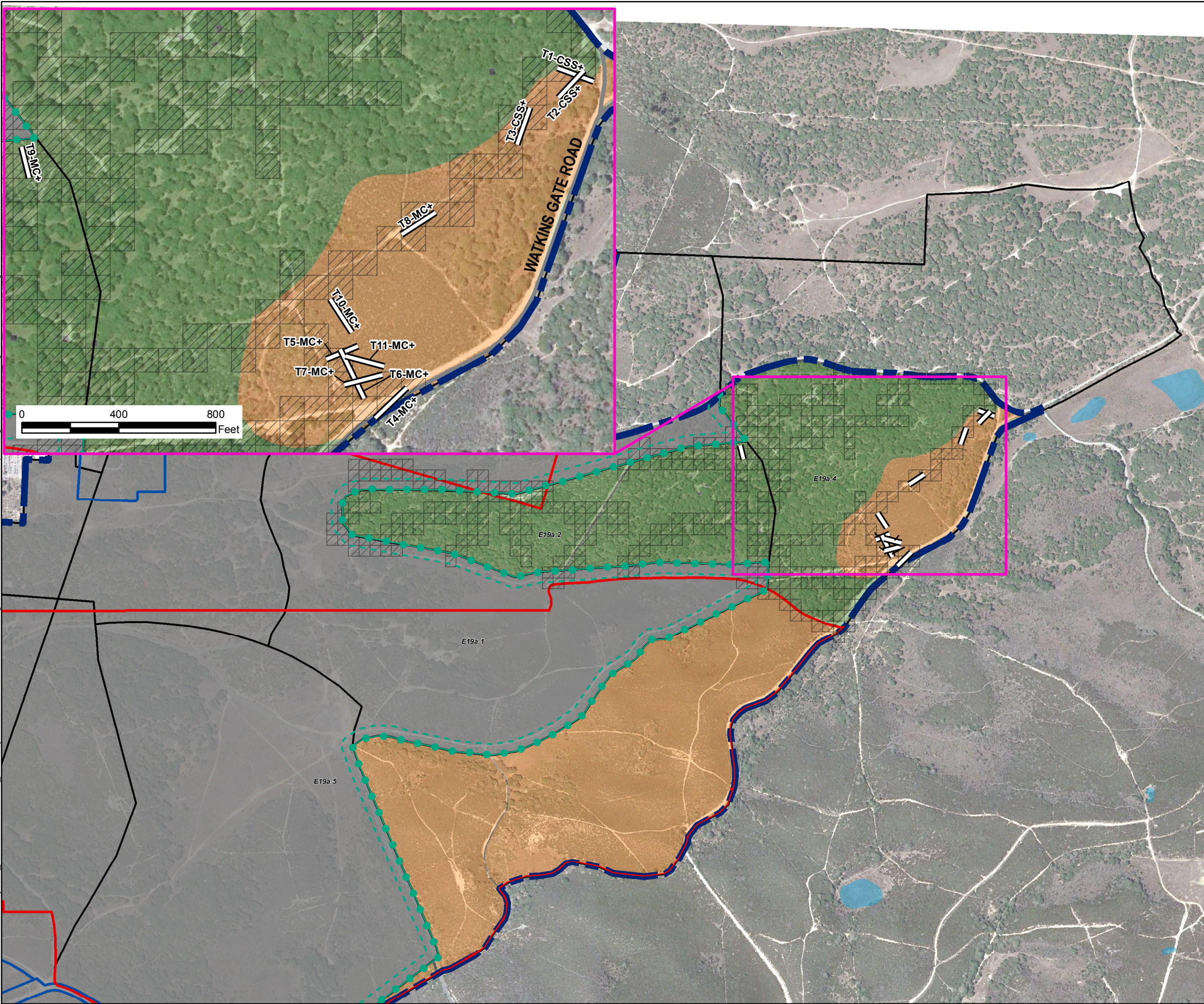
2017 Annual Natural Resource Report

Vegetation Monitoring and HMP Herbaceous Survey Locations Future East Garrison MRA

FORA ESCA RP
Monterey County, California

Figure 6a

Document Path: Z:\GIS\Projects\ENV\FIOrd\0959516_GIS\Projects\AIMRAs\Habitat Monitoring\2017 Annual Natural Resource Report\Fig 6b PF Monitoring Locations and Veg Comm.mxd



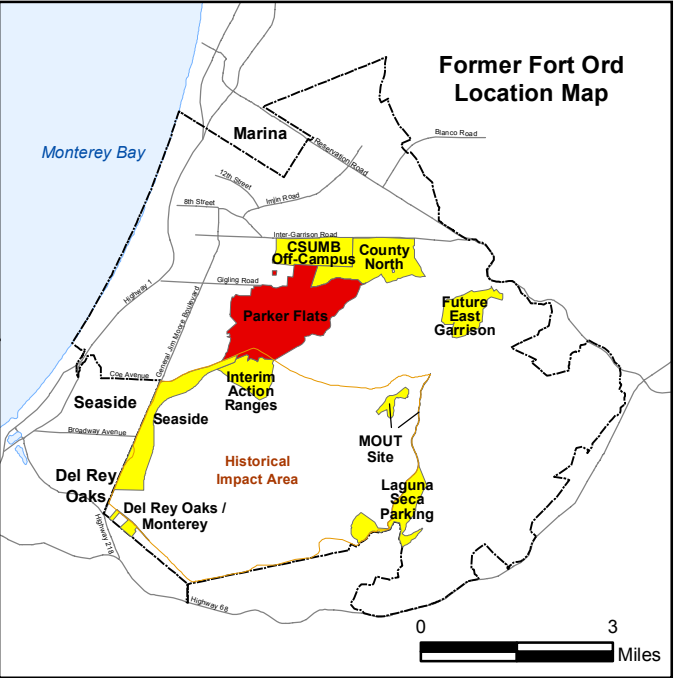
Legend

- Munitions Response Area
- Major Road
- USACE Parcel
- Development Parcel
- 2014 Transect Monitoring
- Borderland Interface
- 100-Foot Buffer from Borderland Interface
- 2017 HMP Herbaceous Species Survey Areas (Survey areas shown outside of MRA habitat boundaries serve as reference locations)
- Aquatic Feature
- Phase 1 Boundary

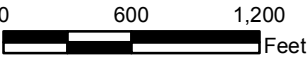
Vegetation Types*

- Central Maritime Chaparral
- Coast Live Oak Woodland
- Grassland

Note:
*Source: Flora and Fauna Baseline Study of Fort Ord, California, Jones and Stokes Association Inc., December 1992.
Vegetation mapping modified from 2011 Annual Natural Resource Report.



Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

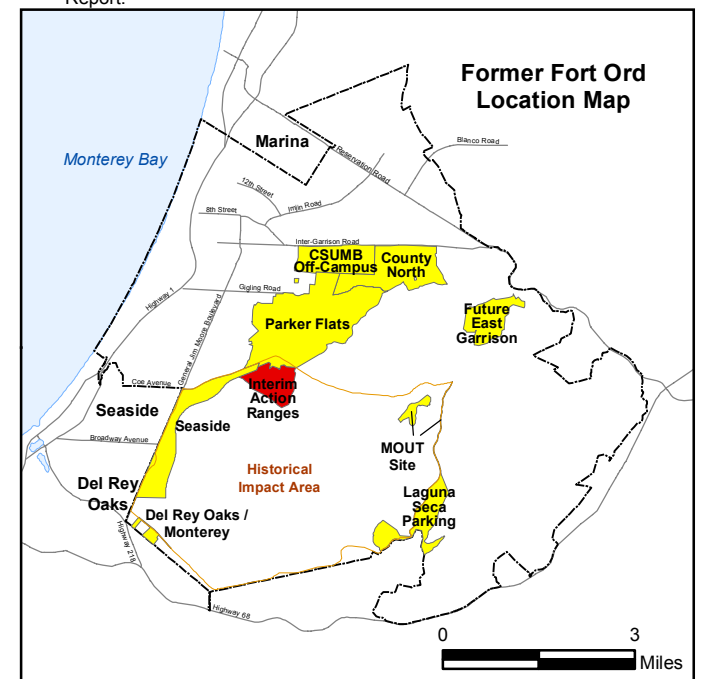


2017 Annual Natural Resource Report
Vegetation Monitoring and HMP
Herbaceous Survey Locations
Parker Flats MRA

FORA ESCA RP
Monterey County, California

Figure 6b

*Source: Flora and Fauna Baseline Study of Fort Ord, California, Jones and Stokes Association Inc., December 1992. Vegetation mapping modified from 2011 Annual Natural Resource Report.



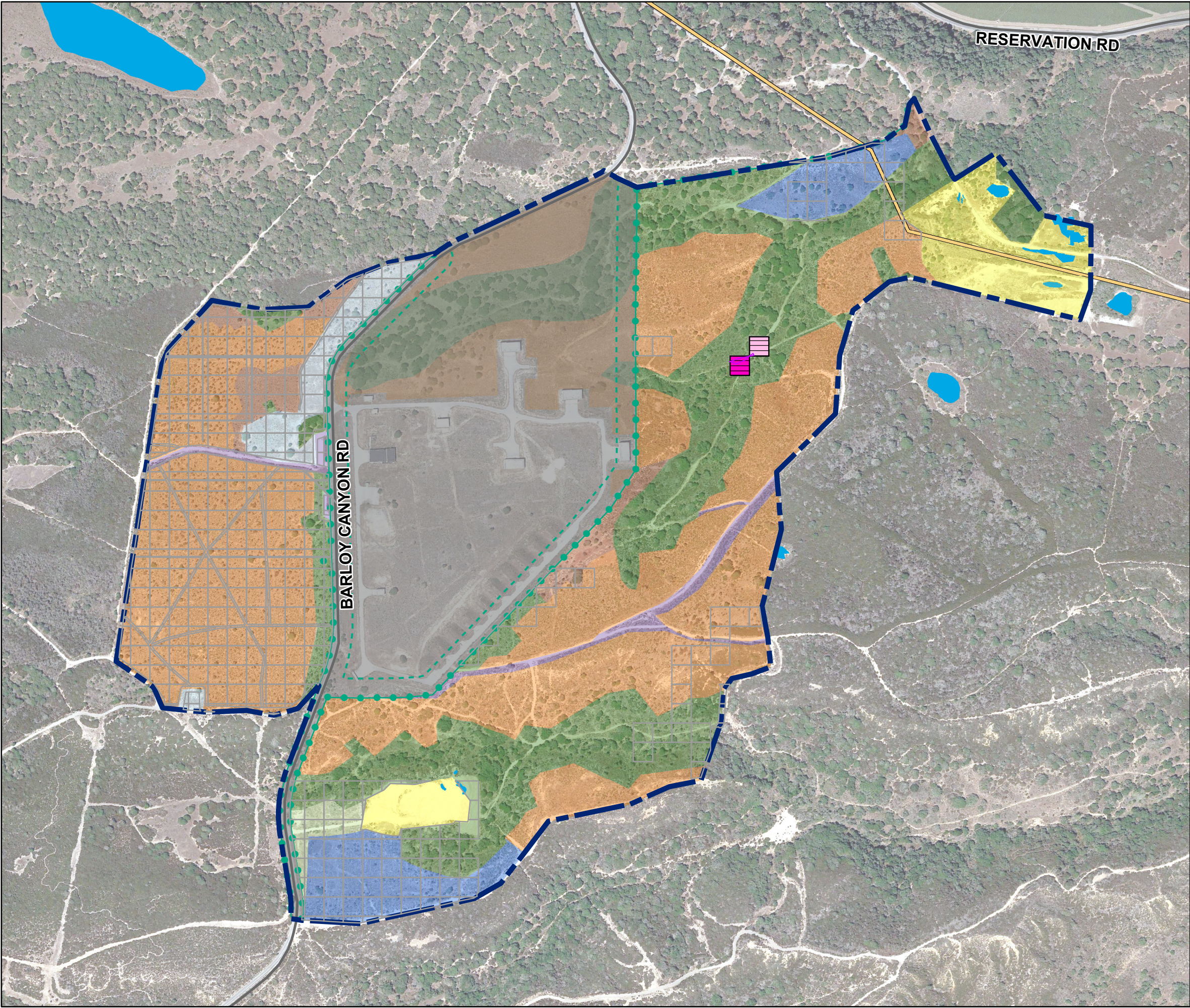
2017 Annual Natural Resource Report

Vegetation Monitoring and HMP Herbaceous Survey Locations Interim Action Ranges MRA

FORA ESCA RP
Monterey County, California

Figure 6c

Z:\GIS\Projects\ENV\FortOrd\095956_GIS\Projects\AllMRAs\Habitat Monitoring\2017 Annual Natural Resource Report\Fig 7a FEG Spineflower Density.mxd 10/25/2017 @ 1:21:14 PM



Legend

- Munitions Response Area
- Major Road
- Natural Gas Pipeline
- Development Parcel
- Borderland Interface
- 100-Foot Buffer from Borderland Interface
- Aquatic Features

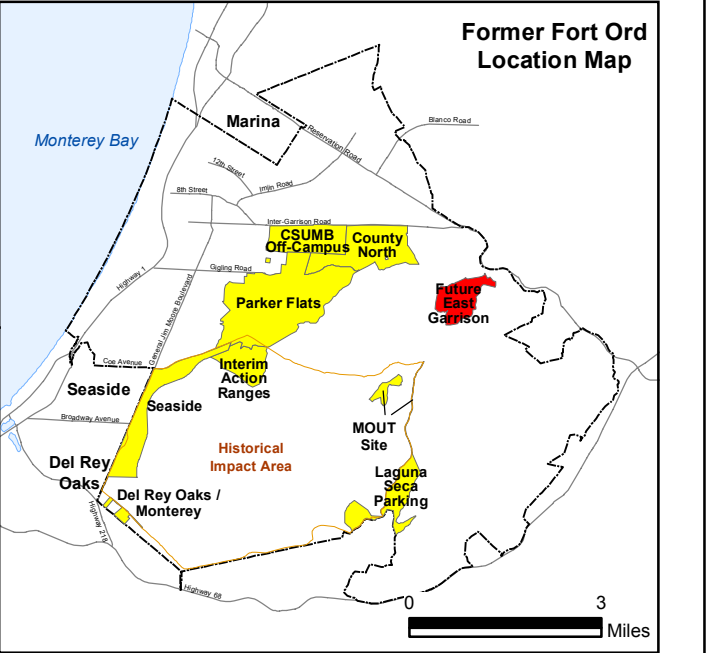
Vegetation Types

- Central Maritime Chaparral
- Chamise-dominated Chaparral
- Low Quality Disturbed Chaparral
- Coast Live Oak Woodland
- Grassland
- Ruderal and Cleared Areas
- Low Recruitment Area
- Roadways and Fuel Breaks

2017 Species Density (# per 10,000 sq. ft.)
(Survey areas shown outside of MRA habitat boundaries serve as reference locations)

0	101-500
1-50	Baseline Grid
51-100	

Note: Vegetation mapping modified from 2011 Annual Natural Resource Report



Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

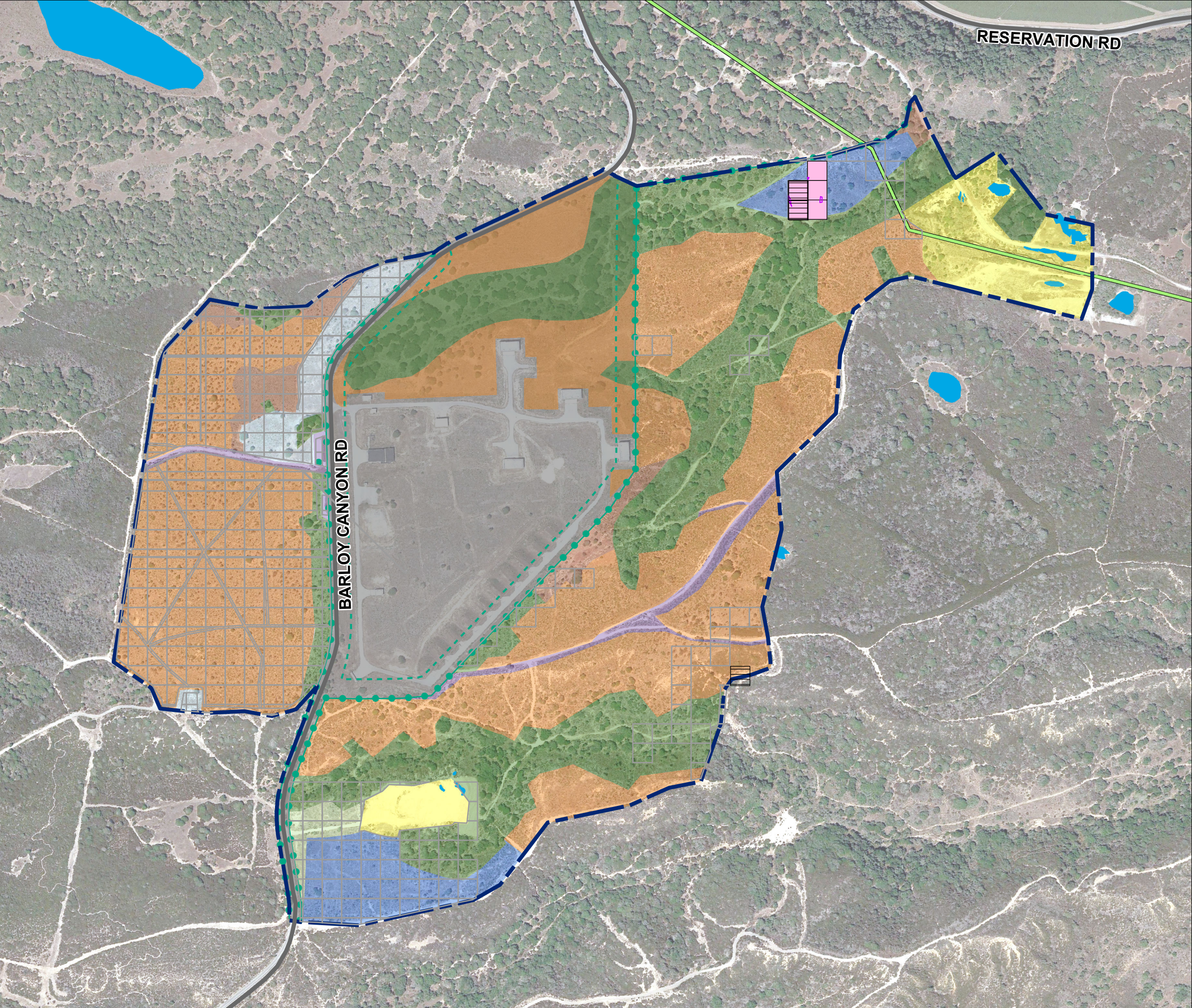
0 500 1,000 Feet

2017 Annual Natural Resource Report
HMP Herbaceous Species in the Future East Garrison MRA - Monterey Spineflower

FORA ESCA RP
Monterey County, California

Figure 7a

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Legend

Munitions Response Area

Major Road

Natural Gas Pipeline

Development Parcel

Borderland Interface

100-Foot Buffer from Borderland Interface

Aquatic Features

Vegetation Types

Central Maritime Chaparral

Chamise-dominated Chaparral

Low Quality Disturbed Chaparral

Coast Live Oak Woodland

Grassland

Ruderal and Cleared Areas

Low Recruitment Area

Roadways and Fuel Breaks

2017 Species Density (# per 10,000 sq. ft.)
(Survey areas shown outside of MRA habitat boundaries serve as reference locations)

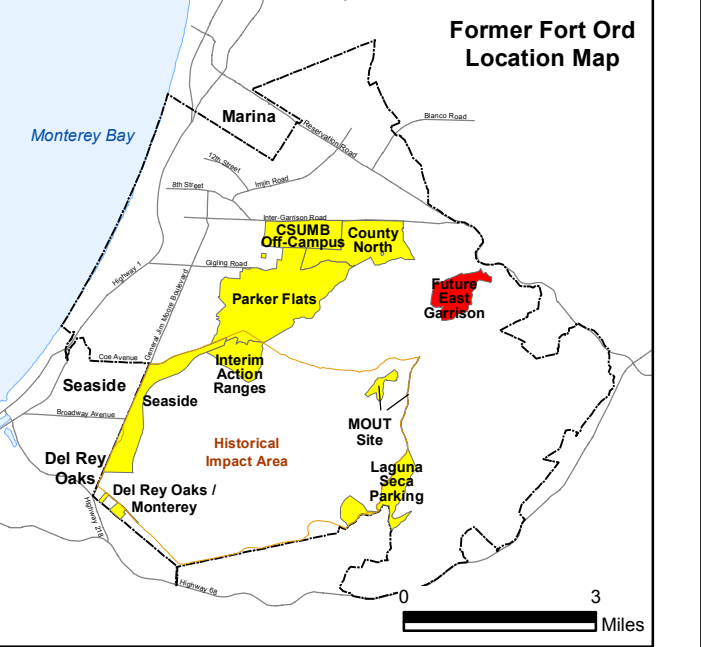
0

1-50

51-100

Baseline Grid

Note: Vegetation mapping modified from 2011 Annual Natural Resource Report



Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

0 500 1,000 Feet

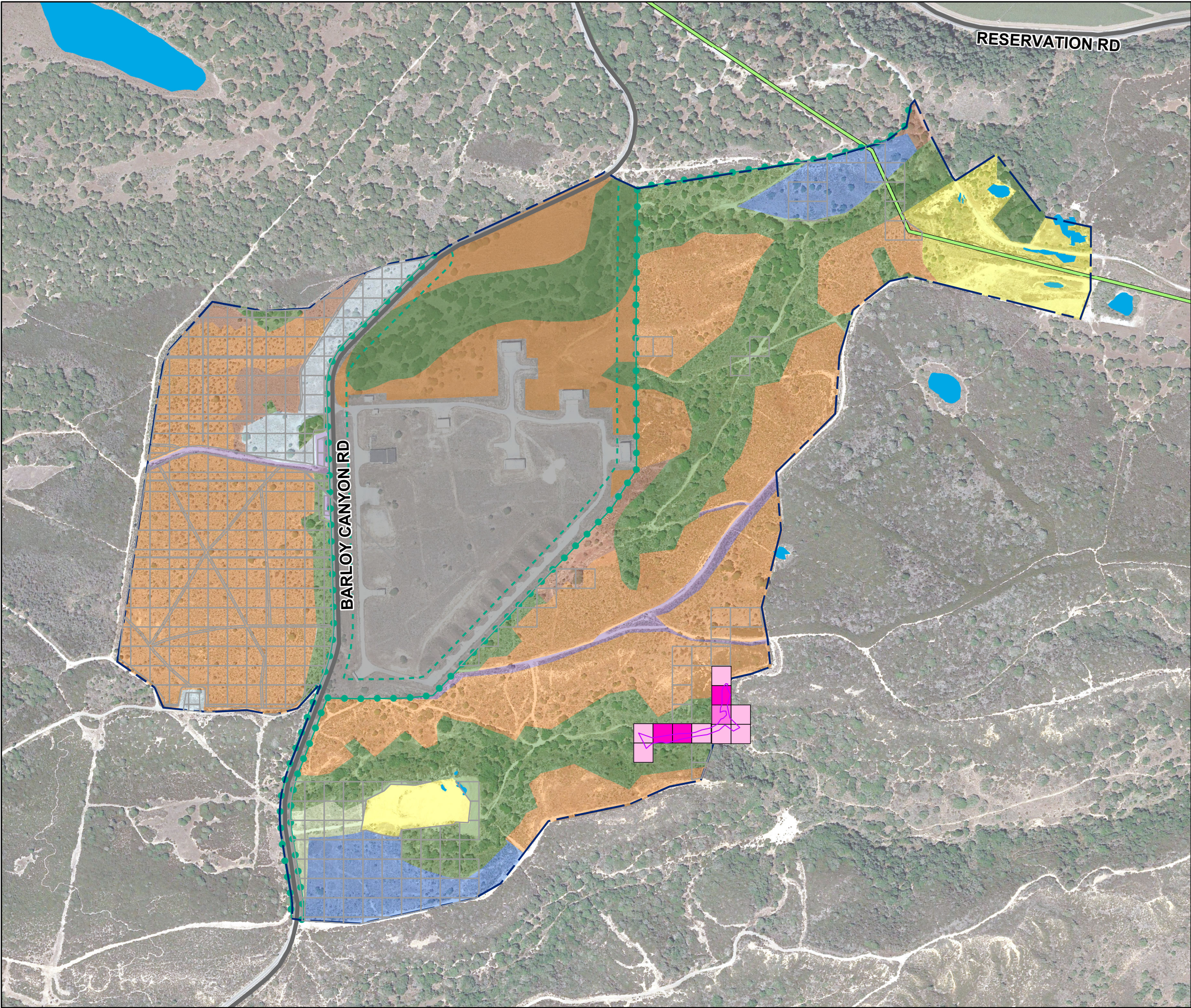
2017 Annual Natural Resource Report

HMP Herbaceous Species in the Future
East Garrison MRA - Monterey Gila

FORA ESCA RP
Monterey County, California

Figure 7b

Z:\GIS\Projects\ENV\FortOrd\095956_GIS\Projects\AllMRAs\Habitat Monitoring\2017 Annual Natural Resource Report\Fig 7c FEG Seaside Bird's Peak Density.mxd 10/26/2017 @ 2:12:17 PM



Legend

- Munitions Response Area
- Major Road
- Natural Gas Pipeline
- Development Parcel
- Borderland Interface
- 100-Foot Buffer from Borderland Interface
- Aquatic Features

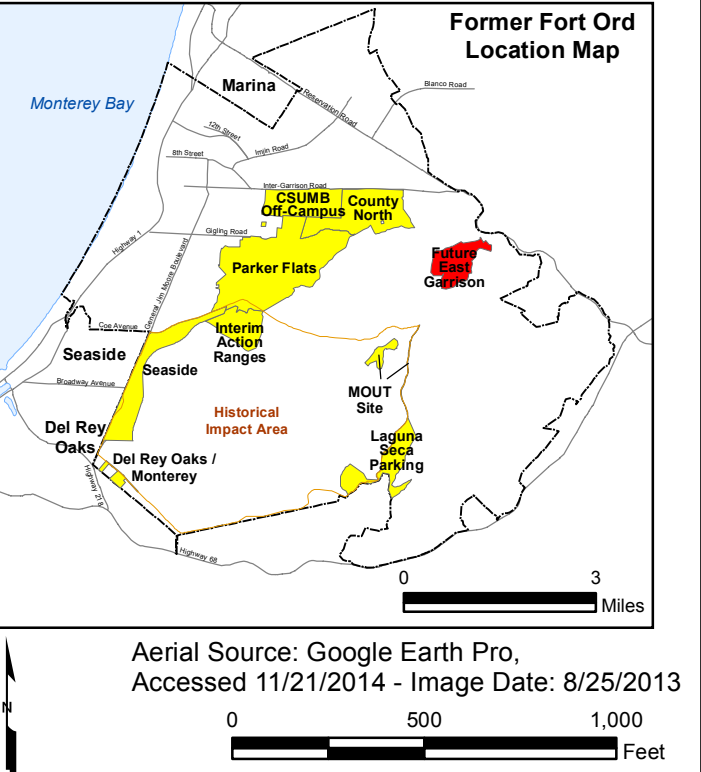
Vegetation Types

- Central Maritime Chaparral
- Chamise-dominated Chaparral
- Low Quality Disturbed Chaparral
- Coast Live Oak Woodland
- Grassland
- Ruderal and Cleared Areas
- Low Recruitment Area
- Roadways and Fuel Breaks

2017 Species Density (# per 10,000 sq. ft.)
(Survey areas shown outside of MRA habitat boundaries serve as reference locations)

0	101-500
1-50	
51-100	

Note: Vegetation mapping modified from 2011 Annual Natural Resource Report. Although previously reported in low numbers in a small portion of the FEG MRA, SSBB was not observed by ESCA RP biologists in the FEG MRA until 2013 in an area where it had not been previously documented. As a result, no baseline grids are available for SSBB



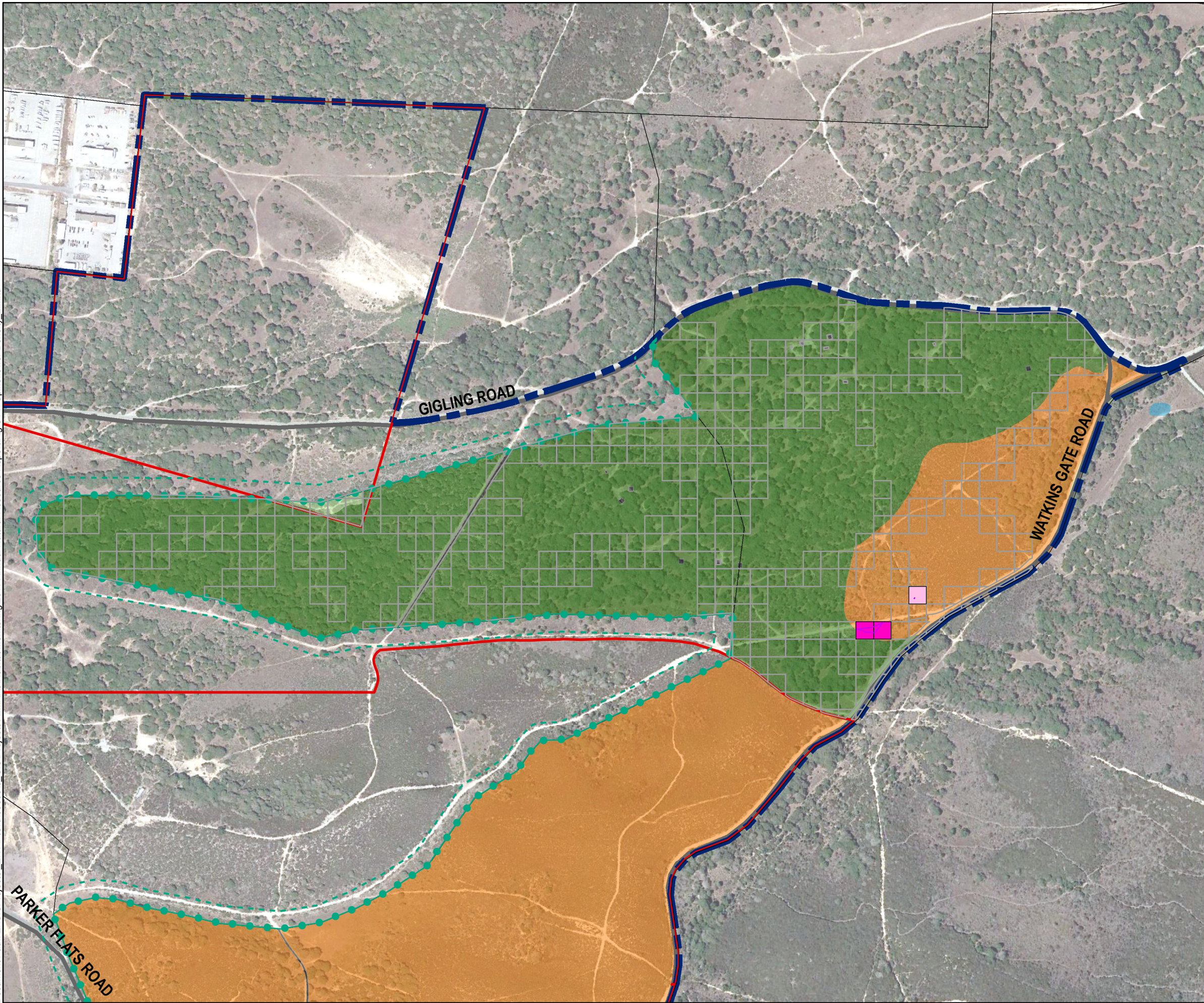
2017 Annual Natural Resource Report

HMP Herbaceous Species in the Future East Garrison MRA - Seaside Bird's Beak

FORA ESCA RP
Monterey County, California

Figure 7c

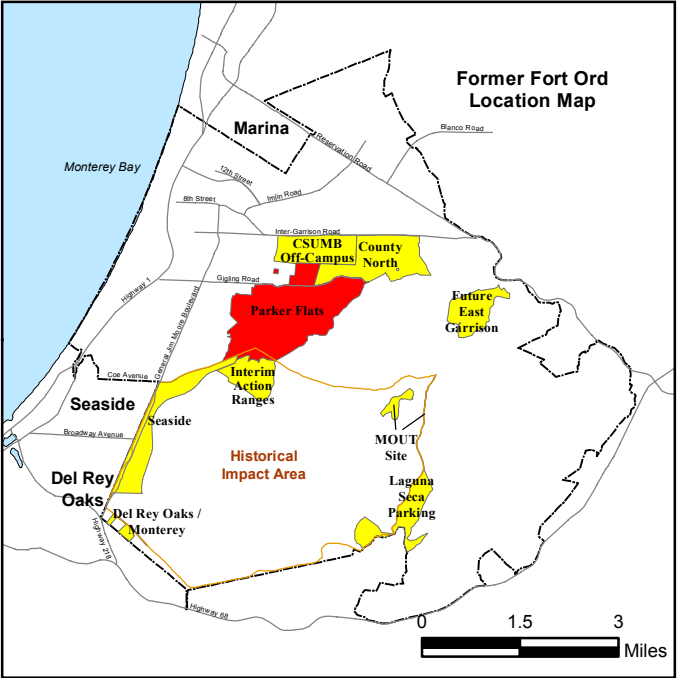
Document Path: Z:\GIS\Projects\ ENV\FortOrd\0959516_GIS\Projects\AIMRAs\Habitat Monitoring\2017 Annual Natural Resource Report\Fig 8 PF Spineflower Density_2.mxd



- Legend**
- Munitions Response Area
 - Major Road
 - Natural Gas Pipeline
 - Development Parcel
 - Borderland Interface
 - 100-Foot Buffer from Borderland Interface
 - Aquatic Features
 - Phase 1 Boundary

- Vegetation Types**
- Central Maritime Chaparral
 - Coast Live Oak Woodland
- 2017 Species Density (# per Grid Cell)**
(Survey areas shown outside of MRA habitat boundaries serve as reference locations)
- | | |
|--------|--|
| 0 | 101-500 |
| 1-50 | >500 |
| 51-100 | 2017 Occupied Habitat and Sample Plots |

NOTE: Monterey Gilia, and Seaside Bird's-Beak were surveyed but were absent.
*Source: Flora and Fauna Baseline Study of Fort Ord, California, Jones and Stokes Association Inc., December 1992.



Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

0 550 1,100
Feet

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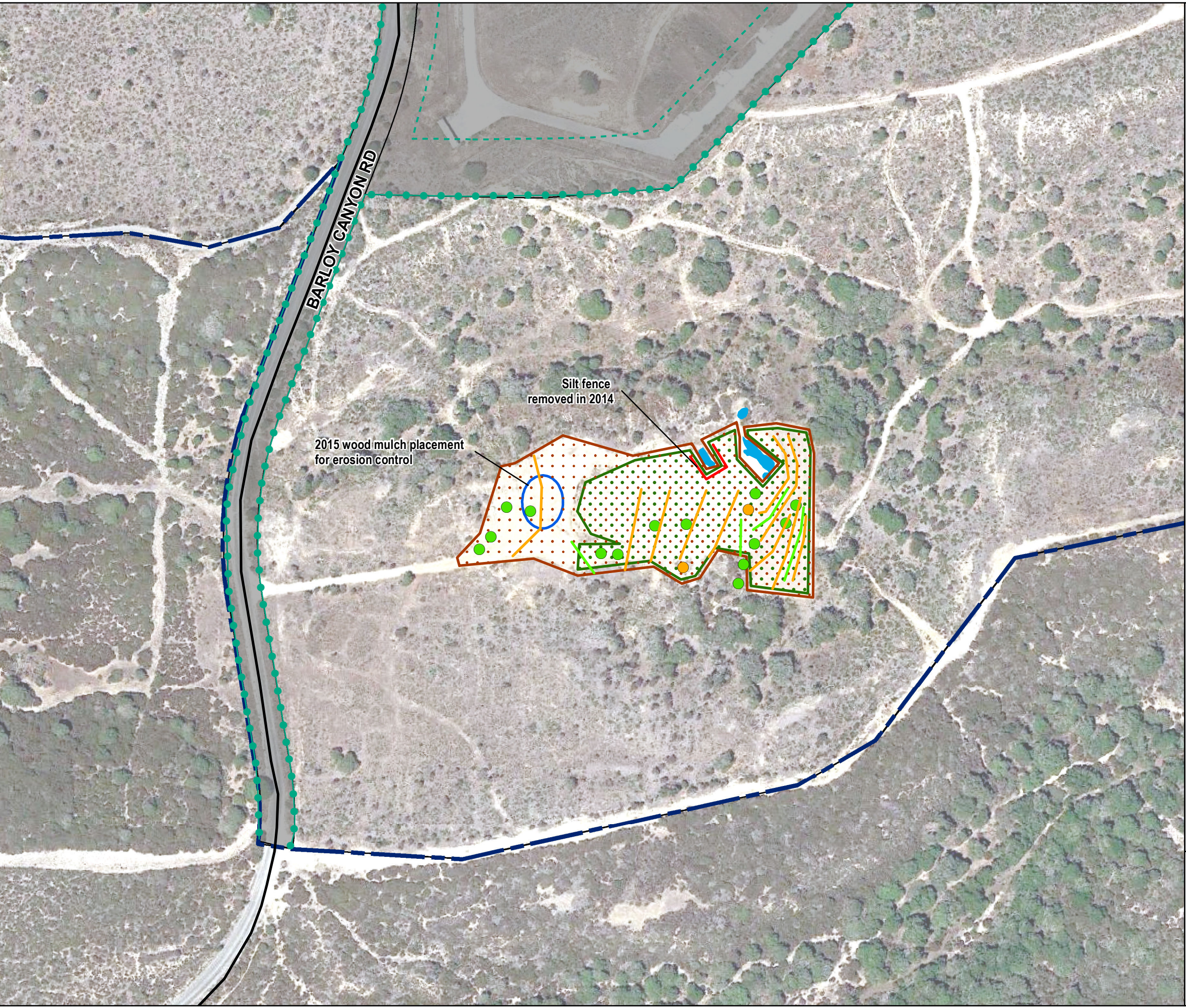
2017 Annual Natural Resource Report

HMP Herbaceous Species in the Parker
Flats MRA - Monterey Spineflower

FORA ESCA RP
Monterey County, California

Figure 8

Z:\GISProjects\ENV\FortOrd\095956_GIS\Projects\AllMRAs\Habitat Monitoring\2017 Annual Natural Resource Report\Fig 9a Erosion Monitoring - FEG.mxd 10/23/2017 @ 3:50:09 PM

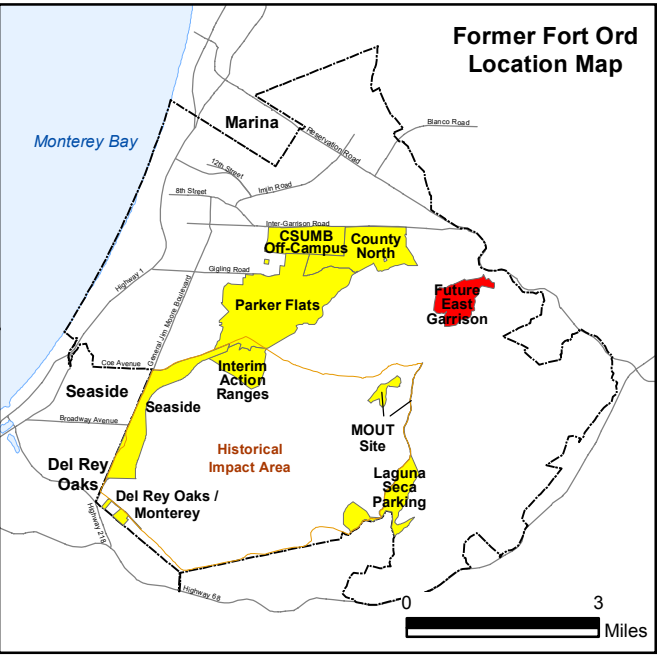


Legend

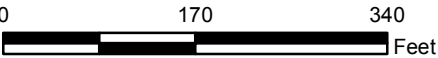
- Major Road
- Munitions Response Area
- Development Parcel
- Aquatic Features
- Borderland Interface
- 100-Foot Buffer from Borderland Interface

Erosion Control Measures

- 2013 Sand Bags/Straw Bales/
Erosion Control Blanket
- 2014 Sand Bags/Straw Bales/
Erosion Control Blanket
- 2013 Silt Fencing
- 2013 Straw Wattles/Water Bars
- 2014 Straw Wattles/Water Bars
- 2013 Hydroseed Areas
- 2014 Hydroseed Areas
- 2015 Wood Mulch



Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013



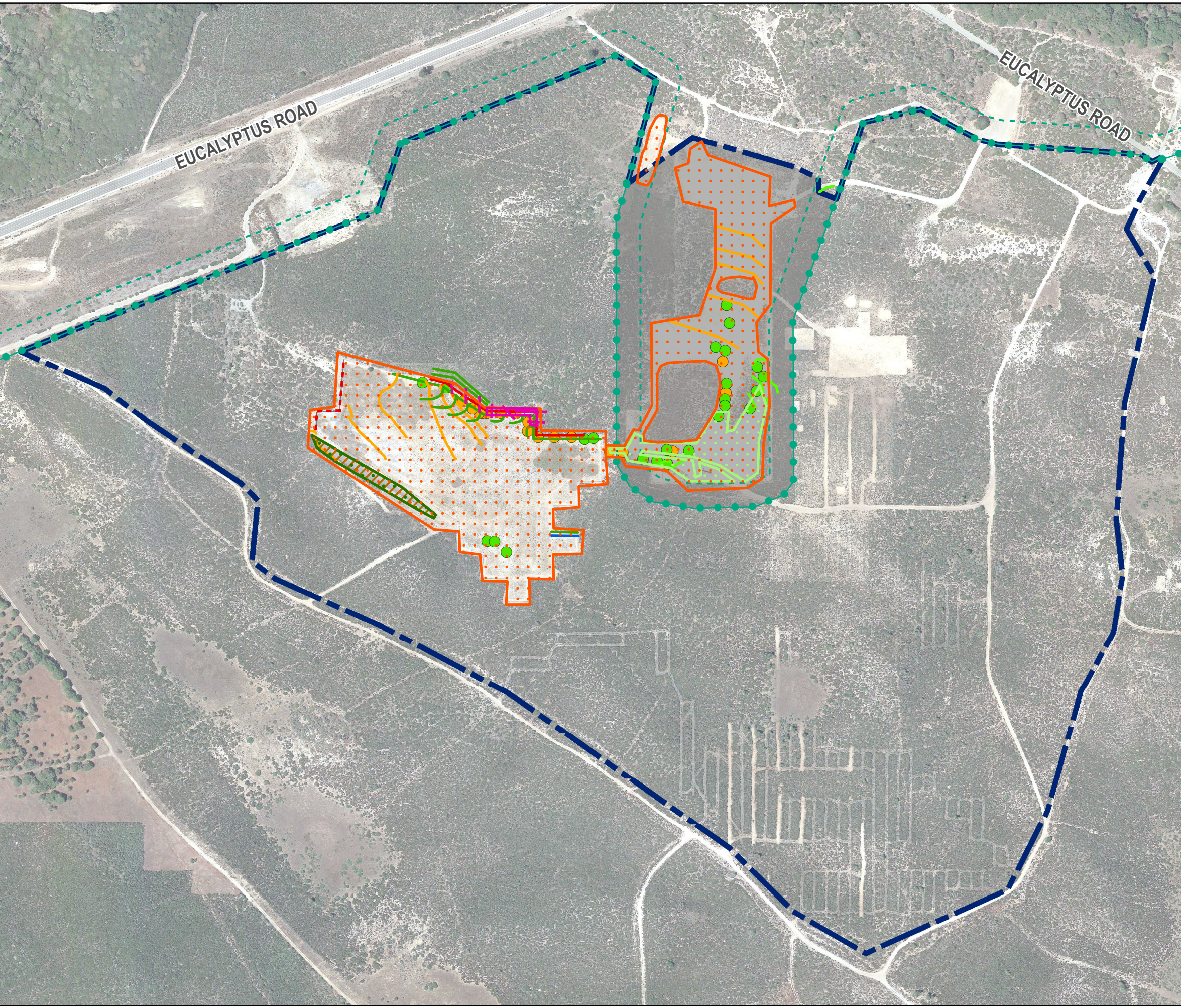
2017 Annual Natural Resource Report

Erosion Control BMPs in Future
East Garrison MRA

FORA ESCA RP
Monterey County, California

Figure 9a

Z:\GISProjects\ENV\FortOrd\09595\6_GIS\Projects\AllMRA\Habitat Monitoring\2017 Annual Natural Resource Report\Fig 9b Erosion Monitoring - IAR.mxd 10/25/2017 @ 10:18:26 AM



Legend

- Major Road
- Munitions Response Area
- Development Parcel
- Borderland Interface
- 100-Foot Buffer from Borderland Interface

Erosion Control Measures

- 2013 Silt Fencing
- 2013 Wind Screen
- 2013 Straw Wattles/Water Bars
- 2014 Silt Fencing
- 2014 Straw Wattles/Water Bars
- 2016 Silt Fencing
- 2016 Straw Wattles
- 2013 Sand Bags/Straw Bales/Erosion Control Blanket
- 2014 Sand Bags/Straw Bales/Erosion Control Blanket
- 2013 Hydromulch Areas
- 2013 Erosion Control Blanket
- 2014 Hydromulch Areas
- 2014 Hydroseed Areas
- 2016 Erosion Blanket

Former Fort Ord Location Map

Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

0 400 800 Feet

2017 Annual Natural Resource Report

Erosion Control BMPs in Interim Action Ranges MRA

FORA ESCA RP
Monterey County, California

Figure 9b

Figure 10.
Future East Garrison MRA – Mean Shrub Cover after Vegetation Cutting

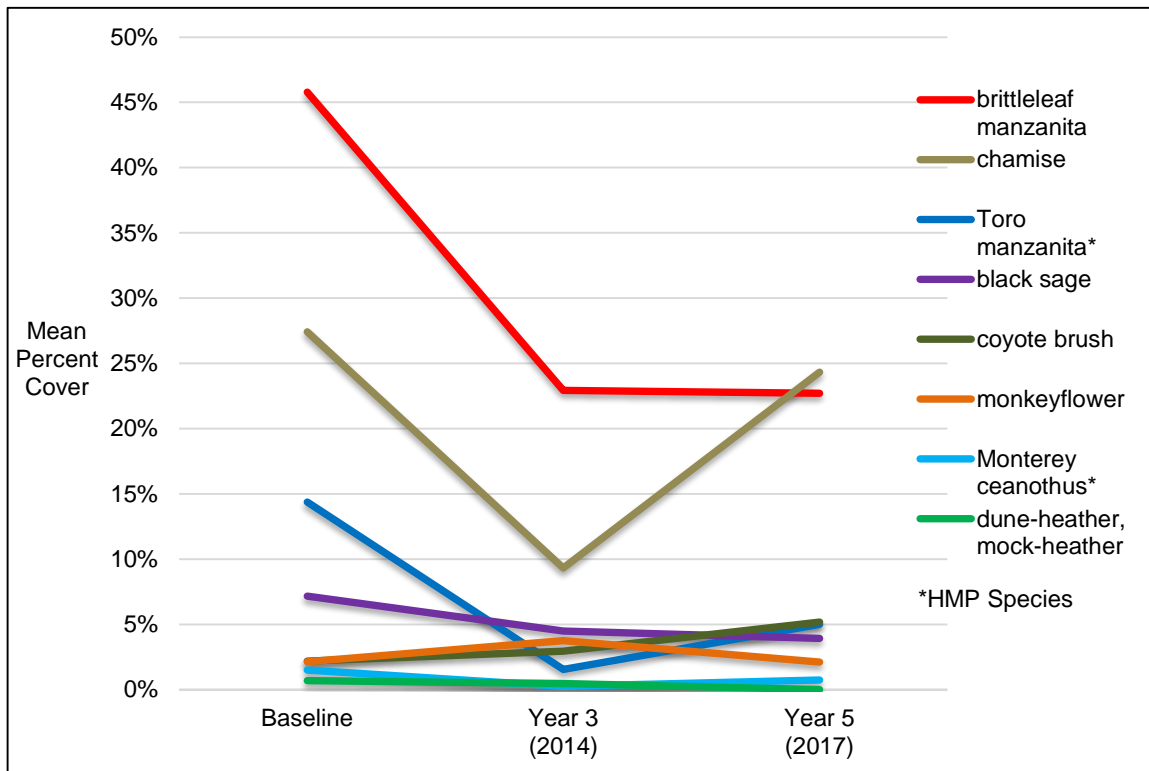


Figure 11.
Future East Garrison MRA – Mean Frequency of Shrub Species after Vegetation Cutting

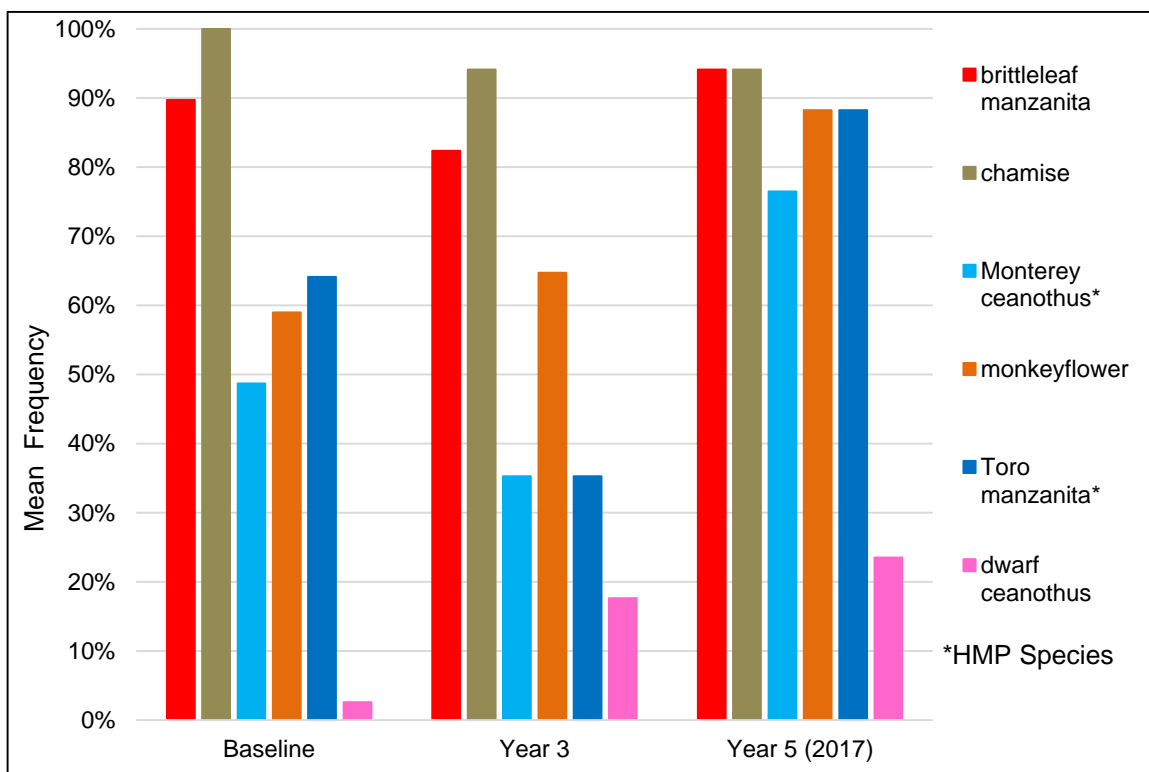


Figure 12.
Future East Garrison MRA – Mean Shrub Cover after Small-scale Excavation

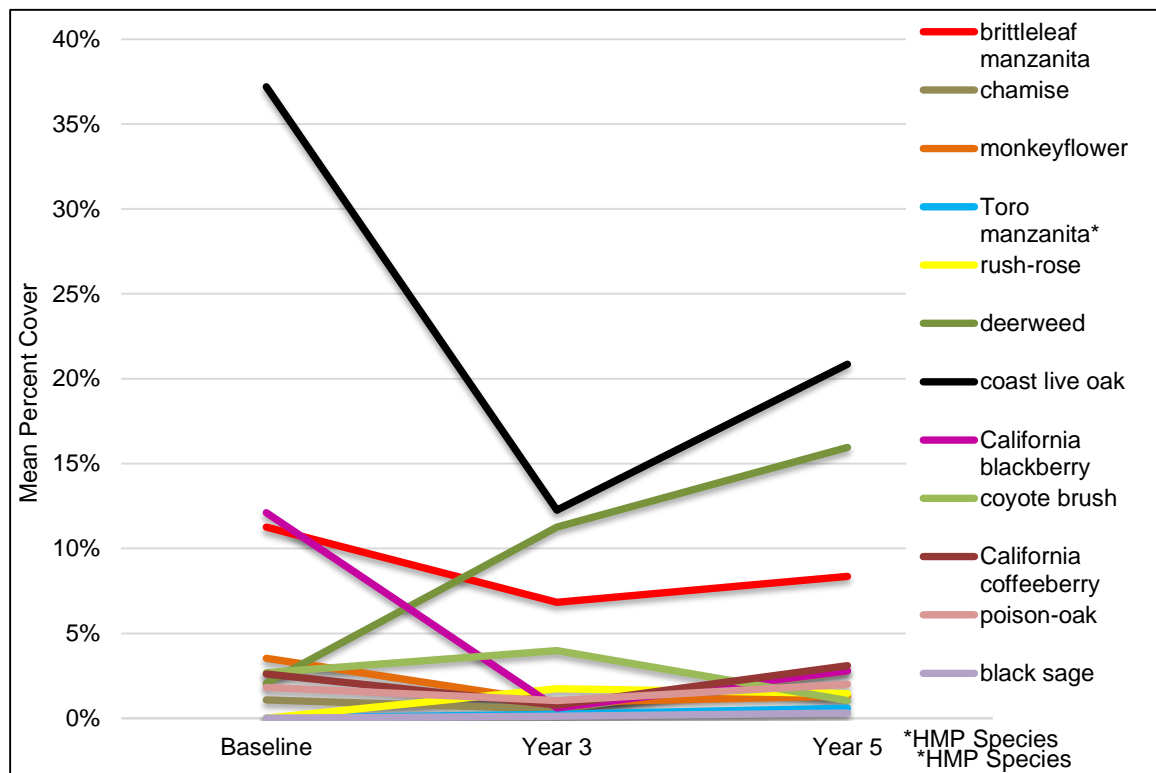


Figure 13.
Future East Garrison MRA – Mean Frequency of Shrub Species after Small-scale Excavation

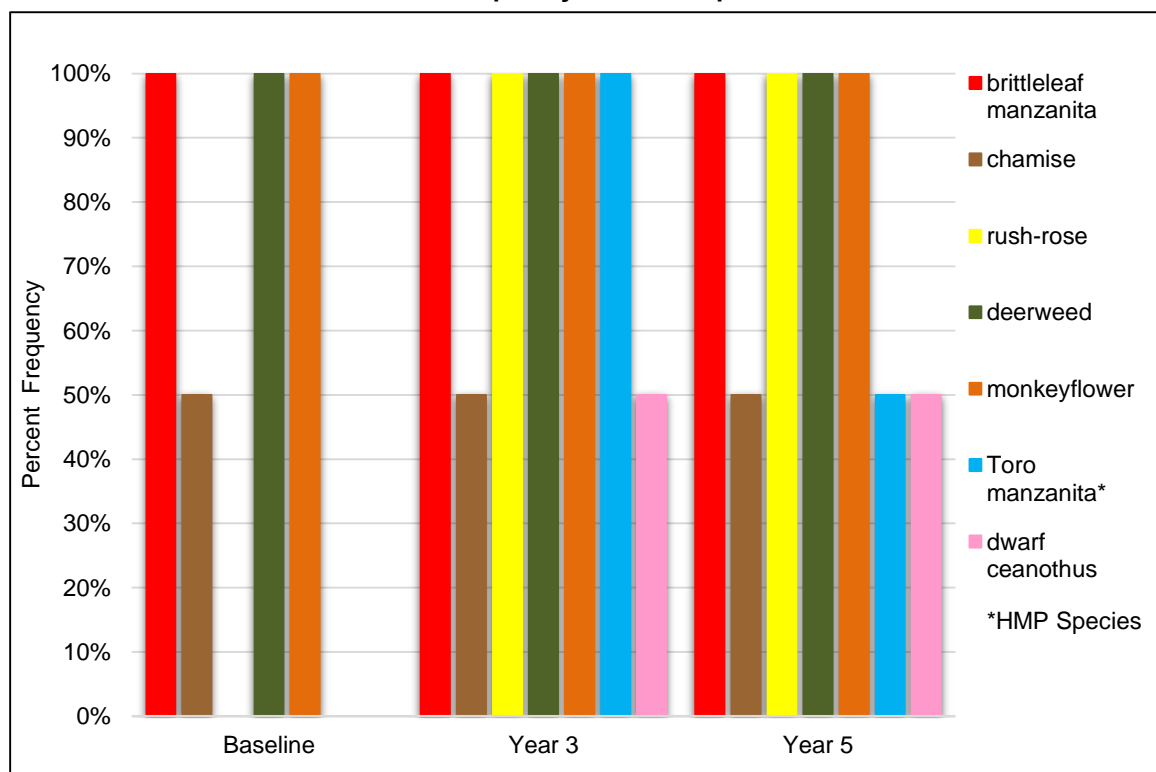


Figure 14.
Parker Flats MRA Phase II – Mean Shrub Cover after Vegetation Cutting in Central Maritime Chaparral

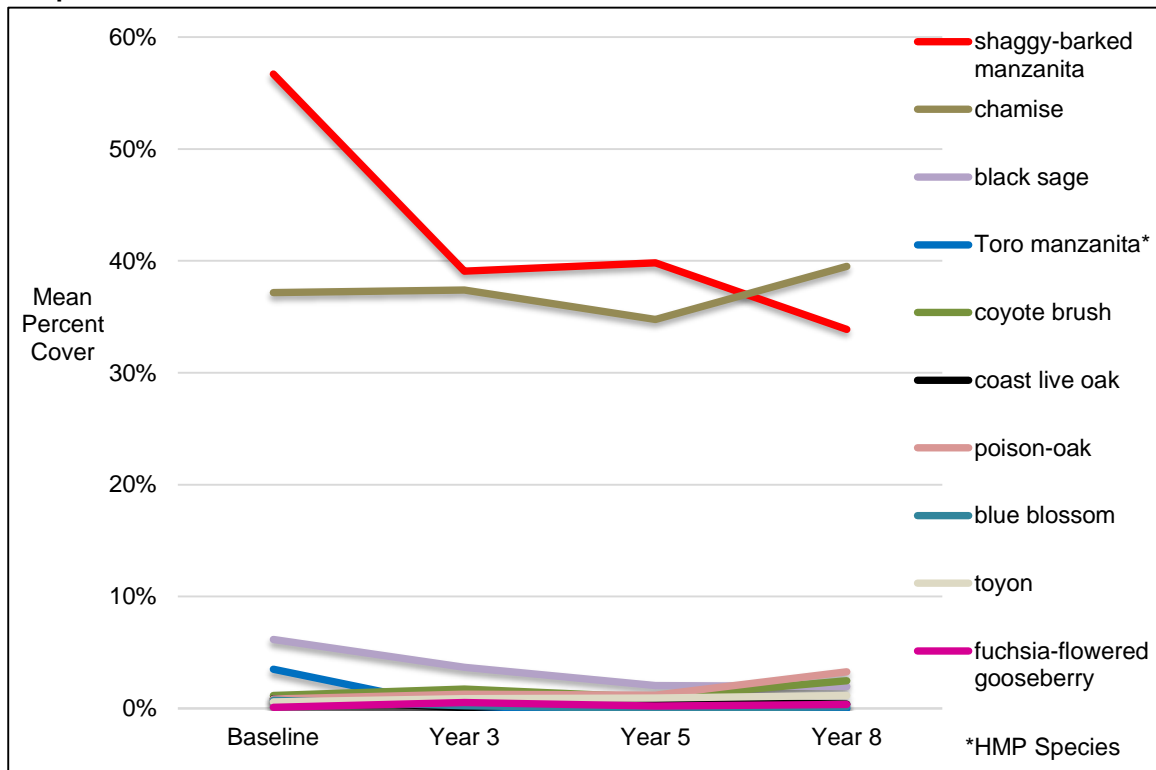


Figure 15. Parker Flats MRA Phase II – Mean Frequency of Shrub Species after Vegetation Cutting in Central Maritime Chaparral

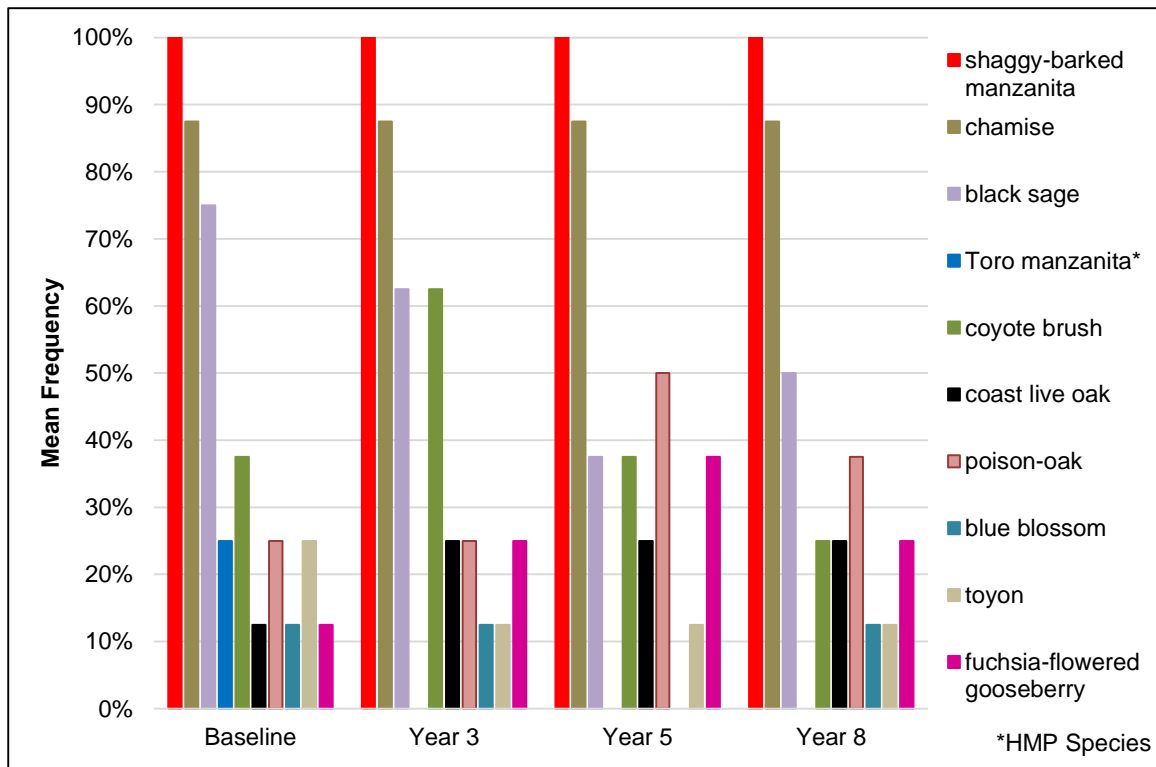


Figure 16.
Parker Flats MRA Phase II – Mean Shrub Cover after Vegetation Cutting in Central Coastal Scrub

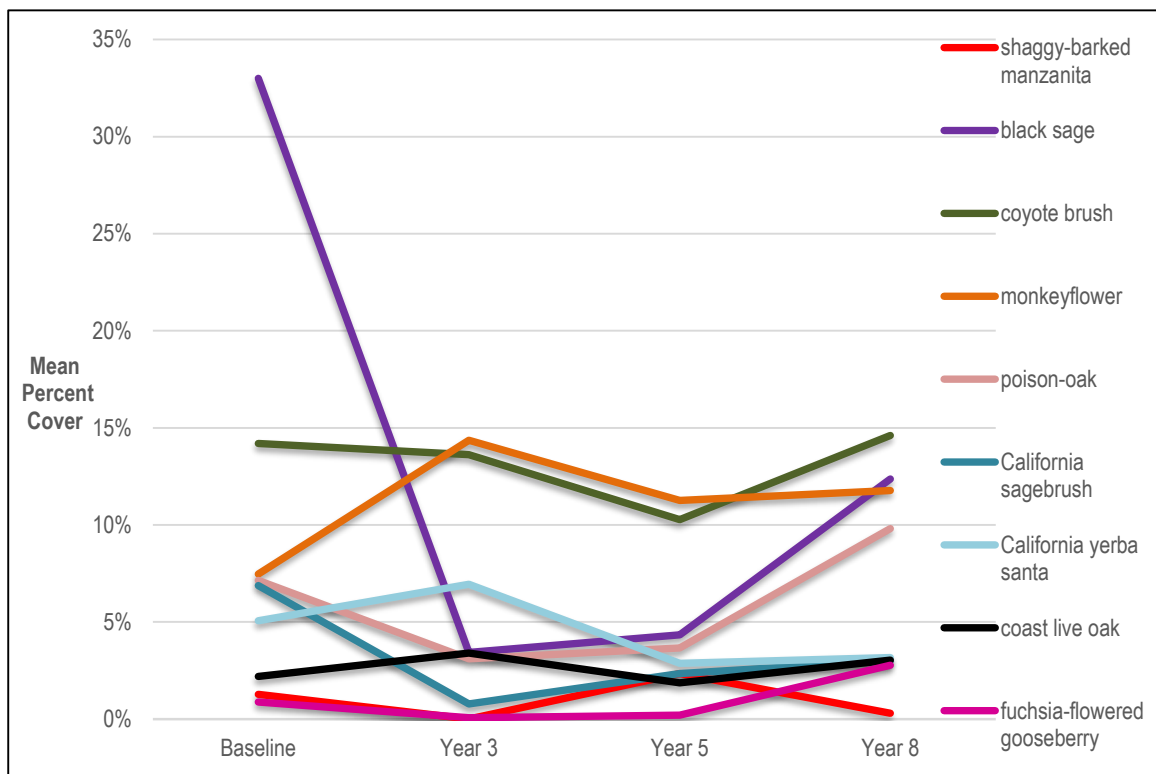


Figure 17.
Parker Flats MRA Phase II – Mean Frequency of Shrub Species after Vegetation Cutting in Central Coastal Scrub

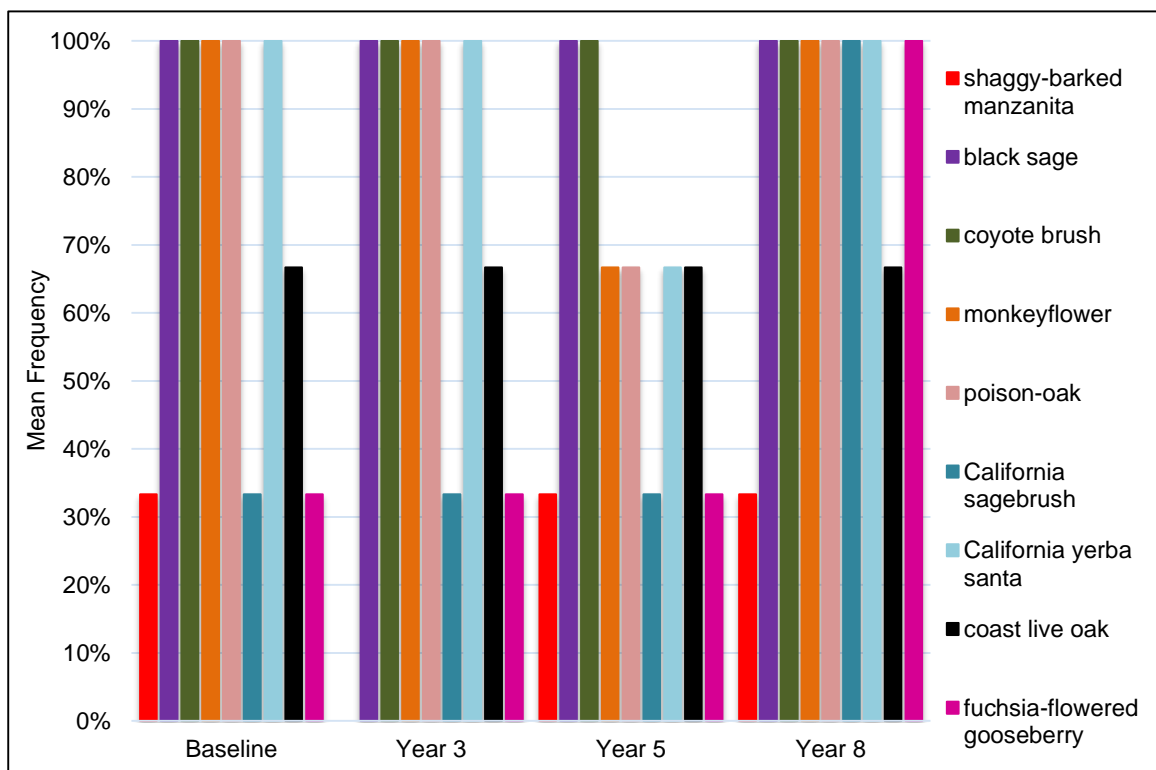
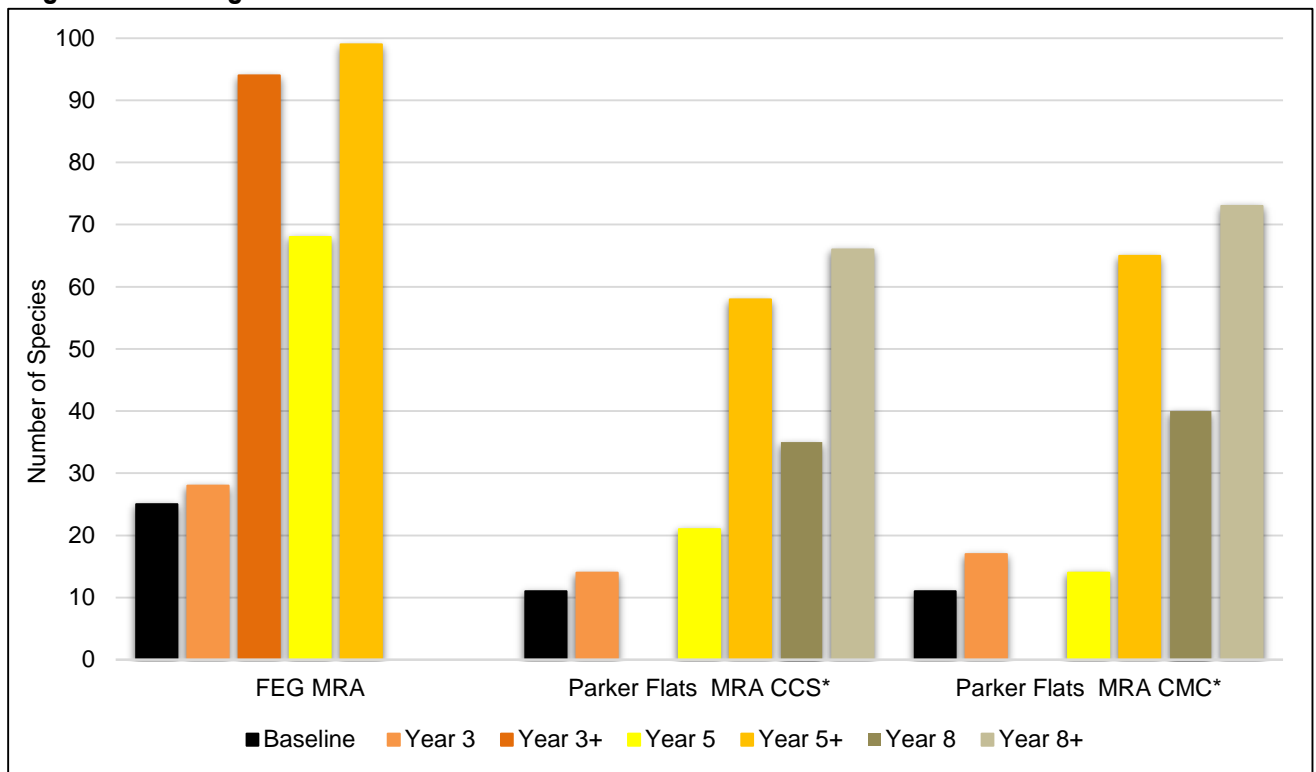


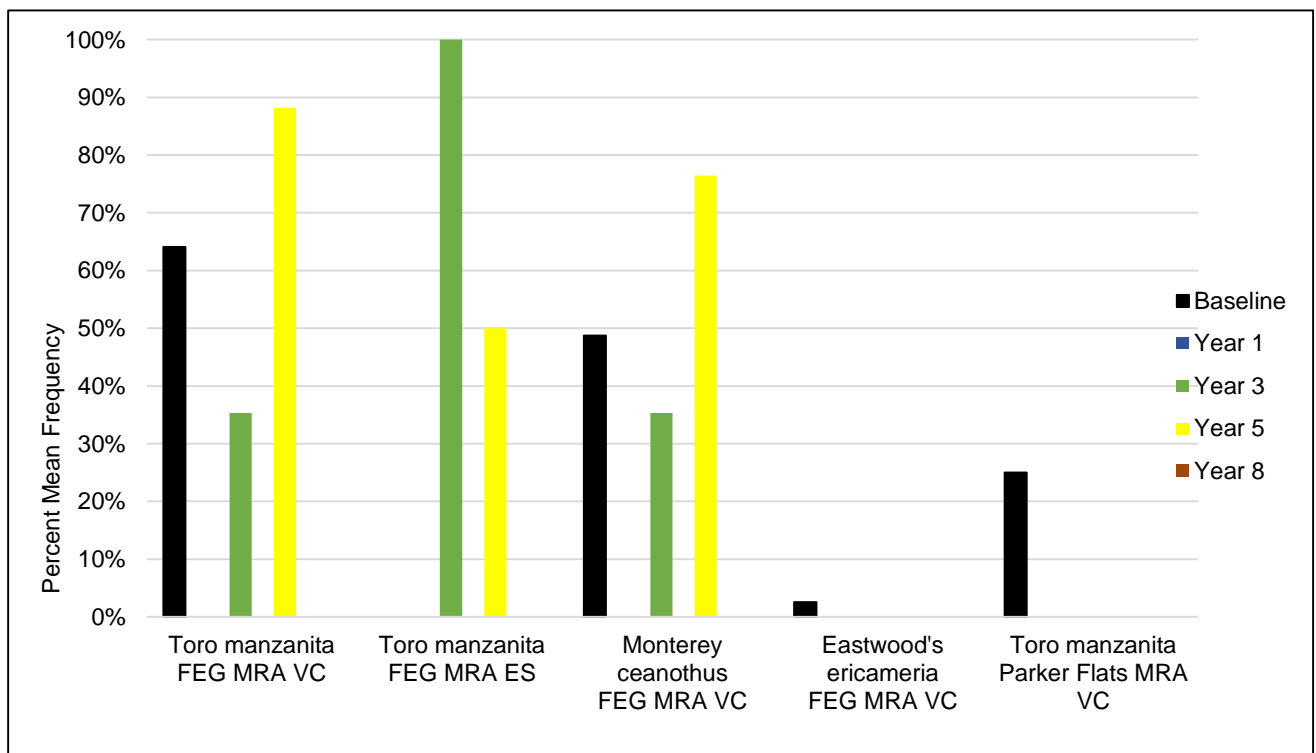
Figure 18.
Future East Garrison MRA and Parker Flats MRA - Native Species Richness before and after
Vegetation Cutting in 2010 – 2016



FEG and Parker Flats Monitoring occurs during Years 3, 5, and 8, therefore there are no data for Years 1, 2, 4, 6 and 7.

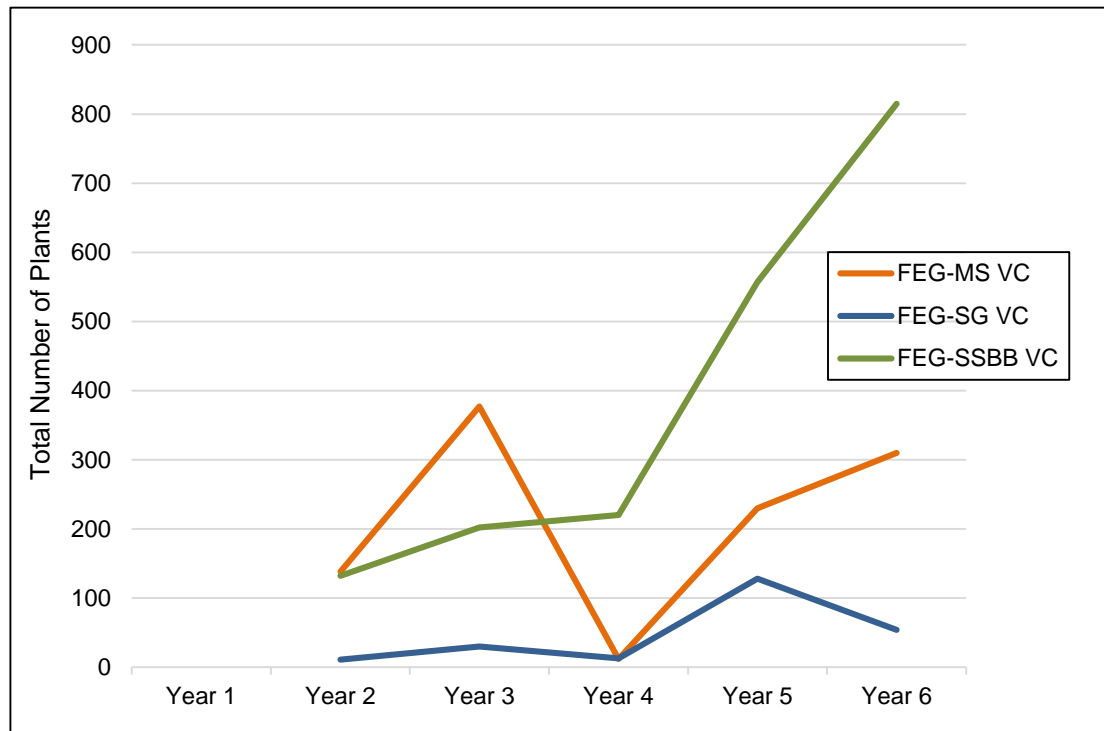
*Parker Flats Year 3 was monitored in 2012, before species surrounding the transects were added to diversity.

Figure 19.
Future East Garrison MRA and Parker Flats MRA - HMP Shrub Species Frequency in 2010 – 2017



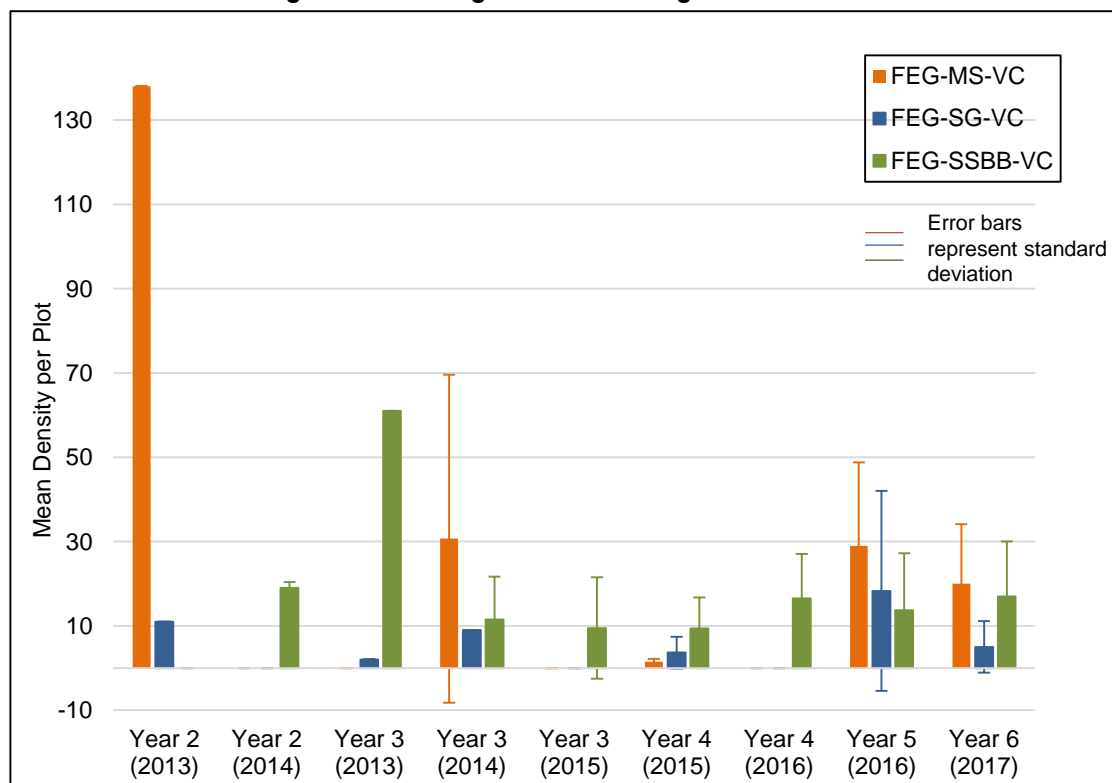
VC = Vegetation Cutting, ES = small-scale excavation

Figure 20. Future East Garrison MRA – Total Number of HMP Herbaceous Species Year 2 – Year 6 after Vegetation Cutting



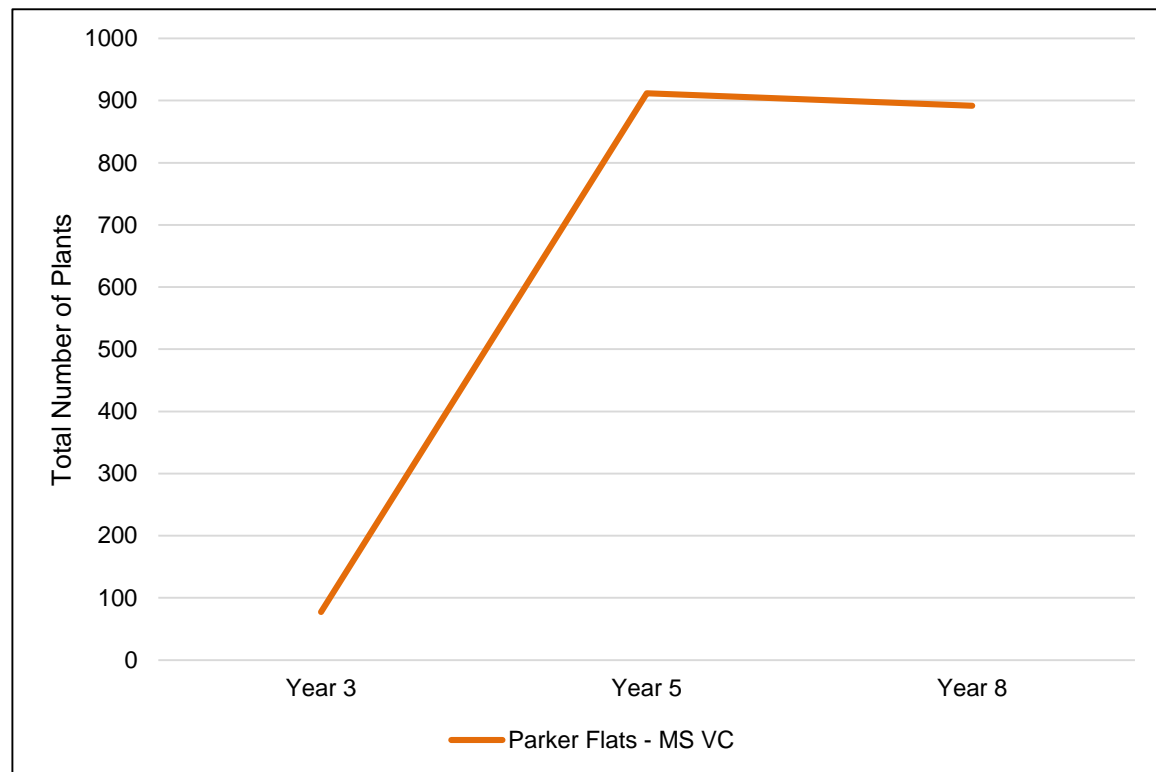
MS = Monterey spineflower, SG = sand (Monterey) gilia, SSBB = seaside bird's-beak
VC = vegetation cutting,

Figure 21. Future East Garrison MRA – Mean Density per Plot of HMP Herbaceous Species In 2013 - 2017 after Vegetation Cutting in Year 2 through Year 6



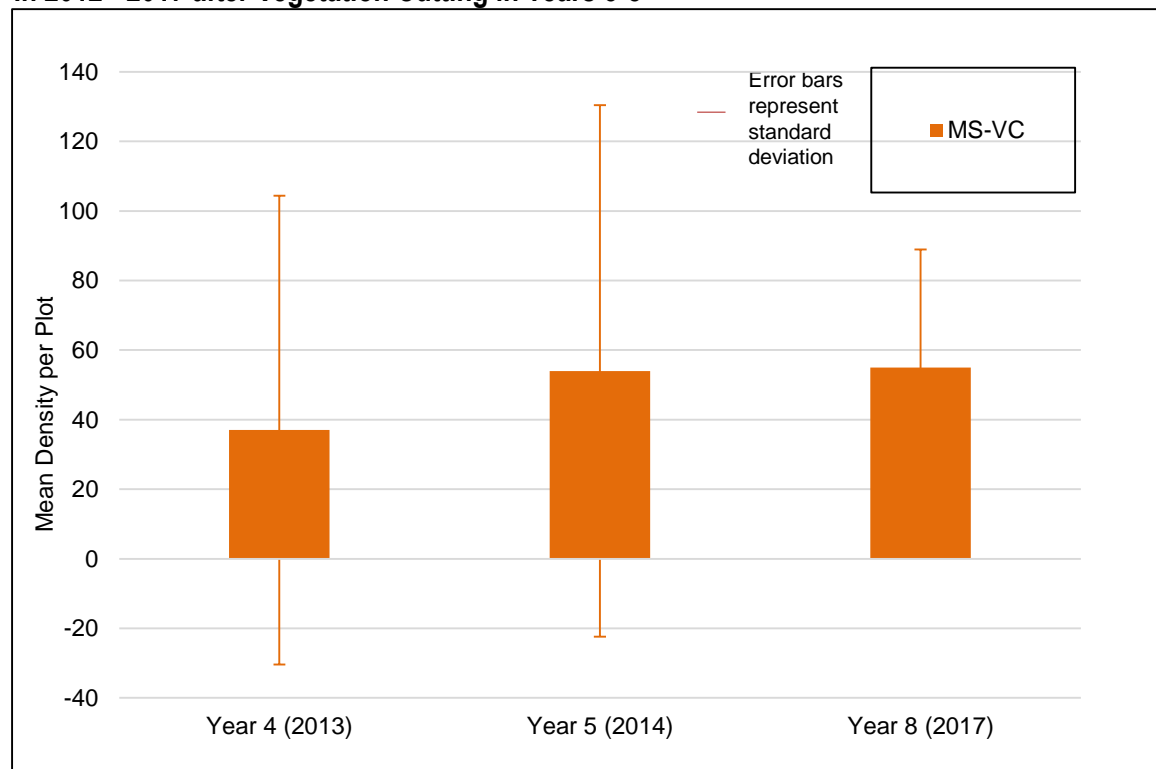
MS = Monterey spineflower, SG = sand (Monterey) gilia, SSBB = seaside bird's-beak VC = vegetation cutting
'Year' represents number of years since vegetation was cut. The Year in parenthesis (e.g., 2013) is monitoring year.
For example: Year 2 (2013) represents grids cut in 2011, Year 2 (2014) represent grids cut in 2012.

Figure 22. Parker Flats MRA Phase II – Total Number of Monterey Spineflower Year 3 – Year 8 after Vegetation Cutting



MS = Monterey spineflower
VC = vegetation cutting,

Figure 23. Parker Flats MRA Phase II – Mean Density per Plot of Monterey Spineflower In 2012 - 2017 after Vegetation Cutting in Years 3-8



MS = Monterey spineflower, VC = vegetation cutting

'Year' represents number of years since VC. The Year in parenthesis (e.g., 2012) is monitoring year.

For example: Year 2 (2013) represents grids cut in 2011, Year 2 (2014) represent grids cut in 2012.

FORA ESCA REMEDIATION PROGRAM

Appendix A.

2017 Habitat Restoration Monitoring Report Interim Action Ranges Munitions Response Area

Former Fort Ord
Monterey County, California

April 2, 2018

Prepared for:

FORT ORD REUSE AUTHORITY

920 2nd Avenue, Suite A
Marina, California 93933



Prepared Under:

Environmental Services Cooperative Agreement

No. W9128F-07-2-01621

and

FORA Remediation Services Agreement (3/30/07)

Document Control Number: 09595-17-057-005

Prepared by:

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ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order of Consent
Arcadis	Arcadis U.S., Inc.
ARARs	Applicable or Relevant and Appropriate Requirements
Army	United States Department of the Army
BMP	best management practice
BO	Biological Opinion
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm	centimeter(s)
CNPS	California Native Plant Society
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESCA	Environmental Services Cooperative Agreement
ESCA RP	Environmental Services Cooperative Agreement Remediation Program
ESCA RP Team	Arcadis U.S., Inc., Weston Solutions, Inc., Westcliffe Engineers, Inc.
FORA	Fort Ord Reuse Authority
ha	hectare(s)
HMP	Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, California
HRP	Habitat Restoration Plan
IAR	Interim Action Ranges
IRACR	Interim Remedial Action Completion Report
km	kilometer(s)
m	meter(s)
MEC	munitions and explosives of concern
MRA	Munitions Response Area(s)
MRS	Munitions Response Site
NCA	Non-Completed Area
ROD	Record of Decision
SCA	Special Case Area
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

1.0 INTRODUCTION

This Year 5 Habitat Restoration Monitoring Report summarizes the activities conducted by the Fort Ord Reuse Authority (FORA) during the fifth year of habitat restoration monitoring in the Interim Action Ranges (IAR) Munitions Response Area (MRA) on the former Fort Ord in Monterey County, California, between 1 January 2017 and 31 December 2017; it represents the fifth mitigation monitoring report documenting maintenance and monitoring restoration activities in the IAR MRA. Restoration implementation activities, including seeding and planting in designated restoration areas, were summarized in the Appendix A of the 2013 Annual Natural Resource Monitoring, Mitigation and Management Report (ESCA RP Team 2014; Appendix A). Previous Habitat Restoration Monitoring Reports have been included as Appendix A in the Annual Natural Resource Monitoring, Mitigation, and Management Reports covering the 2013, 2014, 2015, and 2016 reporting periods (ESCA RP Team 2014, 2015b, 2016, and 2017).

Munitions and explosives of concern (MEC) Design Study and Phase II Interim Actions have been completed in the Range 44 Special Case Area (SCA), Range 47 SCA, and Central Area Non-Completed Areas (NCAs) of the IAR MRA by the Environmental Services Cooperative Agreement (ESCA) Remediation Program (RP) Team (“ESCA RP Team”, consisting of Arcadis U.S., Inc. [Arcadis], Weston Solutions, Inc., and Westcliffe Engineers, Inc.) (Figures A1 and A2). The objective of the Design Study and Phase II Interim Action was to complete the interim remedial action within the IAR MRA consistent with the objectives outlined in the Record of Decision (ROD), Interim Action for Ordnance and Explosives at Ranges 43-48, Range 30A, and Site OE-16, Former Fort Ord, California (“Interim Action ROD”; Army 2002) because the IAR MRA is located within a portion of the United States Department of the Army (Army) Munitions Response Site (MRS) for Ranges 43-48 (“MRS Ranges 43-48”). The interim remedial action objectives in the Interim Action ROD were to reduce risks to human health and the environment and comply with federal and state Applicable or Relevant and Appropriate Requirements (ARARs). The interim remedial action in the remaining portion of the IAR MRA, outside of the SCAs and NCAs, was completed by the Army in accordance with the objectives outlined in the Interim Action ROD and is referred to by FORA as the Phase I Interim Action. To meet the remedial action objectives and complete the selected remedy for the Interim Action ROD in the SCAs and NCAs, a Design Study was conducted followed by an interim remedial action in the Range 47 SCA.

The activities completed during the Design Study and Phase II Interim Action began in February 2011 and were completed in March 2013. Activities were conducted in accordance with the Final Phase II Interim Action Work Plan, IAR MRA (“Interim Action Work Plan”; ESCA RP Team 2011) and associated field variance forms. Activities completed during the Design Study and Phase II Interim Action are discussed in the Interim Remedial Action Completion Report (IRACR; ESCA RP Team 2015a).

In accordance with the Interim Action Work Plan, a Habitat Restoration Plan (HRP) for the IAR MRA (ESCA RP Team 2013b) was prepared to describe the activities to be undertaken to restore the natural resources in habitat parcels that were affected by the ESCA RP Team’s

MEC remedial activities (Figures A2 and A3). The HRP includes requirements outlined in the Installation-Wide Multispecies Habitat Management Plan (HMP) for Former Fort Ord, California (“the HMP”; USACE 1997) and in Biological Opinions (BOs; USFWS 1999, 2002, 2005, 2007) issued to the Army. The HRP includes mitigation measures to avoid and minimize impacts to rare, threatened, and endangered species and their habitats during pre-disposal activities such as munitions response activities (ESCA RP Team 2013b). The plan was reviewed and approved by the Army and United States Fish and Wildlife Service (USFWS) and was provided as an addendum to the Interim Action Work Plan.

The activities outlined in the HRP were designed to establish native vegetation at the site that is progressing on a trajectory toward a self-sustaining native plant community equitable with the species richness and relative cover of species included in the HMP that were present on the site prior to the ESCA RP Team investigation and remedial efforts.

Monitoring data presented in Appendix A of the 2015 and 2016 Annual Natural Resource Reports (ESCA RP Team 2016 and 2017) indicated that most areas in the Interim Action Ranges MRA had met Year 7 performance targets for vegetation cover, overall species diversity, and HMP shrub species richness, pursuant to the HRP; these areas include all of Range 47 SCA and the areas in South Range 44 SCA and Central Area NCAs and North Range 44 SCA subject to vegetation cutting. Areas requiring ongoing vegetation monitoring until performance targets are met include North Range 44 SCA small-scale excavation areas and South Range 44 SCA and Central Area NCAs small-scale excavation areas. All monitoring areas in the IAR MRA met Year 7 performance targets for HMP herbaceous species presence in 2015 (ESCA RP Team 2016) and are no longer subject to ongoing monitoring.

On January 18, 2017, the Army recorded the final remedial decision for the IAR MRA in the IAR MRA ROD (Army 2017), documenting the selected remedial alternative of Land Use Controls for managing the risk to future land users from MEC that potentially remain in the IAR MRA. The IAR MRA ROD states: (1) construction and implementation of the IAR MRA restoration areas has been completed and restoration systems are in place, operational and functioning; (2) operation and maintenance to support the long-term success of restoration at the site is being implemented through a post-installation adaptive management process to evaluate and manage the restoration areas as described in the HRP; and (3) initiated restoration activities are currently on track to achieve the prescribed performance criteria in the IAR MRA restoration areas.

This report summarizes the monitoring activities performed by the ESCA RP Team in 2017, along with its subcontractors, pursuant to requirements outlined in the HRP. Activities were performed for FORA in coordination with the Army.

1.1 Regulatory History

On 31 March 2007, the Army and FORA entered into an ESCA governing the remaining MEC removal activities required for approximately 3,300 acres of former Fort Ord property.

In accordance with the ESCA and an Administrative Order on Consent (AOC), FORA is responsible for completion of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions, except for those retained by the Army. The AOC was entered into voluntarily by FORA, the United States Environmental Protection Agency (EPA) Region 9, the California Department of Toxic Substances Control, and the United States Department of Justice Environment and Natural Resources Division on 20 December 2006 (EPA Region 9 CERCLA Docket No. R9-2007-03). The underlying property was transferred to FORA in May 2009. The AOC was issued by EPA under the authority vested in the President of the United States by Sections 104, 106, and 122 of CERCLA, as amended, 42 United States Code §§ 9604, 9606, and 9622.

Arcadis has prepared this document on behalf of FORA in accordance with industry standards and consistent with the requirements of the Remediation Services Agreement dated 30 March 2007, by and between Arcadis and FORA including any applicable governing documents and applicable laws and regulations. As contractors to FORA under the ESCA RP, the field activities described in this report were conducted by the ESCA RP Team, and their subcontractors. The information presented in this Habitat Restoration Monitoring Report supports the completion of the Phase II Interim Action under the Interim Action ROD and IAR MRA ROD (Army 2002 and 2017).

1.2 Project Summary

Former Fort Ord served primarily as a training and staging facility for cavalry and infantry troops from 1917 until its closure in 1994. The IAR MRA is located in the north-central portion of the former Fort Ord, within the boundary of the historical impact area (Figure A1 and A2). The IAR MRA is approximately 227 acres (92 hectares [ha]) in size and is bordered by the Parker Flats MRA to the north, the Seaside MRA to the northwest, and the historical impact area to the southeast, south, and southwest. The IAR MRA is within the jurisdictional boundaries of the City of Seaside and Monterey County. The IAR MRA contains five United States Army Corp of Engineer (USACE) property transfer parcels, E38, E39, E40, E41, and E42.

The designated future land use for the IAR MRA Phase II Interim Action areas is habitat reserve (Figure A3). The future land use presented in this report is primarily based upon the 1997 Fort Ord Base Reuse Plan (FORA 1997). Other sources of future land use information include public benefit conveyance, negotiated sale requests, transfer documents, the HMP (USACE 1997), and the Assessment East Garrison – Parker Flats Land Use Modifications (Zander 2002). The Fort Ord Base Reuse Plan identified approximately 20 land-use categories at the former Fort Ord (FORA 1997) including habitat management, open space/recreation, institutional/public facilities, commercial, industrial/business park, residential, tourism, mixed use, and others.

The former Fort Ord was used to train Army infantry, cavalry, and field artillery units until official closure in 1994. In support of the training of soldiers, military munitions were used at the ranges throughout the former Fort Ord. As a result of the training activities, a wide variety

of conventional MEC have been encountered in areas throughout the former Fort Ord. The MEC encountered at the former Fort Ord have been either unexploded ordnance or discarded military munitions.

The IAR MRA is located in the area designated by the Army as MRS Ranges 43-48. The Army previously conducted munitions response actions within MRS Ranges 43-48, which encompasses the IAR MRA (Parsons 2002 and 2007). The Army determined that the MRS Ranges 43-48 warranted an interim action due to the proximity and increased accessibility to the public, the threat of trespassing, and the MEC on or near the surface of the ranges. An Interim Action ROD was produced by the Army in August 2002 for Interim Action Sites at the former Fort Ord, which included MRS Ranges 43-48 (Army 2002). The interim remedial action selected for the Interim Action Sites included surface and subsurface MEC remediation. The interim action in MRS Ranges 43-48, which was referred to by FORA as the Phase I Interim Action, encompassed the IAR MRA and began in 2002 with site preparation followed by a prescribed burn. Interim remedial actions were conducted from November 2003 to December 2005 (Parsons 2007). The Army designated approximately 235 acres within MRS Ranges 43-48 where subsurface MEC removal was not completed as SCAs or NCAs. Subsurface MEC removal was not completed within the SCAs due to high concentrations of anomalies caused by metallic debris and various other reasons (Parsons 2007). Approximately 35.9 acres of SCAs and approximately 9.2 acres of NCAs within MRS Ranges 43-48 are located within the boundaries of the IAR MRA. An additional surface removal was conducted in a portion of the Range 44 SCA in 2007. Range 44 SCA (approximately 18.9 acres), Range 47 SCA (approximately 15.2 acres), and Central Area NCAs (approximately 9.2 acres) are the areas monitored and reported within this report. Two additional SCAs (Range 45 Trench SCA [approximately 1.2 acres] and a small portion of the Fenceline SCA [one partial 100-foot by 100-foot grid]) are also located within the IAR MRA; however, these areas were not included in the Phase II Interim Action completed by FORA and were not monitored or included in this report.

On January 18, 2017, the Army recorded the final remedial decision for the IAR MRA in the IAR MRA ROD (Army 2017), documenting the selected remedial alternative of Land Use Controls for managing the risk to future land users from MEC that potentially remain in the IAR MRA. The IAR MRA ROD states: (1) construction and implementation of the IAR MRA restoration areas has been completed and restoration systems are in place, operational and functioning; (2) operation and maintenance to support the long-term success of restoration at the site is being implemented through a post-installation adaptive management process to evaluate and manage the restoration areas as described in the HRP; and (3) initiated restoration activities are currently on track to achieve the prescribed performance criteria in the IAR MRA restoration areas.

1.3 Report Organization

This Year 5 Habitat Restoration Monitoring Report is presented in numbered sections, tables, figures, and a photograph appendix. Tables are numbered to correspond with the section in which they are first referenced. Figures and photographs are numbered sequentially.

Introductory information for the project, including site description and background information, is presented in Section 1.0. Section 2.0 presents the requirements for restoration associated with the ESCA RP Design Study and Phase II Interim Action activities. The goals, restoration strategies, and success criteria identified in the HRP are summarized in Section 3.0. Section 4.0 provides the methods for quantitative restoration monitoring, followed by Section 5.0, which summarizes routine restoration maintenance, including weed abatement, irrigation system monitoring, erosion control monitoring, and animal deterrent fence monitoring. Section 6.0 presents the quantitative monitoring results that document native plant establishment and monitoring results. Conclusions and recommendations are presented in Section 7.0. References are provided in Section 8.0.

2.0 REGULATORY RESTORATION REQUIREMENTS

Primary requirements for restoration associated with ESCA RP response actions are described in the HMP (USACE 1997) and the USFWS BOs (USFWS 1999, 2002, 2005, 2007, and 2015) issued to the Army. These regulatory documents ensure compliance with the Federal Endangered Species Act (ESA) and provide guidance on avoiding and minimizing, to the extent feasible, take of listed species, as well as protection of other species of concern during remedial activities. Moreover, these documents provide specific objectives and goals for the restoration and monitoring of habitat areas reserved in perpetuity that are impacted by remedial activities.

2.1 Habitat Management Plan

The HMP (USACE 1997) and modifications to the HMP provided in the “Assessment, East Garrison—Parker Flats Land Use Modifications, Fort Ord, California” (Zander 2002) present the boundaries of habitat reserve and development areas and describe land use, conservation, management, and habitat monitoring requirements for target species within the former Fort Ord.

The HMP and BOs establish guidelines for the conservation and management of wildlife and plant species and habitats that largely depend on former Fort Ord land for survival (USACE 1992 and 1997). Threatened and endangered plant and animal species as well as designated critical habitat occur at the former Fort Ord. Each reuse area has been screened for potential impacts or disturbances to any threatened and endangered species identified in the HMP (USACE 1997). Implementation of the provisions of the HMP and referenced additional measures satisfy the requirements of the ESA. The HMP specifically addresses protection of habitats and certain wildlife and plant species (“HMP species”) within the former Fort Ord. HMP species were chosen based on their state and federal ESA listing status and the relative importance of existing populations and habitats at the former Fort Ord to the continued survival of the species. The HMP species list also incorporates those plant taxa included on rare plant list (now called rare plant ranks) 1B by the California Native Plant Society (CNPS) in 1997 with more than 10 percent of their known range at former Fort Ord.

Restoration objectives and goals required by the HMP and mitigation requirements relevant to the IAR MRA restoration effort are described in the HRP (ESCA RP Team 2013b) and are listed below:

- Survey sites before disturbance to estimate restoration potential and establish success criteria (including information on species presence, soil composition, presence of non-native species, slope, aspect, and microhabitats)
- Develop a restoration plan
- Develop feedback mechanisms that allow restoration results to guide the Army's restoration program
- Collect seed and cuttings from within 0.6 mile (1 kilometer [km]) of the restoration site
- Recontour excavation sites to recreate a natural landscape that grades smoothly into existing topography
- Implement erosion control
- Establish native vegetation and HMP species populations that are equitable with those that were removed
- Monitor re-establishment of vegetation in accordance with the Army's protocol for vegetation monitoring
- Conduct monitoring to evaluate the success of restoration efforts
- Meet success criteria established to evaluate healthy central maritime chaparral using baseline data from undisturbed central maritime chaparral communities
- Meet success criteria related to vegetative cover and species diversity
- Meet success criteria for Monterey gilia, also known as sand gilia (*Gilia tenuiflora* subsp. *arenaria*), Monterey spineflower (*Chorizanthe pungens* var. *pungens*), and seaside bird's-beak (*Cordylanthus rigidus* subsp. *littoralis*) including restoration results after five years consistent with self-sustaining populations (in different age stands) of central maritime chaparral, occupying the same amount of habitat and with population sizes comparable to those recorded during the Army's vegetation survey of the former Fort Ord conducted in 1992 (USACE 1992)
- Prepare annual monitoring reports
- Implement corrective measures if monitoring indicates that success criteria for vegetation or HMP species are not being met, including recontouring, weeding,

replanting, reseeding, and improvement of habitat for sand (Monterey) gilia and Monterey spineflower

2.2 Biological Opinions

To ensure compliance with the Federal ESA requirements, the Army consulted with the USFWS on the Army's predisposal actions, including cleanup of MEC. These consultations resulted in five BOs that include incidental take coverage for specific numbers of (or habitat acres for) the following wildlife species: Smith's blue butterfly (*Euphilotes enoptes smithi*), black legless lizard (*Anniella pulchra nigra*), western snowy plover (*Charadrius alexandrinus nivosus*), and California tiger salamander (*Ambystoma californiense*). The incidental take statements allow impacts to and incidental take of these listed species during project activities and specify minimization and avoidance measures to be implemented during the project for the protection of special status species and their habitats (USFWS 1999 and 2005). In addressing listed plant species, these BOs state that "Sections 7(b)(4) and 7(o)(2) of the Act do not apply to the incidental take of listed plant species. However, protection of listed plants is provided to the extent that the Act requires a Federal permit for the removal or reduction to possession of endangered plants from areas under Federal jurisdiction."

Five BOs include requirements for habitat restoration related to ESCA RP Team's remedial activities. The BO on closure and reuse of Fort Ord (USFWS 1999, p. 21) states that "The Army shall implement all portions of the April 1997 HMP for all predisposal activities undertaken." The BO on critical habitat of Monterey spineflower (USFWS 2002) contains restoration-related measures for excavation of soils. The BOs on California tiger salamander and critical habitat for Contra Costa goldfields (*Lasthenia conjugens*; USFWS 2005 and 2007) describe restoration requirements proposed by the Army. The BO on cleanup and property transfer actions (USFWS 2015) contains an updated analysis of the effects of Army cleanup and transfer activities on Contra Costa goldfields, California tiger salamander, Monterey spineflower, Monterey gilia, Smith's blue butterfly, Yadon's piperia (*Piperia yadonii*), and any relevant critical habitat. The Army consulted with USFWS in 2017, which resulted in the issuing of the 2017 reinitiated Programmatic Biological Opinion, which supersedes all previous BOs. It should be noted that Contra Costa goldfields and Yadon's piperia have not been reported to occur within the IAR MRA and there is no designated critical habitat for Contra Costa goldfields or Yadon's piperia within the former Fort Ord site.

The following list summarizes USFWS restoration requirements identified in the relevant BOs (USFWS 1999, 2002, 2005, 2007, 2015, and 2017).

- Determine a baseline condition during pre-activity assessment
- Biological surveys for HMP plant species will be conducted using the protocol for conducting vegetation sampling at Fort Ord
- Allow sites to recover naturally or restore sites by planting species consistent with the baseline condition of central maritime chaparral plant species present prior to

remediation. If recolonization does not appear likely; erosion and weed control will be implemented

- Conduct monitoring of disturbed populations in accordance with HMP protocols
- Identify plant species and population densities to be re-established at each site, including a monitoring plan and corrective measures if goals are not met
- Create goals to establish native vegetation at each site and to establish populations of any HMP species affected to levels equitable to those observed before the disturbance
- Develop a restoration plan with success criteria and a monitoring plan
- Develop measures to enhance natural regeneration and recolonization of the [excavated] site
- After excavation, fill will be added to the excavated areas or they will be recontoured into the natural landscape and smooth transition to surrounding topography
- Provide soil stabilization measures to prevent erosion
- Conduct invasive weed and erosion control
- Monitor, evaluate, and implement corrective actions annually for five years to determine if success criteria are met
- Report monitoring results to the USFWS annually

3.0 HABITAT RESTORATION PLAN

In accordance with goals, objectives and requirements outlined above from the HMP and BOs, the HRP was developed to describe the restoration activities in habitat parcels affected by the ESCA RP Team munition response actions. The following goals established in the HRP reflect those outlined in the HMP:

- Preserve, protect, and enhance populations and habitats of federally listed threatened and endangered wildlife and plant species
- Avoid reducing populations or habitat of federal proposed and candidate wildlife and plant species to levels that may result in one or more of these species becoming listed as threatened or endangered
- Preserve and protect populations and habitat of state-listed threatened and endangered wildlife and plant species
- Avoid reducing populations or habitat of species listed as rare, threatened, and endangered by the CNPS (Rare Plant Rank 1B), or with large portions of their range at former Fort Ord, to levels that may result in one or more of these species becoming listed as threatened or endangered

All activities outlined in the HRP are designed to establish native vegetation in the IAR MRA restoration areas that are progressing on a trajectory toward a self-sustaining native plant community equitable with the species richness and relative cover of HMP species documented on the site prior to the ESCA RP Team’s investigation and remedial efforts.

Restoration implementation, maintenance, and monitoring in the restoration areas are overseen by FORA and its contractors. The following sections summarize the restoration strategies and success criteria for specific activities and locations within the IAR MRA.

3.1 Designated Ground Disturbance Categories Associated with MEC Remedial Activities

The areas within the IAR MRA that are the focus of restoration efforts have been given the following names for the purposes of this report, as identified in the HRP (ESCA RP Team 2013b):

- North Range 44 (Figure A3; referred to as “Range 44 SCA [North]” in IAR MRA IRACR Volume 1)
- South Range 44: Includes South Range 44 SCA and Central Area NCAs (Figure A3; referred to as “Range 44 SCA [South] and Central Area NCAs” in IAR MRA IRACR Volume 1)
- Range 47 Subarea A: Includes a portion of the Range 47 SCA that was subject to large-scale excavation in which the vegetative cover has historically been low, 10% or less (Figures A4 and A5; ESCA RP Team 2013b). Non-native pampas grass was abundant in places. Historical aerial imagery indicates that the vegetation of the area has changed little since the 1970s, despite an apparent lack of recent disturbance, except for fire that has affected the whole range.
- Range 47 Subarea B: Includes the majority of Range 47 SCA, which was subject to large-scale excavation prior to restoration activities (Figures A4 and A5). It should be noted that the boundary of Range 47 Subarea B defined in the HRP was adjusted slightly in the 2014 report and all subsequent reports. The boundary adjustment is consistent with the boundary presented in the 2013 Annual Natural Resources Report (ESCA RP Team 2014).
- Range 47 Subarea C: Includes the portion of Range 47 SCA surrounding the large-scale excavation area in which vegetation cutting took place in 2012 (Figures A4 and A5). Subarea C also includes a small scrape where small-scale excavation was conducted, as well as an escarpment created decades previously. It should be noted that the boundary of Range 47 Subarea C defined in the HRP was adjusted slightly in the 2014 Annual Natural Resources Report (ESCA RP Team 2015) and all subsequent reports. The boundary adjustment is consistent with the boundary presented in the 2013 Annual Natural Resources Report (ESCA RP Team 2014).

Four designated categories of MEC remedial activities correlated with ground-disturbing actions are addressed in the HRP (Table A3-1). These designated activity categories include:

- Activity A – Ingress/egress pathways and roads: includes light and heavy traffic ingress/egress pathways on *new* ingress/egress corridors required for access to NCAs and SCAs within the IAR MRA boundaries, which required some limited vegetation clearing. This category originally encompassed a more extensive network of existing pathways and roads before it was recognized that no new widening or other vegetation impacts were necessary for the majority of them. Approximate total area affected: 0.4 acres (0.2 ha).
- Activity B – Above-ground vegetation cutting only, prior to target-specific investigation: vegetation was cut at ground level, and removed material was chipped and left in place. Approximate total area affected: 13.8 acres (5.6 ha).

Target-specific investigation (i.e., highly localized typically small excavations involving typically hand tools, but occasionally backhoe operation) were conducted in SCAs and NCA that were not excavated, as described below for Activities C and D.

- Activity C – Small-scale soil excavation: includes above- and below-ground vegetation removal, root removal, and soil excavation in limited areas (less than 1 acre [0.4 ha] or less than 100 feet [30 meters (m)] wide). Excavation depths varied from 1 to 3 feet (0.3 – 1 m), sometimes exposing subsurface hardpan layers, especially on slopes. Approximate total area affected: 1.2 acres (0.4 ha).
- Activity D – Large-scale soil excavation: includes above- and below-ground vegetation removal, root material removal, and soil excavation in a larger area (more than 1 acre [0.4 ha]). Removed vegetation was stockpiled separately, along with the top 6 to 12 inches (15 to 30 cm) of soil to preserve the existing seedbank. Stockpiled soils were used to backfill excavated areas within the IAR MRA. Approximate total area affected: 13.4 acres (5.4 ha).

Restoration strategies were developed for each activity type, as detailed in the HRP (ESCA RP Team 2013b), and are summarized in the following sections.

3.2 Restoration Strategies

The restoration requirements of the BOs and HMP focus on facilitating re-establishment of native vegetation at the site as well as their associated ecological functions. To address the range of disturbance to native habitats anticipated as a result of the MEC investigation and interim remedial action work, three strategies focused on plant community recovery were identified within the HRP. This multi-strategy approach was based on the assumption that sites experiencing lesser disturbance will be more easily restored via natural processes,

whereas sites experiencing greater disturbance (especially those of larger extent) require more active restoration interventions that facilitate natural recovery processes.

Two principles follow from this assumption:

- The level of restoration effort should be commensurate with the level and/or extent of site disturbance.
- Allocation of restoration resources should be biased toward more disturbed and/or larger sites where prevention of site deterioration and facilitation of natural recovery processes are most needed.

One of the three restoration strategies listed below was applied to each affected site, depending on the type and extent of disturbances:

- Monitoring only
- Passive restoration (seeding only)
- Active restoration (seeding and planting)

Restored sites are also monitored for erosion and invasion by exotic plant species. Each strategy and the associated field activities are discussed in the following sections. Restoration activities in the IAR MRA are shown in Figure A4. Subareas in Range 47 SCA are shown in Figure A5.

3.2.1 Monitoring Only

The monitoring-only strategy involves the least restoration effort, with the primary post-disturbance activity being the monitoring of vegetation regrowth and implementation of weed eradication and/or erosion best management practices (BMPs), as needed. It relies upon vegetation re-establishment from existing root biomass, soil seedbank, and dispersal of plant propagules from adjoining habitat into the sites to re-establish the plant community.

“Monitoring only” was implemented where above-ground vegetation was cut or disturbed, but root systems remain intact; where target-specific excavations that were typically small in size and performed primarily with manual tools; and along ingress/egress pathways that were minimally disturbed during munitions investigation activities (Activities A and B).

The monitoring-only strategy was conducted along ingress/egress routes, and in North Range 44 SCA, South Range 44 SCA and Central Area NCAs, and Range 47 SCA Subarea C. The escarpment portion (0.5 acres) of Range 47 SCA within Subarea C was subject to small-scale excavation (Activity C). The escarpment was categorized as an Activity B area and the monitoring-only strategy was implemented in this historically low-recruitment area. The long-term pre-existing condition and baseline vegetation cover of the escarpment was

documented in the HRP as being an area of low recruitment with less than 10% shrub cover (ESCA RP Team 2013b).

The primary post-disturbance activity associated with the monitoring-only strategy is monitoring regrowth of vegetation and monitoring for weed infestations and/or erosion issues, as needed. Monitoring methods and results of this activity are described in Sections 4 and 6.

3.2.2 Passive Restoration: Seeding Only

The passive restoration strategy involves an intermediate level of effort and includes topsoil seedbank replacement (i.e., back-filled topsoil), seeding by restoration personnel, and natural dispersal of plant propagules from adjoining high-quality habitat into the sites to re-establish the plant community. Topsoil contains native plant seedbank, nutrients, organic material, microorganisms, beneficial fungi, and other elements that promote ecosystem function. Passive restoration is applied to sites where disturbance activities include small-scale soil excavation or soil disturbance of limited extent (i.e., less than 100 feet [30 m] wide [regardless of acreage] or less than 1 acre [0.4 ha], Activity C).

The passive restoration strategy was implemented in North Range 44 SCA, South Range 44 SCA and Central Area NCAs, and along one linear scrape in Range 47 SCA Subarea C (Figures A4 and A5).

Restoration activities in IAR MRA North Range 44 SCA and South Range 44 SCA and Central Area NCAs involved backfilling excavated soil to mimic original conditions, recontouring as needed to match original topography, and seeding of the site by restoration personnel. A small portion of vegetation-cut areas in Range 47 SCA Subarea C was also seeded. Monitoring methods and results of this activity are described in Sections 4 and 6.

3.2.3 Active Restoration: Seeding and Planting

The active restoration strategy involves the greatest level of effort and a wide range of restoration procedures and materials. This strategy has been implemented only in Range 47 SCA, where disturbances included large-scale soil excavation (i.e., greater than 100 feet [30 m] wide and more than 1 acre [0.4 ha], Activity D).

Site preparation involved backfilling excavated soil in the correct sequence, recontouring as needed to match original topography, erosion control prior to installation of an irrigation system, and restoration planting and seeding. Active restoration sites were a primary focus of the adaptive management process, which determines when corrective measures are needed to maintain restoration progress.

All active restoration areas in Range 47 SCA the IAR MRA met all Year 7 performance targets in 2015 and are no longer subject to ongoing monitoring.

3.3 Success Criteria and Performance Targets

Quantitative success criteria for the first seven years following site restoration are shown in Tables A3-2 and A3-3 and Year 5 and Year 6 monitoring results are compared with these success criteria in Section 6 of this report.

Evaluation of and reporting against performance standards is required to support compliance with ARAR (ESA Federal requirements) in completion of the Phase II Interim Action under the Interim Action ROD (Army 2002). Habitat restoration and monitoring activities are documented consistent with the Phase II Interim Action Work Plan. These results are the basis for annual meetings with the Army and the USFWS held in the first quarter of each year. Site restoration performance is evaluated and approved by the USFWS based on compliance with the requirements of the BO and HMP in accordance with the Federal ESA.

Demonstration that the restoration requirements of the BO (USFWS 2017) and the HMP (USACE 1997) have been met will be accomplished by documenting two categories of outcomes as stated below:

- Successful soil and topography remediation in targeted areas (Table A3-2)
- Species and vegetation establishment that meet success criteria (Table A3-3)

Habitat restoration in the IAR MRA is being conducted at the site in a manner consistent with the land use requirements, engineering and institutional controls, and site management restrictions outlined in the HMP (USACE 1997) and HRP (ESCA RP Team 2013b). Quantitative success criteria for plant survival, species richness, and percentage cover have been established for the first seven years following site restoration. Metrics for most criteria are based on the pre-existing baseline values, and progress toward those values is determined on anticipated restoration trajectories. Upon determination that success criteria have been met at each site, monitoring efforts will be considered complete.

Restoration success is evaluated based on the following guidelines as stated in the HRP (ESCA RP Team 2013b):

- The health of the restored community will be determined by successful establishment of the community's component species, most importantly the HMP species (USACE 1997, p. 3-20)
- The self-sustainability of the restored community will be determined by vegetative development (i.e., community species richness and percentage cover) over a minimum of three to five years that is consistent with the generally accepted trajectory of central maritime chaparral vegetation development

- The equity of the restored community will be determined by its consistency with the baseline (i.e., pre-disturbance) community. The baseline community represents the community that was removed (USACE 1997, p. 3-6)
- The equity of the restored populations of the HMP species will be determined by their consistency with the baseline (i.e., pre-disturbance) HMP populations. The baseline HMP populations represent the populations that were removed (USACE 1997, p. 3-6)
- The self-sustainability of restored populations of HMP species will be determined by their initial establishment and subsequent colonization of seeded and/or planted areas (i.e., HMP species richness and population estimates) over a minimum of three to five years that is consistent with the HMP baseline populations
- The establishment of a restored habitat that is devoid of or minimally affected by exotic invasive plant populations will be determined by eliminating populations of the target exotic species and/or documenting that their populations are below the quantitative target levels (i.e., total community percentage cover) for a minimum of three to five years

Achievement of these restoration objectives are evaluated via the following parameters and their associated quantitative metrics as stated in the HRP (ESCA RP Team 2013b). Results of fifth-year monitoring for each objective are presented in tables as noted.

- Community equity will be assessed by comparing the total number of plant species present in the site with the number present prior to disturbance (i.e., the plant palette or baseline, including HMP species; Tables A6-1, A6-2, A6-3, A6-4, A6-5, A6-6, A6-7, and A6-8)
- Restored community health and HMP equity will be assessed by comparing the total number of HMP species present in the site with the number present prior to disturbance (Tables A6-3 and A6-8)
- Self-sustainability of the community will be assessed by: a) achievement of community equity and b) vegetative development as exhibited by the total percentage live plant cover at the site and in a pattern consistent with the anticipated trajectory of central maritime chaparral regeneration (Tables A6-9 to A6-12)
- Minimization of habitat degradation via exotic invasion will be assessed by preventing the total area of the site occupied collectively by populations of pampas grass (*Cortaderia jubata*), iceplant (*Carpobrotus edulis*) and French broom (*Genista monspessulana*) from exceeding a target value (Tables A6-8 to A6-10, summarized in Section 6.6)

The values of most of the metrics are not static but reflect the increases associated with growth and maturation of the community to be expected as it progresses along the anticipated

trajectory. The following assumptions were made in selecting quantitative success criteria (Table A3-3 in this Appendix).

- Vegetation cover will start at a low of 0% in most areas in Year 1 and increase through time
- The trajectory for vegetation cover to be equitable with pre-disturbance baseline conditions for each location will generally take 10 years
- Species diversity will increase with time and achievement of equitable diversity to pre-disturbance baseline conditions for each location will take 15 years. This process is assumed to be slower than vegetative growth since long-distance seed dispersal and ideal germination conditions are required for seedling establishment and growth for each new species at a given site
- HMP shrub species presence will increase through time
- Monterey spineflower and sand (Monterey) gilia cover and frequency will decrease through time as the central maritime chaparral shrub canopy fills in and microsites are occupied by other species
- Seaside bird's-beak is restricted to one location and requires a host plant for long-term presence. This species will recover more quickly in areas with above-ground vegetation removal where host plants are present but will take time to become established in excavated areas
- Plant establishment in Range 47 SCA Subarea A will be slow initially but will increase slowly to at least a minimum of pre-disturbance conditions within 7 years
- Container plant survival will vary by species and individuals may gradually die, but these may be replaced by recruits of the same species

In order to evaluate progress towards achieving success criteria and performance targets, monitoring results are tabulated at least annually, and the result for each parameter are compared with its expected outcome for Year 7 post-installation (Table A3-3). Results that meet or exceed the target criterion for the monitoring period are considered to have demonstrated a successful outcome and achievement of the restoration objective. Results that are below the expected outcome for Year 7 post-installation are examined by the adaptive management process to determine an appropriate course of action, if any. Review and potential reconsideration of past or proposed adaptive management actions will be conducted jointly with USFWS during annual review meetings.

4.0 HABITAT RESTORATION MONITORING METHODS

Monitoring data presented in Appendix A of the 2015 and 2016 Annual Natural Resource Reports (ESCA RP Team 2016 and 2017) indicated that most ESCA RP restoration areas in the Interim Action Ranges MRA had met Year 7 performance targets for vegetation cover, overall species diversity, and HMP shrub species richness, pursuant to the HRP; these areas include all of Range 47 SCA and the areas in North Range 44 SCA and South Range 44 SCA and Central Area NCAs subject to vegetation cutting. All monitoring areas in the IAR MRA met Year 7 performance targets for HMP herbaceous species presence in 2015 and are no longer subject to ongoing monitoring. Performance targets for Activities A and D, container plantings, and HMP herbaceous species were met in 2015 (ESCA RP Team 2016) so their methods are no longer described in this section.

Areas requiring vegetation monitoring in 2017 include North Range 44 SCA small-scale excavation areas and South Range 44 SCA and Central Area NCAs small-scale excavation areas, since these areas did not meet Year 7 performance targets in 2016. Monitoring methods vary, depending on the investigation activity. The order of presentation of methods and results is based on Table A3-3, the Plant Species Diversity and Vegetation-based Success Criteria.

4.1 Native Plant Species Richness Methods (Activity C)

Documentation of native species presence provides an overview of existing species diversity and the suite of species that recolonize work areas over time, along with the relative abundance of HMP species in the site as a whole (Tables A6-1, A6-2, A6-3, and A6-4). Comprehensive plant species lists were maintained for each sampling area and activity type during a given monitoring year. A summary of totals of all native species recorded for each location and activity type is presented in Table A6-1. A comprehensive list of species in the IAR MRA is compiled and updated each year (Table A6-2), HMP species presence in the IAR MRA in Table A6-3, and shrub diversity in Table A6-4.

Additionally, all native plant species occurring along a vegetation transect or within a quadrat were recorded to provide total species richness per sample. All native plant species within one meter of a transect tape measure were also recorded in order to capture a more comprehensive summary of native species in specific munitions investigation areas. Plant species diversity tables for each location and activity type are presented in Tables A6-5, A6-6, and A6-7. These diversity tables also include information on mean species richness per transect or quadrat, evenness, and summary cover data.

Diversity was determined using the Shannon-Wiener Index (H'), which is a function of the relative abundances of the species present, depending on both the number of species and their evenness (Pielou 1974). The following equation was used to calculate H' .

$$H' = - \sum p_i \ln p_i$$

Where:

H' = Shannon-Wiener Index

p_i = proportion of community that belongs to the i th species

Evenness (J') was calculated as the ratio of the observed H' to the maximum possible H' for a community with the same number of species (H'_{max}) (Pielou 1974). The maximum possible value for evenness (i.e., 1) is achieved when $H' = H'_{max}$, which occurs when all species are present in equal abundance. The following equation was used to calculate J' .

$$J' = \frac{H'}{H'_{max}} = \frac{H'}{\log s}$$

Where:

J' = evenness

H' = Shannon-Wiener Index

H'_{max} = maximum possible H' for a community with s species

s = total number of species present

Field logs and species lists for vascular plants and wildlife are maintained and updated on a routine basis during each monitoring visit. Documentation includes conditions prior to investigation activities and subsequent to activities.

For non-HMP shrub species, the number of expected shrub species after a given activity type when compared with baseline numbers is used as a performance metric in the HRP for Activities B and C, based on performance targets in the HRP (Table A3-3).

For HMP shrub species richness metrics, a maximum value of three species was established in the HRP as the baseline. The number of HMP shrub species present in each location for each activity type is compared with this baseline, based on performance targets in the HRP (Table A3-3).

Plant nomenclature follows the *Jepson Manual: Vascular Plants of California*, Second Edition (Baldwin et al. 2012). In addition, pertinent volumes of the *Flora of North America* (Flora of North America Editorial Committee, eds. 1993+) are also utilized for plant identification.

4.2 HMP Shrub Species Frequency Methods

HMP shrub species frequency is calculated based on the number of transects in which a given HMP species appears divided by the total transects in a given sampling location. This metric applied only to Activity B areas and the performance target was met in 2015.

4.3 Native Vegetation Cover Methods (Activity C)

Line-intercept vegetation transects are used to measure shrub and herbaceous vegetation cover in central maritime chaparral vegetation in the IAR MRA in areas subject to ESCA RP munitions investigation activities, following Burleson (2009b); however, pursuant to the HRP, vegetation monitoring occurs yearly in the IAR MRA restoration areas until performance targets have been achieved. Differences in stand age, plant diversity, or other characteristics are documented in order to stratify transect placement into areas that are likely to have distinct species composition and distribution. A random number generator is used to 1) select a grid cell (total number of grid cells in strata), 2) select the quadrant of the grid cell for transect starting point (1-4), and 3) select which compass direction in which to align the transect from the starting point (0-360 degrees). If a transect location is randomly selected and overlaps another transect, it is discarded and a new transect location is chosen.

During 2017, aerial cover by shrub and tree species was recorded for all individuals that intercept the 50-m monitoring tape; including overlapping shrub layers, so there may be two or more species recorded in the same location. Herbaceous cover was only recorded in the absence of shrub or tree overstory, as per the 2009 protocol (Burleson 2009a). Cover by herbaceous plants were recorded by species and the percent cover for each species was recorded individually. Bare ground and/or litter was recorded in transect segments devoid of vegetation. Waypoints obtained from a Global Positioning System unit were recorded for each end of the transect so that the same transect can be revisited in subsequent years. A photograph was taken from one end.

Supplementary herbaceous quadrats were also sampled in grassland vegetation in the IAR MRA in 2017. Results are compared with three grassland “proxy” baseline quadrats that were sampled in the IAR MRA grassland on 29 September 2011; these were placed near to proposed munitions investigation activity areas prior to work.

Performance targets have been met in several categories to date (Table A6-11). In 2015, Year 3 native vegetation cover in North Range 44 areas subjected to ingress egress and vegetation cutting (Activity A and B) and all Range 47 SCA areas (Activity A, B, C and D) met and exceeded the performance targets required for the final year of restoration – Year 7 (ESCA RP Team 2016). Similarly, in 2016, Year 4 native vegetation cover in South Range 44 SCAs and Central Area NCAs subjected to vegetation cutting (Activity B) exceeded the Year 7 performance targets (ESCA RP Team 2017). Therefore, monitoring for native vegetation cover was not conducted in Range 47 SCA or in released portions of North Range 44 and South Range 44 in 2017.

Baseline Transects:

1999-2000 – Baseline transects established by the Army in the Range 44, Range 45, and Range 47 SCA in 2000, prior to the 2003 prescribed burn (HLA 2001, Parsons 2005).

2008 – Thirty Army transects monitored by the ESCA RP Team.

2010-2011 – Twenty-three Army baseline transects in central maritime chaparral selected as “proxy” baseline transects for upcoming munitions activities, excluding the Range 47 SCA large-scale excavation area. An additional nine new “proxy” baseline transects were established near to proposed ESCA RP munitions investigation areas; three of these transects were located immediately west of Range 47 SCA to serve as proxy baseline transects for the large-scale excavation.

As of 2011, no further monitoring of Army transects outside of the IAR MRA NCAs and SCAs was indicated due to vegetation recovery reflecting an appropriate and sustainable trajectory associated with high quality habitat (ESCA RP Team 2012).

Munitions Activities Dates:

2011 - Vegetation cutting and small-scale excavations were completed in linear scrapes in South Range 44 SCA and Central Area NCAs. Limited ingress-egress routes were cut for access to work areas.

2011-2012 - Large-scale excavation was conducted in 14.4 acres (5.8 ha) in Range 47 SCA and completed in December 2012. A small amount of vegetation cutting was conducted around the edges of Range 47 SCA in 2012. Limited ingress-egress routes were cut for access to work areas.

2012-2013 - Vegetation cutting of all grids in North Range 44 SCA and small-scale excavations in targeted areas and along scrapes were conducted in 2012 and completed in early 2013.

Post-activity Transects:

2012 - Sixteen Year 1 post-activity transects were established in the South Range 44 SCA/NCAs and areas outside the large-scale excavation in Range 47 SCA.

2013 - Thirteen Year 1 post-activity transects were established in North Range 44 SCA. Ten new transects were established in the Range 47 SCA large scale excavation. One of these 10 was placed in Subarea A, one was placed in the deer exclusion control area, and one was placed in the irrigation control area. The remaining seven were in Subarea B.

All 29 transects were monitored in 2013.

2014 - All 29 transects were monitored on 8 and 13-14 May, 26 and 30 June, and 1-3 and 14-15 July 2014.

2015 - Thirty-eight transects were monitored on 16 and 24 April and 18, 19, 20, 21, 26, 27, and 28 May 2015. These included five Year 3 transects in vegetation-cut areas in North Range 44 SCA; seven Year 4 transects in vegetation-cut areas in South Range 44 SCA and Central Area NCAs; and three Year 4 transects in vegetation-cut areas in Range 47 SCA Subarea C. An additional 13 transects were monitored in areas subject to small-scale excavations in the IAR MRA. Ten transects were also monitored in the large-scale excavation area in the IAR MRA.

2016 – Twenty transects were monitored on 27, 28, and 29 April and 2 and 5 May 2016. These included seven Year 5 transects in areas subject to vegetation cutting in South Range 44 SCA and Central Area NCAs. An additional 13 Year 4 transects were completed in areas subject to small-scale excavations -- eight in North Range 44 SCA and five in South Range 44 SCA and Central Area NCAs.

2017 - Thirteen transects were monitored on 27 and 29 March 2017. These included Year 5 transects in areas subject to small-scale excavations - eight in North Range 44 SCA and five in South Range 44 SCA and Central Area NCAs.

Locations of all transects in the IAR MRA are shown in Figure A2.

Herbaceous Quadrats

2012 - Six new grassland herbaceous quadrats were monitored in the IAR MRA grassland activity area on 25 June 2012: three in areas subject to vegetation cutting and three in areas subject to small-scale excavation.

2013 – The six grassland herbaceous quadrats were monitored on 22 May 2013.

2014 – The six grassland herbaceous quadrats were monitored on 30 June and 1 July 2014.

2015 – The six grassland herbaceous quadrats were monitored on 1 May 2015.

2016 – The six grassland herbaceous quadrats were monitored on 27 April 2016.

2017 - The six grassland herbaceous quadrats were monitored on 27 April 2017.

4.4 Target Weed Cover Methods (Activities B, C and D)

Several weedy species found at the site are listed by the California Invasive Plant Council as invasive weeds (Cal-IPC 2006). Three target weeds are given priority attention during monitoring events, pampas and/or jubata grass, French broom, and iceplant as required by the HMP (USACE 1997).

In areas that have not already met performance criteria for native vegetation cover, weed cover data are collected along vegetation transects along with native species cover. In areas that have already met performance criteria in previous years, the ESCA RP team used California Native Plant Society (CNPS) Vegetation Rapid Assessment Field forms to assess whether target weeds remained below 5%. Four hundred square meter survey plots were used for each sample, either in a circular or rectangular form to fit the activity area. Five samples were taken in each work area: North Range 44 SCA, South Range 44 SCA and NCAs, and Range 47.

5.0 RESTORATION MAINTENANCE AND MONITORING

Restoration implementation in the Range 47 SCA Restoration Area began immediately following replacement and recontouring of salvaged soil, which was completed in December 2012; this process is described in Appendix A: 2013 Habitat Restoration Implementation and Monitoring Report (ESCA RP Team 2014). Details on the seed mixes, container plantings, and the HMP annual seed, seedbank, and container plantings installed in Range 47 SCA were provided in Appendix A: 2013 Habitat Restoration Implementation and Monitoring Report (ESCA RP Team 2014). Erosion control BMPs in the IAR MRA, including hydroseeding, hydromulching, silt fencing, and erosion control blanket placement, are summarized in Figure A6.

No erosion control BMP maintenance was required in 2017 in the IAR MRA.

6.0 QUANTITATIVE MONITORING RESULTS

Results of quantitative monitoring for species richness, HMP shrub frequency, native vegetation cover, and target weed cover are provided in this section, in Tables A6-1 to A6-11, and in Figures A7-A13.

The order of presentation of methods and results is based on Table A3-3, the Plant Species Diversity and Vegetation-based Success Criteria presented in the HRP.

Performance targets have been met in several categories to date (Table A6-11). In 2015, Year 7 performance targets for all categories were met in areas subject to Activity A (ingress/egress routes) and Activity D (large-scale excavation), as well as for all activity categories in Range 47 SCA. In 2016, Year 7 performance targets for all categories were met in areas subject to Activity B (vegetation cutting). Monitoring efforts in 2017 focused on only those areas and activities that had not yet met Year 7 performance targets -- Range 44 SCAs and NCAs Activity C (small-scale excavation) monitoring areas.

Summary baseline and post-activity plant species richness data are provided in this section and are shown in Table A6-1. Observed species in the IAR MRA NCAs and SCAs are summarized in Table A6-2. HMP species presence by activity type is presented in Table A6-

3, and native shrub species richness by activity type is summarized in Table A6-4. Comparisons of species richness along baseline and post-activity transects in the IAR MRA for different locations and vegetation types are provided in Tables A6-5, A6-6, and A6-7. These tables also include number of HMP plant species, species by growth habit (tree, shrub, herbaceous species, ferns), the Shannon diversity index, as well as cover results for comparison purposes. Figure A7 compares species richness by activity type and year between 2010 and 2017, and Figure A8 presents the number of HMP species present by activity type and year between 2010 and 2017. Cover and frequency data in sampled locations are summarized in Tables A6-8 to A6-10. Status of areas and activity types relative to performance targets are summarized in Table A6-11.

6.1 Native Plant Species Richness Results

The performance category for total native species richness applies to **Activity C** in 2017, based on combined observations from baseline and post-activity areas in North Range 44 SCA and South Range 44 SCA and Central Area NCAs (Table A3-3). In addition, total species richness (including native and non-native species) for grassland vegetation subject to **Activity C** is also included in Table A3-3. It is assumed that baseline native species richness equals twenty species and that a proportion of that number of species will be present each year. Performance targets by year for **Activity C** detail the minimum proportion required to achieve success (starting with 3 species present in Year 1 [15% of 20], with a maximum of 10 species in Year 7 [50% of 20]).

The performance category for HMP shrub species richness applies to **Activity C** in 2017, based on combined observations from baseline and post-activity areas in North Range 44 and South Range 44 (Table A3-3). In baseline surveys, three HMP shrubs were documented in these areas; the performance metric assumes the presence of these three HMP shrubs in baseline conditions and that a proportion of those three species will be present each year. Performance targets by year detail the minimum proportion required to achieve success (starting with no HMP shrubs present in Year 1, with a maximum of two HMP shrubs in Year 7, or 66% of 3 HMP shrubs).

Central Maritime Chaparral: A total of 100 native species were documented in the entire Range 44 and Range 47 Subarea C in central maritime chaparral vegetation prior to munition investigation activities, including 23 shrub species (Table A6-1, A6-2, and A6-4, Figure A7).

Subsequent to small-scale excavation activities (Activity C), the total number of species in these areas dropped to 25 in Year 1 (2013) and the number of shrub and subshrub species dropped to 9. The decrease in species diversity may have resulted from removal of burls and root systems of existing shrubs and perennial species, the removal and redistribution of topsoil and subsoil layers, and the time it takes for a newly excavated area to be recolonized via seed dispersal from the surrounding area.

In 2017, a total of 74 species were observed in Range 44 in central maritime chaparral vegetation areas subject to small-scale excavation, with 25 shrub and subshrub species, although not all of these species were observed along transects (Table A6-1 and Table A6-4).

In North Range 44 SCA, total native species recorded in baseline transects was 15 and the total native species in Year 5 after small-scale excavation activities was 42; the number of shrub and tree species equaled 13 and the number of herbaceous species, 29. A total of 63 species occurred within the one-meter belt along the transect in 2017, including one tree species, 14 shrub species, 47 herbaceous species, and one fern species (Table A6-6).

In South Range 44 SCA and Central Area NCAs, total native species recorded in baseline transects was 15, which increased to 35 in Year 6 after small-scale excavation activities. The number of shrub species was 10 and herbaceous species richness increased from 1 to 25 between baseline and Year 6 (Table A6-5). A total of 58 species were observed within the one-meter belt along the transects, including one tree species, 14 shrub species, and 43 herbaceous species.

Performance summary: The total native species richness of 58 to 63 species present after small-scale excavation activities in 2017, including 25 shrub and subshrub species, is higher than the Years 3 through 7 performance targets for total native species richness (Tables A3-3 and A6-11).

A total of six HMP species were documented in portions of Range 44 prior to small-scale excavation: sandmat manzanita, Eastwood's ericameria, Monterey ceanothus, Monterey spineflower, sand (Monterey) gilia, and seaside bird's-beak. In 2013, coast wallflower appeared in small-scale excavation areas, in addition to areas subject to vegetation cutting. All seven of these species were observed in 2017 (Tables A6-3 and A6-6).

Three HMP shrub species were documented in these areas before small-scale excavation activities. Seedlings and young plants of all three HMP shrub species, sandmat manzanita, Eastwood's ericameria, and Monterey ceanothus (seedlings and juveniles), have appeared after small-scale excavation activities in both North Range 44 SCA and South Range 44 SCA and Central Area NCAs (Table A6-3).

Performance summary: The presence of all three HMP shrub species in 2017 (3 out of 3 or 100%) is higher than the Year 7 performance target for HMP shrub species richness (66%) for areas subject to small-scale excavation (Tables A3-3, A6-4, and A6-11).

Grassland: A small grassland area in South Range 44 SCA (Figure A2) supported 18 total species and six native species prior to munitions investigation activities during baseline monitoring and 31 native species and 11 non-native species in 2017, indicating a marked increase in native species richness over time (Table A6-7 and Figure A7).

Performance summary: Total species richness exceeds the Years 4 through 7 performance targets for this grassland area (Tables A3-3 and A6-11).

6.2 HMP Shrub Species Frequency Results

This metric applied only to Activity B areas and the performance target was met in 2015.

6.3 HMP Herbaceous Species (HMP Annuals and HMP Herbaceous Perennials) Presence and Density

All monitoring areas in the IAR MRA met Year 7 performance targets for HMP herbaceous species presence in 2015 and are no longer subject to ongoing monitoring (ESCA RP Team 2016).

6.4 Container Plant Survival Results in Range 47 Subarea B

All active restoration areas in the IAR MRA met all Year 7 performance targets in 2015 and are no longer subject to ongoing monitoring (ESCA RP Team 2016).

6.5 Native Vegetation Cover Results

The performance category for native vegetation cover applies to Activity C, small-scale excavation, in 2017. Native vegetation in the IAR MRA is comprised primarily of central maritime chaparral, with a small grassland area located in South Range 44 SCA. Baseline and 2017 post-activity sampling data are summarized in this section based on small-scale excavations. During 2017, a total of 13 transects were monitored in the IAR MRA in areas that had been subject to small-scale excavation during munitions investigation activities (Figure A2).

6.5.1 Central Maritime Chaparral

Because all above-ground and below-ground vegetation parts are removed during small-scale excavation, there are few to no burls or other subterranean stems from which shrubs and herbaceous perennials can resprout. Almost all plant species must colonize these areas by germinating from seed or other propagules. Furthermore, many of the small-scale excavation areas were linear scrapes that, in some cases, had exposed hardpan subsurface layers and were also subject to compaction due to vehicle traffic.

North Range 44: Mean native shrub cover in small-scale excavation areas in North Range 44 SCA was 11.5% in Year 4 and 11.8% in Year 5 (Table A6-8, Figure A9). Total 2017 native cover in North Range SCA small-scale excavation areas was 16.6%, slightly less than 2016 native cover. Shrub cover was similar between the two years, but herbaceous cover decreased, due in part to decreases in cover by sand gilia and other annuals during this interval. In addition, 2017 sampling was conducted in late March 2017 and 2016 sampling was conducted in late April and early May 2016; the one-month difference in sampling timing, coupled with more rain and a later spring in 2017 may have resulted in artificially reduced cover numbers.

Shrubs that occurred in more than 50% of small-scale excavation transects include rush-rose (100% frequency), golden yarrow (87.5% frequency), deerweed (75% frequency), sandmat manzanita (75% frequency), dwarf ceanothus (75% frequency), and Monterey ceanothus (50% mean frequency). The greatest shrub and subshrub mean cover in 2017 North Range 44 SCA transects in small-scale excavation areas was provided by deerweed (3.2%), rush-rose (2.7%), and sandmat manzanita (1.9%).

Non-native species cover was 1.1%, primarily comprised of filaree species, tocalote, smooth cat's ears, and rattail fescue. No target weeds were present in these transects.

South Range 44: Year 6 (2017) transects in South Range 44 supported a total of 10.6% mean native cover, with 7.7% mean native shrub and subshrub cover and 2.9% mean native herbaceous cover (Table A6-9, Figure A11). Drops in cover between Year 5 and Year 6 can largely be attributed to mortality of short-lived subshrubs, such as deerweed and rush-rose, as a result of natural senescence and previous die-off during the multi-year drought, in addition to earlier sampling timing, as discussed above. Mean cover by the larger manzanitas and other large shrubs was similar between years or varied by less than 0.5%.

Shrubs that occurred in more than 50% of small-scale excavation transects include rush-rose (100% frequency), golden yarrow (100% frequency), deerweed (100% frequency), sandmat manzanita (80% frequency), and black sage, with 60% mean frequency (Figure A12). As in North Range 44 small-scale excavation areas, herbaceous cover dropped in 2017 compared with the previous year and sampling was conducted one month earlier in the season in 2017.

No target weeds were present in these transects. Non-native species mean cover was 0.6%, with no weed species with 1% or more cover.

6.5.2 Grassland

2010 baseline herbaceous vegetation cover in grassland vegetation in a small area (0.13 acre) in South Range 44 averaged 44.3% in six herbaceous quadrats, with 19% native vegetative cover and 25.3% non-native vegetative cover (Table A6-12). The HMP annual Monterey spineflower averaged 4.7% cover. Six native species were recorded during baseline sampling.

In post-activity Year 6 (2017) transects, total average vegetative cover in six herbaceous quadrats was 82.9%, with 43.3% native cover and 39.6% non-native cover. Mean native cover in 2017 was comprised primarily of the HMP annual, Monterey spineflower, with 8.1% cover, as well as tidy tips (*Layia platyglossa*, 6.9%), sky lupine (*Lupinus nanus*, 6.3%), Bishop's lotus (*Acmispon strigosus*, 3.9%), and California poppy (*Eschscholzia californica*, 3.5%), among others, see Figure A13. Of the 25.3% non-native species cover in Year 6, 14.1% cover consisted of ripgut brome (*Bromus diandrus*), 10.4% of smooth cat's ears (*Hypochaeris glabra*), 6.7% of rattail fescue (*Festuca myuros*), and others.

The jump in both native and non-native species cover is likely correlated with above average rainfall for two winters in a row.

Performance summary: Native vegetation cover (16.6%) for small-scale excavation areas in Year 6 in North Range 44 is higher than the Year 3 performance target of 10% (Tables A3-3 and A6-11).

Native vegetation cover in Year 6 transects in South Range 44 in central maritime chaparral areas subject to small-scale excavation was 10.6%, which is higher than the Year 3 performance target of 10%.

Native vegetation cover in South Range 44 in grassland areas subject to small-scale excavation was 43.3%, which is higher than the Year 7 performance target of 40%.

6.5.3 Vegetation Monitoring Discussion

Central maritime chaparral is the dominant vegetation type in the IAR MRA, where deep aeolian sands form the primary substrate. Mature chaparral vegetation structure consists of a relatively simple canopy layer with a diversity of annual and short-lived herbaceous species in sunny openings between and under shrubs, including a number of local endemic taxa. Fire plays a major role in chaparral ecosystems, typically occurring every few decades, returning nutrients to the soil that are tied up in dead wood and leaf litter as well as creating openings with ample sunlight and space for seed germination and seedling establishment (Zedler, P. H. 1995; Kelley, J. E. 2002; Davis and Borchert 2006).

Several central maritime chaparral shrubs, such as shaggy-barked manzanita, and chamise, produce underground or surface stems (burls) that resprout after fire. Other shrubs, such as dwarf ceanothus, Monterey ceanothus, and sandmat manzanita, are obligate seeders that can recolonize a burned site from seed after fire. Post-fire sites are often carpeted with a mixture of obligate-seeding shrubs and herbaceous species the spring after a wildfire. As shrubs become re-established after fire, herbaceous and smaller species tend to be excluded by expanding canopies of the dominant shrubs; however, even in mature stands of central maritime chaparral, open areas may occur between shrubs that support herbaceous species.

Different types of munitions investigation activities have different effects on central maritime chaparral vegetation. Vegetation cutting leaves the root systems of many stump-sprouting shrubs intact and sites subject to vegetation cutting reach high post-activity shrub cover much more quickly than those subject to small-scale soil excavation, in which the root systems of all species are excavated.

Small-scale soil excavation areas lack topsoil containing native seeds as well as nutrients and beneficial soil microorganisms. The linear scrapes constituting most small-scale excavation areas in Range 44 often reach subsurface hardpan areas, especially higher up on slopes. In addition, vehicle traffic has resulted in soil compaction, with an observable pattern of more vegetation in the center of the scrape compared with the sides, consistent with growth patterns along dirt roads.

These differences are consistently reflected in monitoring data. Central maritime chaparral subject to vegetation cutting met the Year 7 performance targets in Range 47 SCA and North Range 44 in 2015; the remaining vegetation-cut monitoring area in South Range 44 met the Year 7 performance target in 2016.

In contrast, monitoring areas subject to small-scale excavation have been slower to recover, due in large part to lack of topsoil containing seeds, nutrients, and beneficial micro-organisms, as well as compacted subsoils now serving as the growing substrate. Native vegetation recovery in these areas is currently dependent on gradual colonization of the bare excavated areas by means of seed dispersal into the excavated area over time.

Cover by evergreen shrubs in small-scale excavation areas in Range 44 SCAs and NCAs has been very low but steady in post-activity years. Fluctuations in cover values in these areas have been largely influenced by short-lived subshrubs such as deerweed and rush-rose. Because native cover in these areas remain low, adaptive management strategies are under consideration for 2018, including creation of small holes to capture seed, moisture, and litter; spreading of nearby duff and topsoil in small areas; seeding; and other measures.

In grassland areas, native vegetation has completely recovered to baseline conditions and met Year 7 performance targets.

6.6 Target Weed Cover Results

Target weed cover for iceplant in all 2017 transects is at or below 1% (Tables A6-7 to A6-10). Average target weed cover for all areas that have previously met their performance criteria continues to remain below 1% (Table D-1; Appendix D). Weed monitoring and removal activities are summarized in Appendix D in the main report.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Munitions investigation activities in the IAR MRA were completed in early 2013. Biological monitoring in 2017 included completion of 13 vegetation transects and 11 herbaceous quadrats; these monitoring events and associated data provide the ESCA RP Team with valuable information to guide in site management.

Vegetation cover and species diversity data indicate gradual recovery of all sensitive vegetation types subject to munitions response actions in the IAR MRA. A combination of committed stewardship, including reductions in acreages potentially subject to vegetation cutting in South Range 44 (saving 13.2 acres [5.4 ha], or 75% of intact central maritime chaparral, along with a diversity of native and HMP species); steady post-activity increases in vegetation cover, species richness, and number of individual HMP herbaceous species; and ongoing weed and erosion control management activities promote habitat recovery after munitions investigation activities.

All required soil and topography remediation success criteria were met in 2013.

Both large-scale excavation Subareas A and B in Range 47 achieved all performance targets required in the HRP in 2015. Restoration plantings and natural recruits continue increasing in size while maintaining populations of HMP annuals. Irrigation infrastructure and fencing was removed in 2016.

In Range 44, all areas have reached all performance targets for species richness, HMP shrub species presence, and HMP herbaceous species presence in all areas. Vegetation cover in all locations in the IAR MRA met the Year 7 performance target for areas subject to vegetation-cutting in 2015 and 2016. Areas supporting central maritime chaparral vegetation and subject to small-scale excavation show native species recruitment, based on frequency data, but will require additional years to reach vegetation cover performance targets. Because native cover in these areas remain low, implementation of adaptive management strategies such as remedial seeding and addition of nearby duff and topsoil is recommended for 2018.

Native vegetation in grassland areas has completely recovered to baseline conditions and met Year 7 performance targets.

All areas met the weed cover targets each year since monitoring has begun.

The enhanced native species diversity and cover observed at all sites, along with wildlife usage and other indications of elevated ecological functionality, suggest all areas are on trajectories toward self-sustaining native plant communities equitable with the species richness and relative cover of species that were present on the site prior to the FORA ESCA RP Team investigation and remedial efforts.

Areas requiring ongoing monitoring until performance targets are met include Range 44 small-scale excavation areas in central maritime chaparral for percent native vegetation coverage only.

Year 6 and 7 quantitative surveys will begin in selected areas in spring 2018 that have not yet reached Year 7 performance targets to satisfy conditions set forth in the HRP; sampling will be conducted in April and May. The following tasks will be performed in 2018 to complete mitigation efforts:

Range 47 and North Range 44 and South Range 44 Restoration Areas

- Vegetation transects in North Range 44 small-scale excavation areas until performance targets are met
- Vegetation transects in South Range 44 small-scale excavation areas until performance targets are met
- Herbaceous quadrats, if needed (for transects where shrub cover is low and herbaceous cover is high – see Section 4.5)

- Species diversity documentation
- Implementation of adaptive management strategies such as remedial seeding, spreading of nearby duff and topsoil, and other measures
- Conduct weed control program for target weeds in remediation area, as needed; since cover by target weeds was at or less than 1% in 2016 and 2017, weed control in 2018 will be conducted in areas of IAR where target weed cover increases to greater than the performance target threshold (<5% cover by pampas grass, French broom, or iceplant in North and South Range 44 restoration areas). Weed cover will be quantified in restoration areas by activity type using the CDFW-CNPS Vegetation Rapid Assessment Protocol (2016) in five evenly distributed locations in North and South Range 44 restoration areas and the Range 47 restoration area; results will be reported in the 2018 annual monitoring report.
- Submit annual monitoring report

8.0 REFERENCES

- Baldwin, B. G., Goldman, D. H., Keil, D. J., Patterson, R., Rosatti, T. J., and Wilken, D. H. (eds.). 2012. The Jepson Manual. Vascular plants of California. (2nd ed.). Univ. Calif. Press, Berkeley, CA. xxii+1568 pp. January.
- Burleson Consulting, Inc. (Burleson).. 2009. 2009 Biological Monitoring Report for Burn Units 14, 18, 19, 22 and MRS-16, Former Fort Ord. 24 December. (Fort Ord Administrative Record No. BW-2521)
- California Department of Fish and Wildlife and California Native Plant Society (CDFW-CNPS). 2016. CDFW-CNPS Protocol for the Combined Vegetation Rapid Assessment and Relevé Field Form. April 28, 2016.
- California Invasive Plant Council (Cal-IPC). 2006. California Invasive Plant Inventory. 39 pp. February.
- Davis, F. W., and M. I. Borchert. 2006. Central Coast Bioregion. Pp 321-349 in Fire in California's Ecosystems. University of California Press, Berkeley, California, USA.
- Environmental Services Cooperative Agreement Remediation Program Team (ESCA RP Team). 2011. Final Phase II Interim Action Work Plan, Interim Action Ranges Munitions Response Area, Former Fort Ord, Monterey County, California. 24 May. (Fort Ord Administrative Record No. ESCA-0252B)
- _____. 2012. 2011 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California. 25 May. (Fort Ord Administrative Record No. ESCA-0258)
- _____. 2013a. 2012 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California. 19 February. (Fort Ord Administrative Record No. ESCA-0266)
- _____. 2013b. Phase II Interim Action Work Plan Addendum: Habitat Restoration Plan; Interim Action Ranges Munitions Response Area, Former Fort Ord, Monterey County, California. 26 March. Prepared for Fort Ord Reuse Authority. (Fort Ord Administrative Record No. ESCA-0261B)
- _____. 2014. 2013 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 28 March. (Fort Ord Administrative Record No. ESCA-0283)

- _____. 2015a. Final Interim Remedial Action Completion Report, Interim Action Ranges Munitions Response Area Phase II, Former Fort Ord, Monterey County, California, 28 January. (Fort Ord Administrative Record No. ESCA-0285B)
- _____. 2015b. 2014 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 15 April. (Fort Ord Administrative Record No. ESCA-0300)
- _____. 2016. 2015 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 18 March. (Fort Ord Administrative Record No. ESCA-0325)
- _____. 2017. 2016 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California, 18 April. (Fort Ord Administrative Record No. ESCA-0325)
- Fort Ord Reuse Authority (FORA). 1997. Fort Ord Reuse Plan. 13 June.
- Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 12+ vols. New York and Oxford. Vol. 1, 1993; vol. 2, 1993; vol. 3, 1997; vol. 4, 2003; vol. 5, 2005; vol. 19, 2006; vol. 20, 2006; vol. 21, 2006; vol. 22, 2000; vol. 23, 2002; vol. 25, 2003; vol. 26, 20.
- Harding Lawson Associates (HLA). 2001. 2000 Annual Monitoring Report, Biological Baseline Studies and Follow-up Monitoring, Former Fort Ord, Monterey County, California. 19 January. (Fort Ord Administrative Record No. BW-2235)
- Keeley, J. E. 2002. Fire Management of California Shrubland Landscapes. *Environmental Management* 29(3):395-408.
- Parsons Infrastructure & Technology Group, Inc. (Parsons). 2002. Final Technical Information Paper, Surface Removal, Ordnance, and Explosives (OE) Site Ranges 43-48, Former Fort Ord, Monterey, California, Ordnance and Explosives (OE) Cleanup. 7 February. (Fort Ord Administrative Record No. OE-0537)
- _____. 2005. 2005 Annual Biological Monitoring Report, Ranges 43-48, Former Fort Ord, Monterey County, California. 28 November. (Fort Ord Administrative Record No. OE-0577)
- _____. 2007. Final 2007 MRS-Ranges 43-48 Interim Action Technical Information Paper Volume I. January. Prepared for U.S. Army Corps of Engineers Sacramento District. (Fort Ord Administrative Record No. OE-0590L)
- Pielou, E. C. 1974. Population and community ecology: principles and methods. CRC Press.

- U.S. Army Corps of Engineers (USACE) (with Technical Assistance from Jones & Stokes Associates). 1992. Flora and Fauna Baseline Study of Fort Ord, California. Sacramento District. Sacramento, California. December. (Fort Ord Administrative Record No. BW-1938)
- _____. 1997. Installation-Wide Multispecies Habitat Management Plan for Former Fort Ord, CA, U.S. Army Corps of Engineers, Sacramento District. April. (Fort Ord Administrative Record No. BW-1787)
- U.S. Department of the Army (Army). 2002. Record of Decision, Interim Action for Ordnance and Explosives at Ranges 43-48, Range 30A, and Site OE-16, Former Fort Ord, California. 20 September. (Fort Ord Administrative Record No. OE-0414)
- _____. 2017. Record of Decision, Interim Action Ranges Munitions Response Area, Former Fort Ord, California. January 18. (Fort Ord Administrative Record No. ESCA-0331)
- U.S. Fish and Wildlife Service (USFWS). 1999. Biological and Conference Opinion on the Closure and Reuse of Fort Ord, Monterey County, California (1-8-99-F/C-39R). 30 March. (Fort Ord Administrative Record No. BW-2232A)
- _____. 2002. Biological Opinion on the Closure and Reuse of Fort Ord, Monterey County, California, as it affects Monterey Spineflower Critical Habitat (1-8-01-F-70R). 22 October. (Fort Ord Administrative Record No. BW-2233)
- _____. 2005. Cleanup and Reuse of Former Fort Ord, Monterey County, California as it affects California Tiger Salamander and Critical Habitat for Costa Contra Goldfields (1-8-04-F-25R). 14 March. (Fort Ord Administrative Record No. BW-2334)
- _____. 2007. Amendment to Biological Opinion 1-8-04-F-25R, for the Cleanup and Reuse of Former Fort Ord, Monterey County, California as it affects California Tiger Salamander and Critical Habitat for Costa Contra Goldfields. 1 June. (Fort Ord Administrative Record No. BW-2334C)
- _____. 2015. Programmatic Biological Opinion for Cleanup and Property Transfer Actions, (8-8-09-F-74), Conducted at the Former Fort Ord, Monterey County, California 28 May. (Fort Ord Administrative Record No. BW-2747)
- Zander Associates (Zander). 2002. Assessment East Garrison – Parker Flats Land Use Modifications, Fort Ord, California. 1 May. (Fort Ord Administrative Record No. BW-2180).
- Zedler, P. H. 1995. Fire Frequency in Southern California Shrublands: Biological Effects and Management Options. Pp 101-112 in J. E. Keeley and T. Scott (eds), *Brushfires in*

California Wildlands: Ecology and Resource Management. International Association of Wildland Fire, Fairfield, WA.

Table A 3-1
Interim Action Ranges MRA Activity Types and Restoration Strategies

ESCA RP 2017 Annual Natural Resource Report – Appendix A

Activity Type	Activity Category	Anticipated Investigation Area (acres)	Completed Investigation Area (acres)	Restoration Strategy	Planned Actions
Ingress/egress routes	A	5.5	0.4	Monitoring only	- monitor
Above-ground vegetation cutting prior to target-specific excavation	B	12.3	13.8	Monitoring only	- separate/replace topsoil/subsoil in specified sequence
Small-scale soil excavation - areas of less than 1 acre or no more than 100 feet wide. All vegetation removed above and below ground.	C	2.9	1.2	Passive (seeding)	- separate/replace topsoil/subsoil in specified sequence
					- recontour to match original
					- control erosion as needed
					- seed
					- monitor
Large scale soil excavation - areas of greater than 1 acre or more than 100 feet wide. All vegetation removed above and below ground.	D	13.4	13.4	Active (seeding and container planting)	- separate/replace topsoil/subsoil in specified sequence
					- recontour to match original
					- control erosion as needed
					- seed
					- container plantings
					- monitor
Totals		34.1	28.8		

Table A 3-2
Soil and Topography Remediation Success Criteria

ESCA RP 2017 Annual Natural Resource Report – Appendix A

Restoration Strategy	Success Criteria	Evaluation Method/Procedure	Monitoring Frequency
Soil decompaction on trails and roads	Match soil texture and structure to that of nearby native soils	Linear measurements via GIS of trails and roads requiring restoration	At end of construction activities prior to restoration
		Comparison of samples every 0.25 mile with nearby native soils	After completion of de-compaction efforts
Remove constructed berm in Range 47 and restore to pre-existing conditions	Match original topography as closely as possible	Comparison with 1964 aerial image for reference	At end of construction activities prior to remediation
		Ground-level photographic imagery before and after remediation	After completion of re-contouring
Topsoil and subsoil placement in Range 47 Subarea A	6-inch topsoil improvement on 80% of exposed dune hill in Range 47 Subarea A	Comparison with 1964 aerial image for reference	At end of construction activities prior to remediation
		Volume calculations	During re- contouring
		Document soil placement in specified manner	During re- contouring
		Ground-level photographic imagery before and after remediation	After completion of re-contouring

Table A 3-3
Plant Species Diversity and Vegetation-Based Success Criteria

ESCA RP 2017 Annual Natural Resource Report – Appendix A

Activity Category	Location	Completed Investigation Area (acres)	Restoration Strategy	Performance Category	Performance Metric	Performance Target for Post-Installation by Year							Baseline for Comparison
						1	2	3	4	5	6	7	
Ingress/egress routes (Activity A)	All ingress/egress routes	0.4	Monitoring only	Monterey spineflower presence	% focus species baseline	100	70	60	50	30	20	10	Baseline in 2013 ESCA RP Annual Natural Resource Report*
				Sand (Monterey) Gilia presence	% focus species baseline	100	50	40	30	20	10	0	
				Pampas grass and French broom recruits	% total area	<5	<5	<5	<5	<5	<5	<5	total area
Above-ground vegetation cutting followed by target-specific excavation (Activity B)	North Range 44 SCAs, South Range 44 SCAs and Central Area NCAs, part of Range 47 SCA Subarea C ¹	13.8	Monitoring only	Total native species richness (max. value = 20)	% IAR-wide baseline by area	25	30	35	40	50	60	70	Tables 2 and 3 of this HRP
				Native vegetation cover	% cover by location	0	5	10	20	25	30	50	
				HMP shrub species richness (max. value =3)	% IAR-wide baseline by area	0	0	33	33	33	66	66	
				HMP shrub species frequency	% frequency of HMP shrub species	0	5	5	10	15	20	20	
				Monterey spineflower presence	% focus species baseline	100	70	60	50	30	20	10	2012 baseline monitoring plots
				Sand (Monterey) Gilia presence	% focus species baseline	100	50	40	30	20	10	0	
				Seaside bird's beak presence	% focus species baseline	10	10	5	5	5	5	5	
				Pampas grass and French broom recruits	% total area	<5	<5	<5	<5	<5	<5	<5	total area
Small-scale soil excavation (Activity C)	North Range 44 SCAs, South Range 44 SCAs and Central Area NCAs, linear scrape in Range 47 Subarea C	1.1	Passive (seeding)	Total native species richness (max value = 20)	% of Total Present	15	20	25	30	40	50	50	Tables 2 and 3 of this HRP
				Native vegetation cover	% cover by location	0	5	10	20	25	30	50	
				HMP shrub species richness (max value =3)	% of total present	0	0	33	33	33	66	66	
				Monterey spineflower presence	% focus species baseline	100	30	10	0	0	0	0	2012 baseline monitoring plots
				Sand (Monterey) Gilia presence	% focus species baseline	100	20	10	0	0	0	0	
				Seaside bird's beak presence	% focus species baseline	0	0	0	5	5	5	5	
				Pampas grass, iceplant, and French broom recruits	% total area	<5	<5	<5	<5	<5	<5	<5	total area
	Grassland grid cell in South Range 44 SCA	0.1	Passive (seeding)	Total Species Richness	% baseline	10	20	30	40	45	50	50	Grassland Reference Site - 2010/2011*
				Native vegetation cover	% cover	8	12	20	25	30	35	40	Grassland Reference Site - 2010/2011*
				Monterey spineflower presence	% focus species baseline	100	50	30	10	10	10	10	2012 baseline monitoring plots
				Pampas grass, iceplant, and French broom recruits	% total area	<5	<5	<5	<5	<5	<5	<5	total area

Table A 3-3
Plant Species Diversity and Vegetation-Based Success Criteria

ESCA RP 2017 Annual Natural Resource Report – Appendix A

Activity Category	Location	Completed Investigation Area (acres)	Restoration Strategy	Performance Category	Performance Metric	Performance Target for Post-Installation by Year							Baseline for Comparison
						1	2	3	4	5	6	7	
Large-scale soil excavation (Activity D)	Range 47 Subarea A (low recruitment area)	1.2	Passive (seeding)	Shrub species richness	% of total present	0	10	10	20	20	20	30	Tables 2 and 3 in this HRP
				Native vegetation cover	% cover by location	0	1	2	4	6	8	10	
				Monterey spineflower presence	% focus species baseline	0	0	30	10	10	10	10	2012 baseline monitoring plots
				Pampas grass, iceplant, and French broom recruits	% total area	<5	<5	<5	<5	<5	<5	<5	total area
	Range 47 Subarea B	12.2	Active (container planting and seeding)	Container plant survival	% total planted	0	60	60	60	50	50	50	Tables 2 and 3 in this HRP
				Shrub species richness	% of total present	0	20	30	40	50	60	70	
				Native vegetation cover	% cover by location	0	5	15	20	25	30	50	
				HMP shrub species richness (max value =3)	% of total present	0	0	33	33	33	66	66	
				HMP shrub species frequency	% frequency of HMP shrub species in IAR-	0	0	33	33	33	66	66	
				Monterey spineflower presence	% focus species baseline	100	70	60	50	30	20	10	2012 baseline monitoring plots
				Sand (Monterey) Gilia presence	% focus species baseline	100	50	40	30	20	10	0	
				Pampas grass, iceplant, and French broom recruits	% total area	<5	<5	<5	<5	<5	<5	<5	total area

Notes:

1 = Area includes 0.5-acre escarpment where small-scale excavation was conducted. The escarpment could not be accessed safely to conduct passive or active restoration. For this reason, the escarpment was categorized as an Activity B area and the monitoring-only strategy was implemented in this area.

*ESCA RP Team. 2014. 2013 Annual Natural Resource Monitoring, Mitigation, and Management Report, Former Fort Ord, Monterey County, California.28 March.

(Fort Ord Administrative Record No. ESCA-0283)

Table A 6-1
Total Native Species Richness by Activity Type

ESCA RP 2017 Annual Natural Resource Report – Appendix A

Activity Category	Location	Restoration Strategy	Total Native Species Present					
			Prior to Activities	After Activities 2013	After Activities 2014	After Activities 2015	After Activities 2016 ²	After Activities 2017 ²
Ingress/egress routes (Activity A)	All ingress/egress routes	Monitoring only	14	14	36	36	--	--
Above-ground vegetation cutting followed by target-specific excavation (Activity B)	North Range 44 SCAs and Central Area NCAs, South Range 44 SCAs, Range 47 SCA Subarea C	Monitoring only	100	79	92	92	92	--
Small-scale soil excavation (Activity C)	North Range 44 SCAs and Central Area NCAs, South Range 44 SCAs, Range 47 SCA Subarea C	Passive (seeding)	100	25	64	64	68	74
	Grassland grid cell in South Range 44 SCA		18	20	28	28	20	31
Large-scale soil excavation (Activity D)	Range 47 Subarea A (low recruitment area)	Passive (seeding)	25 ¹	47	41	41	--	--
	Range 47 Subarea B	Active (container planting and seeding)	25 ¹	115	115	115	--	--

¹ Only limited field surveys allowed in Range 47 prior to munitions investigations activities

² Areas that met or exceeded performance criteria targets in previous year were not sampled in subsequent year

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2017 Annual Natural Resource Report – Appendix A

Scientific Name	Common Name	HMP species	CNPS Rare Plant Rank	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 44 Grassland
Trees						
<i>Arbutus menziesii</i>	Pacific madrone					
<i>Hesperocyparis macrocarpa</i>	Monterey cypress		1B.2			
<i>Pinus radiata</i>	Monterey pine		1B.1			
<i>Populus trichocarpa</i>	black cottonwood					
<i>Quercus agrifolia</i>	coast live oak			x		
<i>Salix lasiolepis</i>	arroyo willow			x		
Shrubs and Subshrubs						
<i>Acmispon glaber</i>	deerweed			x		
<i>Adenostoma fasciculatum</i>	chamise			x		
<i>Arctostaphylos pumila</i>	sandmat manzanita	HMP	1B.2	x		
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita			x		
<i>Artemisia californica</i>	California sagebrush			x		
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote bush, coyote brush			x		
<i>Ceanothus dentatus</i>	dwarf ceanothus			x		
<i>Ceanothus rigidus</i>	Monterey ceanothus	HMP	4.2	x		
<i>Crocanthemum scoparium</i>	rush-rose			x		
<i>Ericameria ericoides</i>	dune-heather, mock-heather			x		
<i>Ericameria fasciculata</i>	Eastwood's ericameria	HMP	1B.1	x	x	
<i>Eriophyllum confertiflorum</i>	golden yarrow			x		
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry			x		
<i>Garrya elliptica</i>	coast silk-tassel			x		
<i>Heteromeles arbutifolia</i>	toyon			x		
<i>Lepechinia calycina</i>	pitcher sage			x		
<i>Lupinus arboreus</i>	coastal bush lupine			x		
<i>Lupinus chamissonis</i>	silver bush lupine			x	x	
<i>Mimulus aurantiacus</i>	bush monkeyflower			x		
<i>Ribes malvaceum</i>	chaparral currant			x		
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry			x		
<i>Salvia mellifera</i>	black sage			x		
<i>Solanum umbelliferum</i>	blue witch nightshade			x		
<i>Symphoricarpos mollis</i>	creeping snowberry			x		
<i>Toxicodendron diversilobum</i>	poison-oak			x		

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2017 Annual Natural Resource Report – Appendix A

Scientific Name	Common Name	HMP species	CNPS Rare Plant Rank	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 44 Grassland
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)						
<i>Achillea millefolium</i>	common yarrow			x		
<i>Acmispon heermannii</i> var. <i>orbicularis</i>	woolly lotus			x	x	
<i>Acmispon strigosus</i>	Bishop's lotus			x		
<i>Aira caryophylla</i>	common silver-hair grass			x	x	
<i>Amblyopappus pusillus</i>	amblyopappus			x		
<i>Amsinckia intermedia</i>	common fiddleneck			x	x	
<i>Anagallis arvensis</i>	scarlet pimpernel			x		
<i>Antirrhinum majus</i>	snapdragon					
<i>Apiastrum angustifolium</i>	wild celery			x		
<i>Armeria maritima</i> subsp. <i>californica</i>	California sea-pink, sea thrift			x		
<i>Artemisia douglasiana</i>	mugwort					
<i>Avena barbata</i>	slender wild oat			x	x	
<i>Avena fatua</i>	wild oat					
<i>Briza maxima</i>	rattlensnake grass					
<i>Bromus diandrus</i>	ripgut brome			x	x	
<i>Bromus hordeaceus</i>	soft chess			x	x	
<i>Bromus madritensis</i> subsp. <i>rubens</i>	red brome		high	x		
<i>Calandrinia ciliata</i>	red maids			x	x	
<i>Calochortus albus</i> var. <i>albus</i>	fairy lanterns, globe lily			x		
<i>Calyptridium monandrum</i>	pussy paws			x		
<i>Calystegia subacaulis</i>	hill morning-glory			x		
<i>Camissonia contorta</i>	contorted suncups			x	x	
<i>Camissonia strigulosa</i>	strigose suncups			x	x	
<i>Camissoniopsis cheiranthifolia</i> subsp. <i>cheiranthifolia</i>	beach primrose					
<i>Camissoniopsis micrantha</i>	small suncups			x		
<i>Cardionema ramosissimum</i>	sand mat			x		
<i>Carex globosa</i>	round-fruited sedge			x		
<i>Carpobrotus edulis</i>	hottentot fig/ice plant		high	x		
<i>Castilleja exserta</i> subsp. <i>latifolia</i>	wideleaf purple owl's clover			x	x	
<i>Caulanthus lasiophyllus</i>	California mustard			x		
<i>Centaurea melitensis</i>	toalote		mod	x	x	
<i>Cerastium glomeratum</i>	mouseear chickweed			x	x	

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2017 Annual Natural Resource Report – Appendix A

Scientific Name	Common Name	HMP species	CNPS Rare Plant Rank	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 44 Grassland
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)						
<i>Chenopodium californicum</i>	California goosefoot					
<i>Chorizanthe diffusa</i>	diffuse chorizanthe			x		
<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	HMP	1B.2	x	x	
<i>Cirsium occidentale</i> var. <i>occidentale</i>	cobweb thistle			x	x	
<i>Cirsium vulgare</i>	bull thistle			mod		
<i>Clarkia amoena</i>	farewell-to-spring					
<i>Claytonia perfoliata</i>	miner's lettuce			x		
<i>Collinsia heterophylla</i>	Chinese houses					
<i>Cordylanthus rigidus</i> subsp. <i>littoralis</i>	seaside bird's beak	HMP	1B.1	x		
<i>Corethrogyne filaginifolia</i>	California aster			x		
<i>Cortaderia jubata</i>	pampas grass, jubata grass			high	x	
<i>Crassula connata</i>	pygmy weed			x	x	
<i>Croton californicus</i>	California croton			x	x	
<i>Cryptantha clevelandii</i> var. <i>florosa</i>	coastal cryptantha			x	x	
<i>Cryptantha micromeres</i>	small-flowered cryptantha			x	x	
<i>Cryptantha microstachys</i>	Tejon cryptantha			x	x	
<i>Daucus pusillus</i>	rattlesnake weed			x		
<i>Deinandra increscens</i> subsp. <i>increscens</i>	coast tarplant			x	x	
<i>Dichelostemma capitatum</i>	blue dicks, wild hyacinth			x	x	
<i>Drymocallis glandulosa</i> var. <i>glandulosa</i>	sticky cinquefoil			x		
<i>Elymus glaucus</i> subsp. <i>glaucus</i>	western wild-rye			x		
<i>Epilobium brachycarpus</i>	tall annual willowherb					
<i>Epilobium canum</i>	California-fuchsia					
<i>Epilobium ciliatum</i> var. <i>ciliatum</i>	northern willowherb					
<i>Eriastrum virgatum</i>	wand woollystar		4.3	x	x	
<i>Erigeron bonariensis</i>	flax-leaved fleabane					
<i>Erigeron canadensis</i>	horseweed			x	x	
<i>Erigeron foliosus</i> var. <i>foliosus</i>	leafy daisy			x		
<i>Erigeron sumatrensis</i>	tropical horseweed					

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2017 Annual Natural Resource Report – Appendix A

Scientific Name	Common Name	HMP species	CNPS Rare Plant Rank	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 44 Grassland
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)						
<i>Erodium botrys</i>	long-beaked filaree			x	x	
<i>Erodium cicutarium</i>	red-stemmed filaree			lim	x	x
<i>Erysimum ammodendrum</i>	coast wallflower	HMP	1B.2	x		
<i>Eschscholzia californica</i>	California poppy			x	x	
<i>Euphorbia peplus</i>	petty spurge					
<i>Festuca microstachya</i>	small fescue			x		
<i>Festuca myuros</i>	rattail fescue			mod	x	x
<i>Festuca octoflora</i>	six-weeks fescue			x	x	
<i>Fritillaria affinis</i>	checker lily, Mission bells			x		
<i>Galium californicum</i>	California bedstraw			x		
<i>Galium porrigens</i> var. <i>porrigens</i>	climbing bedstraw			x		
<i>Gamochaeta ustulata</i>	purple cudweed			x		
<i>Gilia capitata</i> subsp. <i>abrotanifolia</i>	ball gilia					
<i>Gilia capitata</i> subsp. <i>capitata</i>	ball gilia					
<i>Gilia tenuiflora</i> subsp. <i>arenaria</i>	sand [Monterey] gilia	HMP	1B.2	x		
<i>Gilia tricolor</i>	bird's eyes gilia					
<i>Helminthotheca echioides</i>	bristly ox-tongue			lim		
<i>Herniaria hirsuta</i> subsp. <i>cinerea</i>	hairy rupturewort					
<i>Heterotheca grandifolia</i>	telegraph weed			x	x	
<i>Hordeum brachyantherum</i> subsp. <i>brachyantherum</i>	meadow barley					
<i>Horkelia cuneata</i> var. <i>cuneata</i>	coast horkelia, wedge-leaved horkelia			x	x	
<i>Hypochaeris glabra</i>	smooth cat's ears			lim	x	x
<i>Hypochaeris radicata</i>	cat's ears			mod	x	
<i>Juncus effusus</i> var. <i>pacificus</i>	bog rush					
<i>Koeleria macrantha</i>	June grass			x		
<i>Layia platyglossa</i>	tidy tips			x	x	
<i>Lepidium nitidum</i>	common peppergrass			x		
<i>Leptochloa fusca</i> subsp. <i>fascicularis</i>	bearded sprangletop					
<i>Lessingia pectinata</i> var. <i>pectinata</i>	common lessingia			x	x	
<i>Leptosiphon parviflorus</i>	common linanthus					
<i>Logfia gallica</i>	narrow-leaved filago			x	x	
<i>Logfia filaginoides</i>	California filago			x	x	
<i>Lomatium parvifolium</i>	coastal biscuitroot		4.2	x		

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2017 Annual Natural Resource Report – Appendix A

Scientific Name	Common Name	HMP species	CNPS Rare Plant Rank	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 44 Grassland
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)						
<i>Lupinus bicolor</i>	miniature lupine			x	x	
<i>Lupinus concinnus</i>	elegant lupine					
<i>Lupinus nanus</i>	sky lupine			x	x	
<i>Lupinus truncatus</i>	blunt-leaved lupine					
<i>Madia exigua</i>	small tarplant			x		
<i>Marah fabaceus</i>	wild cucumber			x		
<i>Melica imperfecta</i>	Coast Range melic			x		
<i>Mellilotus indicus</i>	yellow sweet-clover					
<i>Micropus californicus</i> var. <i>californicus</i>	cottontop			x		
<i>Mimulus cardinalis</i>	scarlet monkeyflower					
<i>Monardella sinuata</i> subsp. <i>nigrescens</i>	northern curly-leaved monardella		4.2	x	x	
<i>Navarretia hamata</i> subsp. <i>parviloba</i>	hooked navarretia			x		
<i>Navarretia intertexta</i>	needle-leaved navarretia			x	x	
<i>Navarretia squarrosa</i>	skunkweed			x		
<i>Nemophila menziesii</i>	baby blue-eyes					
<i>Nuttallanthus texanus</i> [<i>Linaria canadensis</i>]	toad-flax			x	x	
<i>Orobanche bulbosa</i>	chaparral broomrape			x		
<i>Orobanche californica</i>	California broomrape			x		
<i>Oxalis pilosa</i>	hairy wood sorrel					
<i>Parapholis incurva</i>	sicklegrass					
<i>Pectocarya penicillata</i>	winged combseed			x	x	
<i>Petrorhagia dubia</i>	hairypink			x	x	
<i>Phacelia campanularia</i>	desert bluebells					
<i>Phacelia distans</i>	wild heliotrope			x		
<i>Phacelia douglasii</i>	Douglas' phacelia			x		
<i>Piperia michaelii</i>	Michael's rein-orchid		4.2	x		
<i>Plagiobothrys collinus</i> var. <i>fulvescens</i>	rusty-haired popcorn flower			x		
<i>Plantago coronopus</i>	cut-leaved plantain			x		

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2017 Annual Natural Resource Report – Appendix A

Scientific Name	Common Name	HMP species	CNPS Rare Plant Rank	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 44 Grassland
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)						
<i>Plantago erecta</i>	California plantain			x	x	
<i>Poa annua</i>	annual bluegrass					
<i>Poa secunda</i>	one-sided bluegrass, pine bluegrass			x		
<i>Polypogon interruptus</i>	ditch beard grass					
<i>Polypogon monspeliensis</i>	rabbitsfoot grass			lim		
<i>Polypogon viridis</i>	water beard grass					
<i>Pseudognaphalium beneolens</i>	fragrant everlasting			x		
<i>Pseudognaphalium californicum</i>	California everlasting			x	x	
<i>Pseudognaphalium ramosissimum</i>	pink everlasting			x		
<i>Pseudognaphalium stramineum</i>	cottonbatting plant			x		
<i>Psilocarphus tenellus</i>	slender woolly marbles					
<i>Pterostegia drymarioides</i>	fairy mist			x		
<i>Rumex acetosella</i>	sheep sorrel			mod	x	x
<i>Sagina apetela</i>	sticky pearlwort					
<i>Senecio c.f. aphanactis</i>	chaparral ragwort		2B.2	x		
<i>Senecio glomeratus</i>	cut-leaved fireweed			mod		
<i>Senecio vulgare</i>	common ragwort					
<i>Silene gallica</i>	windmill pink			x	x	
<i>Sisymbrium orientale</i>	Indian hedgemustard					
<i>Sisyrinchium bellum</i>	blue-eyed grass					
<i>Solanum americanum</i> (herbaceous)	American nightshade					
<i>Sonchus asper</i> subsp. <i>asper</i>	prickly sow-thistle			x		
<i>Sonchus oleraceus</i>	common sow-thistle			x		
<i>Spergula arvensis</i>	corn spurrey					
<i>Spergularia rubra</i>	red sand-spurrey					
<i>Stachys bullata</i>	wood mint			x		
<i>Stipa pulchra</i>	purple needlegrass			x		
<i>Stylocline gnaphaliodes</i>	everlasting neststraw			x	x	
<i>Taraxia [Camissonia] ovata</i>	suncups			x		
<i>Toxicoscordion fremontii</i>	Fremont's star lily			x		
<i>Trifolium ciliolatum</i>	foothill clover			x	x	
<i>Trifolium gracilentum</i>	pinpoint clover			x		
<i>Trifolium hirtum</i>	rose clover			mod		
<i>Trifolium microcephalum</i>	hairy clover, small-headed clover			x	x	
<i>Uropappus lindleyi</i>	silver puffs			x		
<i>Viola cultivar</i>	pansy					

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2017 Annual Natural Resource Report – Appendix A

Scientific Name	Common Name	HMP species	CNPS Rare Plant Rank	Cal-IPC Invasiveness Status	IAR MRA Range 44	IAR MRA Range 44 Grassland
Ferns and Fern-relatives						
<i>Pteridium aquilinum</i> var. <i>pubescens</i>	western bracken fern				x	

Native species in bold

Species and locations noted in this table are for work areas, including monitoring areas and ingress/egress routes; this is not a comprehensive list

Status Codes:

California Native Plant Society (CNPS)

Rare Plant Rank (RPR)

RPR 1B: Plants Rare, Threatened, or Endangered in California and Elsewhere

RPR 2A: Plants Presumed Extirpated in California, but More Common Elsewhere

RPR 2B: Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere

RPR 3: Plants About Which More Information is Needed - A Review List

RPR 4: Plants of Limited Distribution - A Watch List

Extensions to List Categories

0.1 - Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)

0.2 – Moderately threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)

0.3 – Not very threatened in California (<20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

California Invasive Plant Council (Cal-IPC) ratings:

high – severe ecological impacts, high rates of dispersal and establishment.

moderate – substantial and apparent ecological impacts , moderate to high rates of dispersal, establishment dependent upon disturbance.

limited – invasive but impacts not widespread statewide, low to moderate rates of dispersal, may be locally persistent and problematic.

Table A 6-3
Interim Action Ranges MRA HMP Species Presence by Activity Type

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Activity Category	Location	Restoration Strategy	Total HMP Species ¹ Present					
			Prior to Activities	After Activities 2013	After Activities 2014	After Activities 2015	After Activities 2016 ³	After Activities 2017 ³
Ingress/egress routes (Activity A)	All ingress/egress routes	Monitoring only	1	3	4	4	--	--
Above-ground vegetation cutting followed by target-specific excavation (Activity B)	North Range 44 SCAs and Central Area NCAs, South Range 44 SCAs, Range 47 SCA Subarea C	Monitoring only	6	k,	7	7	7	--
Small-scale soil excavation (Activity C)	North Range 44 SCAs and Central Area NCAs, South Range 44 SCAs, Range 47 SCA Subarea C	Passive (seeding)	6	4	7	7	7	7
	Grassland grid cells in South Range 44 SCA		1	1	2	2	2	2
Large-scale soil excavation (Activity D)	Range 47 Subarea A (low recruitment area)	Passive (seeding)	1 ²	3	5	5	--	--
	Range 47 Subarea B	Active (container planting and seeding)	5 ²	6	6	6	--	--

¹ Observed HMP species summarized in this table include: sandmat manzanita, Monterey ceanothus, Eastwood's ericameria, Monterey spineflower, seaside bird's-beak, coast wallflower, and sand (Monterey) gilia.

² Only limited field surveys allowed in Range 47 prior to munitions investigations activities

³ Areas that met or exceeded performance criteria targets in these years were not sampled in subsequent year:
Range 47 SCA, all activities; North Range 44 SCAs and Central Area NCAs, Activity A and B; and South Range 44 SCA, Activity A

Table A 6-4
Interim Action Ranges MRA Native Shrub Species Richness by Activity Type

ESCA RP 2017 Annual Natural Resource Report – Appendix A

Activity Category	Location	Restoration Strategy	Presence of Native Shrub Species Not Listed as HMP Species							Baseline Number of Non-HMP Shrub Species Required
			Prior to Activities ²	After Activities					2017 Compared with Baseline (percent of presence)	
				2013	2014	2015	2016 ³	2017 ³		
Ingress/egress routes (Activity A)	All ingress/egress routes	Monitoring only	0	0	11	11	--	--	no baseline ¹	0
Above-ground vegetation cutting followed by target-specific excavation (Activity B)	North Range 44 SCAs and Central Area NCAs, South Range 44 SCAs, Range 47 SCA Subarea C	Monitoring only	20	14	22	22	22	--	--	14
Small-scale soil excavation (Activity C)	North Range 44 SCAs and Central Area NCAs, South Range 44 SCAs, Range 47 SCA Subarea C	Passive (seeding)	20	7	22	22	22	22	110.0%	14
	Grassland grid cell in South Range 44 SCA		0	0	0	1	1	1	no baseline ¹	0
Large-scale soil excavation (Activity D)	Range 47 Subarea A (low recruitment area)	Passive (seeding)	10	14	15	15	--	--	--	8
	Range 47 Subarea B	Active (container planting and seeding)	22	22	22	22	--	--	--	8

¹ No baseline = no performance criteria or baseline for this activity type or location
² Only limited field surveys allowed in Range 47 prior to munitions investigations activities
³ Areas that met or exceeded performance criteria targets in 2015 and 2016 year were not sampled in 2016 or 2017

Table A 6-4
Interim Action Ranges MRA Native Shrub Species Richness by Activity Type

ESCA RP 2017 Annual Natural Resource Report – Appendix A

Activity Category	Location	Restoration Strategy	Presence of HMP Shrub Species						
			Prior to Activities ²	After Activities					2017 Compared with Baseline Requirement of 3 HMP Shrubs (percent of presence)
				2013	2014	2015	2016 ³	2017 ³	
Ingress/egress routes (Activity A)	All ingress/egress routes	Monitoring only	0	0	3	3	--	--	--
Above-ground vegetation cutting followed by target-specific excavation (Activity B)	North Range 44 SCAs and Central Area NCAs, South Range 44 SCAs, Range 47 SCA Subarea C	Monitoring only	3	3	3	3	3	--	--
Small-scale soil excavation (Activity C)	North Range 44 SCAs and Central Area NCAs, South Range 44 SCAs, Range 47 SCA Subarea C	Passive (seeding)	3	2	3	3	3	3	100.0%
	Grassland grid cell in South Range 44 SCA		0	0	1	0	0	0	no baseline ¹
Large-scale soil excavation (Activity D)	Range 47 Subarea A (low recruitment area)	Passive (seeding)	2	2	3	3	--	--	--
	Range 47 Subarea B	Active (container planting and seeding)	3	3	3	3	--	--	--

¹ No baseline = no performance criteria or baseline for this activity type or location

² Only limited field surveys allowed in Range 47 prior to munitions investigations activities

³ Areas that met or exceeded performance criteria targets in 2015 and 2016 year were not sampled in 2016 or 2017

Table A 6-5
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
2017 Plant Species Richness and Diversity

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA in Central Maritime Chaparral									
Location	Interim Action Ranges MRA Range 44								
Area	All	South Range 44 NCAs and Central Area SCAs							
Activity Type	Baseline	Vegetation Cutting							
Activity Year	2010	Year 1 (2012)	Year 2 (2013)	Year 3 (2014)	Year 3 with surrounding species included (2014)	Year 4 (2015)	Year 4 with surrounding species included (2015)	Year 5 (2016)	Year 5 with surrounding species included (2016)
Number of Transects/Quadrats	Seven Transects	Seven Transects							
Total Number of Native Species	15	24	18	23	41	37	52	43	62
Total Number of HMP Species Present	3	4	3	3	3	6	6	4	6
Total Number of HMP Herbaceous Species Present	0	1	0	1	1	3	3	2	3
Total Tree Species in All Transects	0	0	1	1	1	1	1	0	1
Total Shrub Species in All Transects	14	16	16	12	17	15	16	13	16
Total Herbaceous Species in All Transects or Related Herbaceous Plots	1	8	1	10	23	21	35	30	45
Total Fern and Fern Allies Species in All Transects	0	0	0	0	0	0	0	0	0
Mean Number of Tree Species per Transect	0.0	0.0	0.1	0.1	0.3	0.1	0.3	0.0	0.4
Mean Number of Shrub Species per Transect	9.6	4.7	8.6	7.1	10.6	8.0	11.1	6.4	10.3
Mean Number of Herbaceous Species per Transect	0.0	0.7	0.3	2.1	5.9	6.3	13.7	16.1	24.9
Mean Number of Fern and Fern Allies Species per Transect	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table A 6-5
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
2017 Plant Species Richness and Diversity

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA in Central Maritime Chaparral									
Location	Interim Action Ranges MRA Range 44								
Area	All	South Range 44 NCAs and Central Area SCAs							
Activity Type	Baseline	Vegetation Cutting							
Activity Year	2010	Year 1 (2012)	Year 2 (2013)	Year 3 (2014)	Year 3 with surrounding species included (2014)	Year 4 (2015)	Year 4 with surrounding species included (2015)	Year 5 (2016)	Year 5 with surrounding species included (2016)
Number of Transects/Quadrats	Seven Transects	Seven Transects							
Diversity - Shannon Index	1.8	1.4	1.5	1.4	--	1.4	--	1.4	--
Evenness	0.2	0.2	0.2	0.2	--	0.2	--	0.2	--
Total Percent Mean Native Cover (Transects)	108.8%	24.6%	34.2%	30.6%	--	34.5%	--		--
Percent Mean Shrub Cover	107.6%	21.1%	31.3%	28.4%	--	32.6%	--		--
Percent Mean Herbaceous Cover (Transects)	1.2%	3.5%	2.8%	2.2%	--	1.8%	--	--	--
Percent Mean Herbaceous Species Cover (Quadrats)	--	--	--	--	--	--	--	--	--
Total Percent Mean Native Cover (Herbaceous Quadrats)	--	--	--	--	--	--	--		--

Table A 6-5
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
2017 Plant Species Richness and Diversity

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA in Central Maritime Chaparral										
Location	Interim Action Ranges MRA Range 44									
Area	South Range 44 NCAs and Central Area SCAs									
Activity Type	Small-scale Excavation									
Activity Year	Year 1 (2012)	Year 2 (2013)	Year 3 (2014)	Year 3 with surrounding species included (2014)	Year 4 (2015)	Year 4 with surrounding species included (2015)	Year 5 (2016)	Year 5 with surrounding species included (2016)	Year 6 (2017)	Year 6 with surrounding species included (2017)
Number of Transects/Quadrats					Five Transects					
Total Number of Native Species	18	29	26	39	44	70	39	52	35	58
Total Number of HMP Species Present	1	3	5	5	3	5	3	5	3	5
Total Number of HMP Herbaceous Species Present	1	1	3	2	2	2	2	2	2	3
Total Tree Species in All Transects	0	0	0	0	1	1	0	0	0	1
Total Shrub Species in All Transects	7	12	11	14	17	20	8	14	10	14
Total Herbaceous Species in All Transects or Related Herbaceous Plots	11	17	15	25	26	49	31	38	25	43
Total Fern and Fern Allies Species in All Transects	0	0	0	0	0	0	0	0	0	0
Mean Number of Tree Species per Transect	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Mean Number of Shrub Species per Transect	4.0	5.8	5.0	9.2	5.2	9.2	4.4	9.0	5.8	7.8
Mean Number of Herbaceous Species per Transect	4.6	6.6	3.0	11.2	7.0	14.0	14.8	23.4	13.8	22.3
Mean Number of Fern and Fern Allies Species per Transect	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table A 6-5
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
2017 Plant Species Richness and Diversity

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA in Central Maritime Chaparral										
Location	Interim Action Ranges MRA Range 44									
Area	South Range 44 NCAs and Central Area SCAs									
Activity Type	Small-scale Excavation									
Activity Year	Year 1 (2012)	Year 2 (2013)	Year 3 (2014)	Year 3 with surrounding species included (2014)	Year 4 (2015)	Year 4 with surrounding species included (2015)	Year 5 (2016)	Year 5 with surrounding species included (2016)	Year 6 (2017)	Year 6 with surrounding species included (2017)
Number of Transects/Quadrats	Five Transects and 30 Quadrats				Five Transects					
Diversity - Shannon Index	0.7	0.6	0.8	--	1.0	--	1.2	--	1.3	--
Evenness	0.2	0.1	0.2	--	0.2	--	0.2	--	0.2	--
Total Percent Mean Native Cover (Transects)	7.5%	14.4%	19.7%	--	14.8%	--		--	10.6%	--
Percent Mean Shrub Cover	2.3%	7.6%	16.4%	--	11.3%	--		--	7.7%	--
Percent Mean Herbaceous Cover (Transects)	5.1%	6.8%	3.3%	--	3.5%	--	--	--	2.9%	--
Percent Mean Herbaceous Species Cover (Quadrats)	1.2%	1.6%	4.2%	--	--	--	--	--	--	--
Total Percent Mean Native Cover (Herbaceous Quadrats)	1.3%	3.4%	6.2%	--	--	--		--	--	--

Table A 6-6
Interim Action Ranges MRA North Range 44 SCA and Central Area NCAs
2010 - 2017 Plant Species Richness and Diversity

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA in Central Maritime Chaparral										
Location	Interim Action Ranges MRA Range R44									
Area	All	North Range 44 NCA and Central Area SCAs								
Activity Type	Baseline	Small-scale Excavation								
Activity Year	2010	Year 1 (2013)	Year 2 (2014)	Year 2 with surrounding species included (2014)	Year 3 (2015)	Year 3 with surrounding species included (2015)	Year 4 (2016)	Year 4 with surrounding species included (2016)	Year 5 (2017)	Year 5 with surrounding species included (2017)
Number of Transects/Quadrats	Five Transects	Eight Transects								
Total Number of Native Species	15	24	41	58	44	62	47	60	42	63
Total Number of HMP Species Present	3	3	6	7	6	7	6	7	6	7
Total Number of HMP Herbaceous Species Present	0	1	3	4	3	4	3	4	3	4
Total Tree Species in All Transects	0	1	1	1	1	1	1	1	1	1
Total Shrub Species in All Transects	14	10	15	18	13	17	11	15	12	14
Total Herbaceous Species in All Transects or Related Herbaceous Plots	1	12	24	38	30	43	35	43	29	47
Total Fern and Fern Allies Species in All Transects	0	1	1	1	0	1	0	1	0	1
Mean Number of Tree Species per Transect	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mean Number of Shrub Species per Transect	9.8	2.9	4.9	8.3	5.0	11.0	3.9	9.5	6.1	8.0
Mean Number of Herbaceous Species per Transect ²	0.0	1.9	5.0	11.3	8.8	15.6	10.1	18.0	8.4	16.4
Mean Number of Fern and Fern Allies Species per Transect	0.0	0.3	0.1	0.3	0.0	0.3	0.0	0.4	0.0	0.2

Table A 6-6
Interim Action Ranges MRA North Range 44 SCA and Central Area NCAs
2010 - 2017 Plant Species Richness and Diversity

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA in Central Maritime Chaparral										
Location	Interim Action Ranges MRA Range R44									
Area	All	North Range 44 NCA and Central Area SCAs								
Activity Type	Baseline	Small-scale Excavation								
Activity Year	2010	Year 1 (2013)	Year 2 (2014)	Year 2 with surrounding species included (2014)	Year 3 (2015)	Year 3 with surrounding species included (2015)	Year 4 (2016)	Year 4 with surrounding species included (2016)	Year 5 (2017)	Year 5 with surrounding species included (2017)
Number of Transects/Quadrats	Five Transects	Eight Transects								
Diversity - Shannon Index	1.8	0.8	0.9	--	1.1	--	1.2	--	1.3	--
Evenness	0.2	0.3	0.2	--	0.2	--	0.2	--	0.2	--
Total Percent Mean Native Cover (Transects)	99.6%	2.8%	4.4%	--	10.9%	--	23.8%	--	16.5%	--
Percent Mean Shrub Cover	98.0%	0.8%	1.9%	--	5.0%	--	11.5%	--	12.3%	--
Percent Mean Herbaceous Cover (Transects)	1.7%	0.0%	2.4%	--	5.4%	--	11.3%	--	4.2%	--
Percent Mean Herbaceous Species Cover (Quadrats)	--	0.9%	0.7%	--	--	--	--	--	--	--
Total Percent Mean Native Cover (Herbaceous Quadrats)	--	0.5%	0.6%	--	--	--	--	--	--	--

Table A 6-7
Interim Action Ranges MRA South Range 44 SCA Grassland
2010 - 2017 Plant Species Richness and Diversity

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA - South Range 44 SCA Grassland							
Activity Year	Baseline (2010)	Year 1 (2012)	Year 2 (2013)	Year 3 (2014)	Year 4 (2015)	Year 5 (2016)	Year 6 (2017)
Number of Transects/Quadrats	Three Quadrats	Six Quadrats					
Total Number of Native Species	6	9	16	15	18	20	31
Total Number of HMP Species Present	1	1	1	2	1	1	1
Total Number of HMP Herbaceous Species Present	1	1	1	1	1	1	1
Total Native Tree Species in All Herbaceous Plots	0	0	0	0	0	0	0
Total Shrub Species in All Herbaceous Plots	1	0	1	1	0	1	0
Total Native Herbaceous Species in All Herbaceous Plots	5	9	15	14	18	19	31
Total Native Ferns and Fern Allies in Herbaceous Plots	0	0	0	0	0	0	0
Mean Number Tree Species per Herbaceous Plots	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean Number Shrub Species per Herbaceous Plot	0.3	0.0	0.2	0.2	0.0	0.2	0.0
Mean Number of Native Herbaceous Species per Herbaceous Plots	3.0	3.2	5.0	5.0	7.0	7.8	7.8
Mean number of Native Ferns and Fern Allies per Herbaceous Plots	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diversity - Shannon Index	1.61	1.49	2.14	2.14	1.32	1.47	1.76
Evenness	0.20	0.09	0.09	0.09	0.16	0.20	0.20
Total Percent Mean Native Cover (Herbaceous Quadrats)	23.7%	4.3%	23.8%	10.0%	12.4%	30.6%	49.6%

Table A 6-8
Interim Action Ranges MRA North Range 44 SCA
Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Twenty-nine Baseline Transects				
		Baseline Data 2010 - 2011 (all Interim Action Ranges MRA baseline transects)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.0%	--	--	0.0%	0.0%
Total Cover by Native Tree Species		0.0%			0%	
<i>Acmispon glaber</i>	deerweed	1.4%	0.0%	--	1.5%	0.0%
<i>Crocanthemum scoparium</i>	rush-rose	8.1%	9.1%	2.9%	8.6%	86.2%
<i>Arctostaphylos pumila</i>	sandmat manzanita	1.6%	2.0%	0.6%	1.7%	65.5%
<i>Ceanothus dentatus</i>	dwarf ceanothus	20.2%	16.0%	5.0%	21.4%	89.7%
<i>Eriophyllum confertiflorum</i>	golden yarrow	1.5%	2.2%	0.7%	1.6%	65.5%
<i>Lupinus chamissonis</i>	silver bush lupine	0.4%	1.1%	0.4%	0.4%	13.8%
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	--	--	0.0%	0.0%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	29.3%	15.6%	4.9%	31.0%	100%
<i>Ceanothus rigidus</i>	Monterey ceanothus	13.5%	9.3%	2.9%	14.3%	96.6%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.2%	0.5%	0.2%	0.2%	17.2%
<i>Salvia mellifera</i>	black sage	5.3%	7.2%	2.3%	5.6%	69.0%
<i>Adenostoma fasciculatum</i>	chamise	9.0%	6.9%	2.2%	9.5%	89.7%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	1.5%	5.6%	1.8%	1.6%	24.1%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.9%	1.9%	0.6%	1.0%	31.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.7%	1.8%	0.6%	0.7%	24.1%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.5%	0.9%	0.3%	0.5%	27.6%
<i>Lepechinia calycina</i>	pitcher sage	0.4%	1.4%	0.5%	0.4%	20.7%
Total Mean Percent Shrub and Subshrub Cover		94.5%			100.0%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		0.0%	--	--	0.0%	--
Target Weed Total (<i>Carpobrotus edulis</i>)		0.0%				
Total Mean Non-native Herbaceous Species Cover		na				
Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)		94.5%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		19.3%				
Total Mean Percent Masticated Vegetation (only calculated in 2014)		--				
Total Mean Percent Bare Ground		19.3%	9.3%	2.9%	--	100%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values are reported here.

Table A 6-8
Interim Action Ranges MRA North Range 44 SCA
Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Five Baseline Transects				
		Baseline Data 2010 -2011 (North Range 44 baseline transects only)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.0%	0.0%	--	0.0%	0.0%
Total Cover by Native Tree Species		0%			0%	
<i>Acmispon glaber</i>	deerweed	0.8%	0.9%	0.8%	0.8%	80.0%
<i>Crocanthemum scoparium</i>	rush-rose	11.6%	11.0%	10.5%	11.6%	100.0%
<i>Arctostaphylos pumila</i>	sandmat manzanita	2.4%	3.3%	3.1%	2.4%	60.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	23.4%	19.3%	18.4%	23.5%	100.0%
<i>Eriophyllum confertiflorum</i>	golden yarrow	2.8%	3.2%	3.0%	2.8%	100.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.3%	0.7%	0.7%	0.3%	20.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	0.0%	--	0.0%	0.0%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	22%	6%	6%	22%	100%
<i>Ceanothus rigidus</i>	Monterey ceanothus	9.4%	10.3%	9.9%	9.4%	100.0%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.6%	0.9%	0.8%	0.6%	40.0%
<i>Salvia mellifera</i>	black sage	6.1%	5.8%	5.6%	6.1%	60.0%
<i>Adenostoma fasciculatum</i>	chamise	16.1%	6.1%	5.8%	16.2%	100.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.8%	1.2%	1.1%	0.8%	40.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	1.8%	2.2%	2.1%	1.8%	60.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	0.0%	--	0.0%	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	0.1%	0.1%	0.1%	20.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
Total Mean Percent Shrub and Subshrub Cover		98.0%			98.3%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		1.7%	1.4%	1.3%	1.7%	100.0%
Target Weed Total (<i>Carpobrotus edulis</i>)		0.0%	0.0%	--	0.0%	0.0%
Total Mean Non-native Herbaceous Species Cover		na				
Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)		99.6%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		20.3%				
Total Mean Percent Masticated Vegetation (only calculated in 2014)		--				
Total Mean Percent Bare Ground		20%	10%	10%	--	100%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values are reported here.

Table A 6-8
Interim Action Ranges MRA North Range 44 SCA
Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Eight Transects in Small Scale Excavations in North Range 44				
		Post-Activity Data 2015* (Year 3)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.5%	1.5%	1.0%	4.2%	12.5%
Total Cover by Native Tree Species		0.5%			4.9%	
<i>Acmispon glaber</i>	deerweed	1.1%	2.3%	1.6%	8.4%	62.5%
<i>Crocanthemum scoparium</i>	rush-rose	1.0%	1.1%	0.7%	7.6%	75.0%
<i>Arctostaphylos pumila</i>	sandmat manzanita	0.9%	0.9%	0.6%	7.5%	75.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.4%	0.6%	0.4%	3.1%	50.0%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.3%	0.3%	0.2%	2.2%	62.5%
<i>Lupinus chamissonis</i>	silver bush lupine	0.1%	0.4%	0.2%	1.1%	25.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.5%	0.9%	0.6%	3.7%	25.0%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.4%	0.7%	0.5%	2.8%	37.5%
<i>Ceanothus rigidus</i>	Monterey ceanothus	0.2%	0.4%	0.2%	1.4%	50.0%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.1%	0.4%	0.3%	1.1%	12.5%
<i>Salvia mellifera</i>	black sage	0.0%	0.1%	0.1%	0.3%	25.0%
<i>Adenostoma fasciculatum</i>	chamise	0.0%	0.0%	0.0%	0.1%	12.5%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.0%	0.0%	0.0%	0.1%	12.5%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	--	--	--	0.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	--	--	--	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	--	--	--	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	--	0.0%
Total Mean Percent Shrub and Subshrub Cover		5.0%			45.7%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		5.4%	7.9%	5.3%	49.4%	100.0%
Target Weed Total (<i>Carpobrotus edulis</i>)		0.0%	0.0%	0.0%	0.0%	12.5%
Total Mean Non-native Herbaceous Species Cover		1.7%	3.6%	2.4%		
Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)		10.9%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		87.2%				
Total Mean Percent Masticated Vegetation (only calculated in 2014)		0.0%	0.0%	--	--	--
Total Mean Percent Bare Ground		87.2%	14.2%	9.5%	--	100%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values are reported here.

Table A 6-8
Interim Action Ranges MRA North Range 44 SCA
Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Eight Transects in Small Scale Excavations in North Range 44				
		Post-Activity Data 2016 (Year 4)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	1.0%	2.9%	1.9%	3.9%	12.5%
Total Cover by Native Tree Species		1.0%			5.0%	
<i>Acmispon glaber</i>	deerweed	4.4%	10.9%	7.3%	17.1%	75.0%
<i>Crocanthemum scoparium</i>	rush-rose	2.7%	2.6%	1.8%	10.4%	75.0%
<i>Arctostaphylos pumila</i>	sandmat manzanita	2.0%	1.1%	0.7%	7.9%	87.5%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.4%	0.6%	0.4%	1.5%	62.5%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.8%	1.1%	0.7%	3.1%	75.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.3%	0.7%	0.5%	1.0%	25.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.1%	0.3%	0.2%	0.4%	12.5%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.5%	0.8%	0.5%	1.8%	50.0%
<i>Ceanothus rigidus</i>	Monterey ceanothus	0.1%	0.3%	0.2%	0.6%	37.5%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.2%	0.4%	0.3%	0.6%	25.0%
<i>Salvia mellifera</i>	black sage	0.1%	0.2%	0.1%	0.3%	25.0%
<i>Adenostoma fasciculatum</i>	chamise	0.1%	0.2%	0.1%	0.3%	25.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.0%	--	--	0.0%	0.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	--	--	0.0%	0.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	--	--	0.0%	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	--	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	0.0%	0.0%
Total Mean Percent Shrub and Subshrub Cover		11.5%			56.4%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		7.9%	10.9%	7.3%	38.6%	100.0%
Target Weed Total (<i>Carpobrotus edulis</i>)		0.0%	0.0%	0.0%	0.0%	7.7%
Total Mean Non-native Herbaceous Species Cover		1.8%	3.8%	2.6%	7.1%	46.2%
Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)		20.5%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		82.4%				
Total Mean Percent Masticated Vegetation (only calculated in 2014)		0.0%	--	--		0%
Total Mean Percent Bare Ground		82.4%	14.4%	9.6%		62%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values are reported here.

Table A 6-8
Interim Action Ranges MRA North Range 44 SCA
Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Eight Transects in Small Scale Excavations in North Range 44				
		Post-Activity Data 2017 (Year 5)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
Tree Species						
<i>Quercus agrifolia</i>	coast live oak	0.6%	1.6%	1.1%	3.2%	12.5%
Total Cover by Native Tree Species						
<i>Acmispon glaber</i>	deerweed	3.2%	7.7%	5.1%	17.7%	75.0%
<i>Crocanthemum scoparium</i>	rush-rose	2.7%	2.7%	1.8%	15.4%	100.0%
<i>Arctostaphylos pumila</i>	sandmat manzanita	1.9%	1.3%	0.8%	10.4%	75.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	1.0%	1.5%	1.0%	5.4%	75.0%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.8%	0.6%	0.4%	4.6%	87.5%
<i>Lupinus chamissonis</i>	silver bush lupine	0.6%	1.6%	1.1%	3.2%	25.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.5%	0.9%	0.6%	2.7%	25.0%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.5%	0.9%	0.6%	2.6%	37.5%
<i>Ceanothus rigidus</i>	Monterey ceanothus	0.4%	0.6%	0.4%	2.2%	50.0%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.2%	0.4%	0.3%	1.1%	25.0%
<i>Salvia mellifera</i>	black sage	0.1%	0.2%	0.1%	0.5%	25.0%
<i>Adenostoma fasciculatum</i>	chamise	0.1%	0.2%	0.1%	0.4%	12.5%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.0%	0.0%	--	0.0%	0.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	0.0%	--	0.0%	0.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	0.0%	--	0.0%	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	0.0%	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
Total Mean Percent Shrub and Subshrub Cover		11.8%			70.8%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		4.3%	5.7%	3.8%	25.8%	87.5%
Target Weed Total (<i>Carpobrotus edulis</i>)		0.0%	0.0%	0.0%	0.0%	12.5%
Total Mean Non-native Herbaceous Species Cover		1.1%	2.8%	1.9%	6.9%	75.0%
Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)		16.6%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		82.7%				
Total Mean Percent Masticated Vegetation (only calculated in 2014)		0.1%	0.2%	0.1%		12.5%
Total Mean Percent Bare Ground		82.6%	15.5%	10.4%		100%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values are reported here.

Table A 6-9
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Twenty-nine Baseline Transects				
		Baseline Data 2010 - 2011 (all Interim Action Ranges MRA baseline transects)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
<i>Eriophyllum confertiflorum</i>	golden yarrow	1.5%	2.2%	0.7%	1.6%	65.5%
<i>Arctostaphylos pumila</i>	sandmat manzanita	1.6%	2.0%	0.6%	1.7%	65.5%
<i>Crocanthemum scoparium</i>	rush-rose	8.1%	9.1%	2.9%	8.6%	86.2%
<i>Acmispon glaber</i>	deerweed	1.4%	0.0%	--	1.5%	0.0%
<i>Adenostoma fasciculatum</i>	chamise	9.0%	6.9%	2.2%	9.5%	89.7%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	29.3%	15.6%	4.9%	31.0%	100%
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	--	--	--	0.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	1.5%	5.6%	1.8%	1.6%	24.1%
<i>Salvia mellifera</i>	black sage	5.3%	7.2%	2.3%	5.6%	69.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	20.2%	16.0%	5.0%	21.4%	89.7%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.7%	1.8%	0.6%	0.7%	24.1%
<i>Ceanothus rigidus</i>	Monterey ceanothus	13.5%	9.3%	2.9%	14.3%	96.6%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.2%	0.5%	0.2%	0.2%	17.2%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.9%	1.9%	0.6%	1.0%	31.0%
<i>Lepechinia calycina</i>	pitcher sage	0.4%	1.4%	0.5%	0.4%	20.7%
<i>Lupinus chamissonis</i>	silver bush lupine	0.4%	1.1%	0.4%	0.4%	13.8%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.5%	0.9%	0.3%	0.5%	27.6%
Total Mean Percent Shrub and Subshrub Cover		94.5%			99%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		1.3%	2.3%	1.3%	1.4%	90.0%
Target Weed Total (<i>Carpobrotus edulis</i>)		0.0%	0.0%		0.0%	0.0%
Total Mean Non-native Herbaceous Species Cover		na				
Total Mean Percent Native Vegetative Cover		95.8%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		19.3%				
Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)		--				
Total Mean Percent Bare Ground		19.3%	9.3%	2.9%	--	100.0%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values are reported here.

Table A 6-9
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Seven Baseline Transects				
		Baseline Data 2010 - 2011 (South Range 44 baseline transects only)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
<i>Eriophyllum confertiflorum</i>	golden yarrow	3.0%	2.7%	2.0%	2.8%	85.7%
<i>Arctostaphylos pumila</i>	sandmat manzanita	0.7%	0.6%	0.4%	0.7%	71.4%
<i>Crocanthemum scoparium</i>	rush-rose	10.0%	8.5%	6.2%	9.2%	100%
<i>Acmispon glaber</i>	deerweed	1.2%	1.1%	0.8%	1.1%	85.7%
<i>Adenostoma fasciculatum</i>	chamise	9.9%	7.1%	5.2%	9.1%	100%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	25.8%	9.5%	6.9%	23.7%	100%
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	0.0%	--	0.0%	0.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.0%	0.0%	--	0.0%	0.0%
<i>Salvia mellifera</i>	black sage	8.7%	9.7%	7.1%	8.0%	100%
<i>Ceanothus dentatus</i>	dwarf ceanothus	30.4%	14.9%	10.9%	27.9%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.2%	0.4%	0.3%	0.2%	28.6%
<i>Ceanothus rigidus</i>	Monterey ceanothus	16.3%	5.0%	3.7%	14.9%	100%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.1%	0.2%	0.2%	0.1%	14.3%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.1%	0.2%	0.2%	0.1%	14.3%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	1.2%	2.1%	1.5%	1.1%	28.6%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	0.0%	--	0.0%	0.0%
Total Mean Percent Shrub and Subshrub Cover		107.6%			98.9%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		1.2%	1.2%	0.9%	1.1%	71.4%
Target Weed Total (<i>Carpobrotus edulis</i>)		0.0%	0.0%	--	0.0%	0.0%
Total Mean Non-native Herbaceous Species Cover		na				
Total Mean Percent Native Vegetative Cover		108.8%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		16.2%				
Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)		--				
Total Mean Percent Bare Ground		16.2%	7.9%	5.8%	14.8%	100.0%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values are reported here.

Table A 6-9
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Five Transects in Small-scale Excavations in South Range 44 Conducted in 2011				
		Post-activity Data 2015* (Year 4)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Cover	Mean Frequency
<i>Eriophyllum confertiflorum</i>	golden yarrow	1.2%	1.2%	1.2%	7.7%	100.0%
<i>Arctostaphylos pumila</i>	sandmat manzanita	0.9%	1.2%	1.2%	6.2%	80.0%
<i>Crocanthemum scoparium</i>	rush-rose	1.4%	1.6%	1.5%	9.4%	100%
<i>Acmispon glaber</i>	deerweed	7.0%	7.4%	7.1%	46.1%	80%
<i>Adenostoma fasciculatum</i>	chamise	0.4%	0.9%	0.9%	2.6%	20.0%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.1%	0.1%	0.1%	0.6%	40.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.2%	0.3%	0.3%	1.0%	20.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.1%	0.3%	0.3%	0.8%	20.0%
<i>Salvia mellifera</i>	black sage	0.0%	0.1%	0.1%	0.3%	40.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.0%	0.0%	0.0%	0.1%	20.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	--	--	--	0.0%
<i>Ceanothus rigidus</i>	Monterey ceanothus	0.0%	--	--	--	0.0%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.0%	--	--	0.0%	0.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	--	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.0%	--	--	0.0%	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	--	--	0.0%	0.0%
Total Mean Percent Shrub and Subshrub Cover		11.3%			76.0%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		3.6%	5.2%	5.0%	23.7%	100%
Target Weed Total (<i>Carpobrotus edulis</i>)		0.0%	--	--	--	0.0%
Total Mean Non-native Herbaceous Species Cover		0.2%	0.4%	0.0%		
Total Mean Percent Native Vegetative Cover		14.9%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		85.3%				
Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)		0.0%				
Total Mean Percent Bare Ground		85.3%	6.0%	5.7%	--	100%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values are reported here.

Table A 6-9
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Five Transects in Small-scale Excavations in South Range 44 Conducted in 2011				
		Post-activity Data 2016 (Year 5)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Cover	Mean Frequency
<i>Eriophyllum confertiflorum</i>	golden yarrow	2.3%	2.1%	2.0%	9.2%	100.0%
<i>Arctostaphylos pumila</i>	sandmat manzanita	1.9%	1.4%	1.4%	7.7%	80.0%
<i>Crocanthemum scoparium</i>	rush-rose	2.4%	2.0%	1.9%	9.3%	100%
<i>Acmispon glaber</i>	deerweed	5.9%	5.2%	4.9%	29.7%	80%
<i>Adenostoma fasciculatum</i>	chamise	0.4%	0.8%	0.8%	1.8%	20.0%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.3%	0.5%	0.5%	1.3%	40.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	--	--	0.0%	0.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.1%	0.3%	0.3%	0.5%	20.0%
<i>Salvia mellifera</i>	black sage	0.4%	0.8%	0.8%	1.5%	60.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.1%	0.2%	0.1%	0.5%	60.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	--	--	--	0.0%
<i>Ceanothus rigidus</i>	Monterey ceanothus	0.1%	0.1%	0.1%	0.2%	20.0%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.0%	--	--	0.0%	0.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	--	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.0%	--	--	0.0%	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	--	--	0.0%	0.0%
Total Mean Percent Shrub and Subshrub Cover		14.0%			75.3%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		4.6%	6.0%	5.8%	22.9%	100%
Target Weed Total (<i>Carpobrotus edulis</i>)		0.0%	--	--	--	0.0%
Total Mean Non-native Herbaceous Species Cover		1.5%	1.7%	1.6%	7.3%	80.0%
Total Mean Percent Native Vegetative Cover		18.6%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		80.2%				
Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)		0.0%				
Total Mean Percent Bare Ground		80.2%	5.7%	5.4%	--	100%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values are reported here.

Table A 6-9
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Five Transects in Small-scale Excavations in South Range 44 Conducted in 2011				
		Post-activity Data 2017 (Year 6)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Cover	Mean Frequency
<i>Eriophyllum confertiflorum</i>	golden yarrow	2.1%	1.7%	1.7%	18.4%	100.0%
<i>Arctostaphylos pumila</i>	sandmat manzanita	2.0%	1.5%	1.4%	17.7%	80.0%
<i>Crocanthemum scoparium</i>	rush-rose	1.6%	2.3%	2.2%	14.1%	100%
<i>Acmispon glaber</i>	deerweed	1.4%	0.9%	0.9%	12.3%	100%
<i>Adenostoma fasciculatum</i>	chamise	0.4%	0.9%	0.9%	3.6%	20.0%
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.2%	0.3%	0.3%	1.8%	40.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.1%	0.2%	0.1%	0.6%	40.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.0%	0.0%	0.0%	0.2%	20.0%
<i>Salvia mellifera</i>	black sage	0.0%	0.0%	0.0%	0.2%	60.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.0%	0.0%	0.0%	0.1%	20.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	0.0%	--	0.0%	0.0%
<i>Ceanothus rigidus</i>	Monterey ceanothus	0.0%	0.0%	--	0.0%	0.0%
<i>Ericameria fasciculata</i>	Eastwood's ericameria	0.0%	0.0%	--	0.0%	0.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	0.0%	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.0%	0.0%	--	0.0%	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	0.0%	--	0.0%	0.0%
Total Mean Percent Shrub and Subshrub Cover		7.7%	0.7%	0.7%	69.0%	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		2.9%	4.8%	4.6%	25.8%	100%
Target Weed Total (<i>Carpobrotus edulis</i>)		0.0%				
Total Mean Non-native Herbaceous Species Cover		0.6%	0.7%	0.7%	5.2%	80.0%
Total Mean Percent Native Vegetative Cover		10.6%				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		88.4%				
Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)		0.1%				
Total Mean Percent Bare Ground		88.3%	8.2%	7.8%	--	100%

HMP Species in Bold

*A calculation error was discovered after report submission in 2015; updated values are reported here.

Table A 6-10
2012 - 2017 Cover Frequency of Herbaceous Species in South Range 44 Grassland
(6 Quadrats)

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	2010 Baseline				
		Six Quadrats in South Range 44 Grassland				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Percent Cover	Mean Frequency
Shrub and Subshrub Species						
<i>Frangula californica</i> subsp. <i>californica</i>	California coffee berry	0.7%	1.6%	1.3%	1.5%	16.7%
<i>Lupinus chamissonis</i>	silver bush lupine	0.0%	--	--	0.0%	0.0%
Total Cover by Native Shrub and Subshrub Species		0.7%			1.36%	
Native Herbaceous Species						
<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	4.7%	6.4%	5.3%	10.2%	50.0%
<i>Layia platyglossa</i>	tidytips	0.0%	--	--	0.0%	0.0%
<i>Lupinus nanus</i>	sky lupine	0.0%	--	--	0.0%	0.0%
<i>Acmispon strigosus</i>	Bishop's lotus, strigose lotus	0.0%	--	--	0.0%	0.0%
<i>Eschscholzia californica</i>	California poppy	0.0%	--	--	0.0%	0.0%
<i>Claytonia perfoliata</i>	miner's lettuce	0.0%	--	--	0.0%	0.0%
<i>Cryptantha micromeres</i>	small-flowered cryptantha	0.0%	--	--	0.0%	0.0%
<i>Lessingia pectinata</i> var. <i>pectinata</i>	common lessingia	0.0%	--	--	0.0%	0.0%
<i>Plantago erecta</i>	California plantain	0.0%	--	--	0.0%	0.0%
<i>Calandrinia ciliata</i>	red maids	0.0%	--	--	0.0%	0.0%
<i>Camissonia strigulosa</i>	strigose suncups	0.0%	--	--	0.0%	0.0%
<i>Deinandra increscens</i> subsp. <i>increscens</i>	coast tarplant	5.7%	0.5%	0.4%	10.9%	83.3%
<i>Trifolium microcephalum</i>	hairy clover, small-headed clover	0.0%	--	--	0.0%	0.0%
<i>Trifolium gracilentum</i>	pinpoint clover	0.0%	--	--	0.0%	0.0%
<i>Heterotheca grandifolia</i>	telegraph weed	0.0%	--	--	0.0%	0.0%
<i>Nuttallanthus texanus</i>	blue toad-flax	0.0%	--	--	0.0%	0.0%
<i>Pectocarya penicillata</i>	winged combseed	0.0%	--	--	0.0%	0.0%
<i>Crassula connata</i>	pygmy weed	0.0%	--	--	0.0%	0.0%
<i>Logfia filaginoides</i>	California filago	0.0%	--	--	0.0%	0.0%
<i>Stylocline gnaphaloides</i>	everlasting neststraw	0.0%	--	--	0.0%	0.0%
<i>Castilleja exserta</i> subsp. <i>latifolia</i>	wideleaf purple owl's clover	0.0%	--	--	0.0%	0.0%
<i>Croton californicus</i>	California croton	2.0%	3.3%	2.8%	4.4%	33.3%
<i>Cryptantha microstachys</i>	Tejon cryptantha	0.0%	--	--	0.0%	0.0%
<i>Eriastrum virgatum</i>	wand woollystar	0.0%	--	--	0.0%	0.0%
<i>Erigeron canadensis</i>	horseweed	10.0%	--	--	14.7%	33.3%
<i>Festuca octoflora</i>	six-weeks fescue	0.0%	--	--	0.0%	0.0%
<i>Galium californicum</i>	California bedstraw	0.7%	1.6%	1.3%	1.5%	16.7%
<i>Trifolium ciliolatum</i>	foothill clover	0.0%	--	--	0.0%	0.0%
Total Cover by Native Herbaceous Species		23.0%			47.0%	
Non-native Herbaceous Species						
<i>Bromus diandrus</i> *	ripgut brome	0.0%	--	--	0.0%	0.0%
<i>Hypochaeris glabra</i> *	smooth cat's-ear	0.0%	--	--	0.0%	0.0%
<i>Festuca myuros</i> *	rattail fescue	19.3%	23.4%	19.2%	47.9%	66.7%
<i>Erodium cicutarium</i> *	red-stemmed filaree	0.0%	--	--	0.0%	0.0%
<i>Petrorhagia dubia</i> *	hairypink	0.0%	--	--	0.0%	0.0%
<i>Cerastium glomeratum</i> *	mouseear chickweed	0.0%	0.0%	--	0.0%	0.0%
<i>Centaurea melitensis</i> *	tocalote	0.0%	--	--	0.0%	0.0%
<i>Aira caryophyllea</i> *	common silver-hair grass	0.0%	--	--	0.0%	0.0%
<i>Avena barbata</i> *	slender wild oat	0.0%	--	--	0.0%	0.0%
<i>Bromus hordeaceus</i> *	soft chess	0.0%	--	--	0.0%	0.0%
<i>Logfia gallica</i> *	narrowleaf cottonrose	0.0%	--	--	0.0%	0.0%
<i>Silene gallica</i> *	windmill pink	0.0%	--	--	0.0%	0.0%
<i>Rumex acetosella</i> *	sheep sorrel	6.0%	12.8%	10.6%	13.1%	33.3%
Total Cover by Non-native Herbaceous Species		25.3%			51.7%	
Total Mean Non-native Grass Species Cover		6.0%				
Total Cover by All Herbaceous Species		48.3%				
Total Mean All Vegetative Cover		49.0%				
Total Mean Native Vegetative Cover		23.7%			48.3%	
Total Mean Bare ground		51.0%				

*non-native species, HMP species in bold

Table A 6-10
2012 - 2017 Cover Frequency of Herbaceous Species in South Range 44 Grassland
(6 Quadrats)

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Post-activity Data 2015 (Year 4)				
		Six Quadrats in South Range 44 Grassland				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Percent Cover	Mean Frequency
Shrub and Subshrub Species						
<i>Frangula californica</i> subsp. <i>californica</i>	California coffee berry	0.0%	--	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.1%	0.2%	0.2%	0.4%	16.7%
Total Cover by Native Shrub and Subshrub Species		0.1%			0.6%	
Native Herbaceous Species						
<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	5.0%	7.5%	6.1%	26.2%	83.3%
<i>Layia platyglossa</i>	tidytips	3.2%	4.0%	3.3%	16.6%	66.7%
<i>Lupinus nanus</i>	sky lupine	0.8%	1.2%	1.0%	3.9%	50.0%
<i>Acmispon strigosus</i>	Bishop's lotus, strigose lotus	0.2%	0.4%	0.3%	0.9%	16.7%
<i>Eschscholzia californica</i>	California poppy	1.1%	1.0%	0.8%	5.7%	83.3%
<i>Claytonia perfoliata</i>	miner's lettuce	0.0%	--	--	0.0%	0.0%
<i>Cryptantha micromeres</i>	small-flowered cryptantha	0.0%	--	--	0.0%	0.0%
<i>Lessingia pectinata</i> var. <i>pectinata</i>	common lessingia	1.3%	1.3%	1.0%	6.6%	66.7%
<i>Plantago erecta</i>	California plantain	0.1%	0.2%	0.2%	0.5%	33.3%
<i>Calandrinia ciliata</i>	red maids	0.0%	--	--	0.0%	0.0%
<i>Camissonia strigulosa</i>	strigose suncups	0.2%	0.4%	0.3%	1.0%	33.0%
<i>Deinandra increscens</i> subsp. <i>increscens</i>	coast tarplant	0.2%	0.4%	0.3%	1.0%	50.0%
<i>Trifolium microcephalum</i>	hairy clover, small-headed clover	0.0%	--	--	0.0%	0.0%
<i>Trifolium gracilentum</i>	pinpoint clover	0.0%	--	--	0.0%	0.0%
<i>Heterotheca grandifolia</i>	telegraph weed	0.2%	0.4%	0.3%	0.9%	16.7%
<i>Nuttallanthus texanus</i>	blue toad-flax	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Pectocarya penicillata</i>	winged combseed	0.0%	--	--	0.0%	0.0%
<i>Crassula connata</i>	pygmy weed	0.1%	0.2%	0.2%	0.4%	16.7%
<i>Logfia filaginoides</i>	California filago	0.0%	--	--	0.0%	0.0%
<i>Stylocline gnaphaloides</i>	everlasting neststraw	0.0%	--	--	0.0%	0.0%
<i>Castilleja exserta</i> subsp. <i>latifolia</i>	wideleaf purple owl's clover	0.2%	0.4%	0.3%	1.0%	50.0%
<i>Croton californicus</i>	California croton	0.0%	--	--	0.0%	0.0%
<i>Cryptantha microstachys</i>	Tejon cryptantha	0.1%	0.2%	0.2%	0.5%	33.3%
<i>Eriastrum virgatum</i>	wand woollystar	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Erigeron canadensis</i>	horseweed	0.0%	--	--	0.0%	0.0%
<i>Festuca octoflora</i>	six-weeks fescue	0.0%	--	--	0.0%	0.0%
<i>Galium californicum</i>	California bedstraw	0.0%	--	--	0.0%	0.0%
<i>Trifolium ciliolatum</i>	foothill clover	0.1%	0.1%	0.0%	0.3%	50.0%
Total Cover by Native Herbaceous Species		7.5%			55.0%	
Non-native Herbaceous Species						
<i>Bromus diandrus</i> *	ripgut brome	4.0%	7.9%	6.5%	21.1%	66.7%
<i>Hypochaeris glabra</i> *	smooth cat's-ear	0.6%	0.7%	0.6%	3.2%	100.0%
<i>Festuca myuros</i> *	rattail fescue	0.2%	0.2%	0.2%	1.1%	83.3%
<i>Erodium cicutarium</i> *	red-stemmed filaree	0.7%	0.5%	0.4%	3.5%	66.7%
<i>Petrorhagia dubia</i> *	hairypink	0.0%	--	--	0.0%	0.0%
<i>Cerastium glomeratum</i> *	mouseear chickweed	0.0%	0.0%	--	0.0%	0.0%
<i>Centaurea melitensis</i> *	tocalote	0.4%	0.4%	0.3%	1.8%	66.7%
<i>Aira caryophyllea</i> *	common silver-hair grass	0.0%	--	--	0.0%	0.0%
<i>Avena barbata</i> *	slender wild oat	0.2%	0.4%	0.3%	1.0%	50.0%
<i>Bromus hordeaceus</i> *	soft chess	0.0%	--	--	0.0%	0.0%
<i>Logfia gallica</i> *	narrowleaf cottonrose	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Silene gallica</i> *	windmill pink	0.0%	--	--	0.0%	0.0%
<i>Rumex acetosella</i> *	sheep sorrel	0.0%	--	--	0.0%	0.0%
Total Cover by Non-native Herbaceous Species		6.1%			44.4%	
Total Mean Non-native Grass Species Cover		0.4%				
Total Cover by All Herbaceous Species		13.6%				
Total Mean All Vegetative Cover		13.7%				
Total Mean Native Vegetative Cover		7.6%			55.6%	
Total Mean Bare ground		86.3%				

*non-native species, HMP species in bold

Table A 6-10
2012 - 2017 Cover Frequency of Herbaceous Species in South Range 44 Grassland
(6 Quadrats)

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Post-activity Data 2016 (Year 5)				
		Six Quadrats in South Range 44 Grassland				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Percent Cover	Mean Frequency
Shrub and Subshrub Species						
<i>Frangula californica</i> subsp. <i>californica</i>	California coffee berry	0.0%	--	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.2%	0.4%	0.3%	0.5%	16.7%
Total Cover by Native Shrub and Subshrub Species		0.2%			0.5%	
Native Herbaceous Species						
<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	0.9%	0.9%	0.8%	3.0%	66.7%
<i>Layia platyglossa</i>	tidytips	6.0%	6.0%	4.9%	19.7%	83.3%
<i>Lupinus nanus</i>	sky lupine	6.8%	5.6%	4.6%	22.4%	83.3%
<i>Acmispon strigosus</i>	Bishop's lotus, strigose lotus	0.4%	0.5%	0.4%	1.4%	66.7%
<i>Eschscholzia californica</i>	California poppy	1.3%	2.4%	1.9%	4.1%	50.0%
<i>Claytonia perfoliata</i>	miner's lettuce	0.0%	--	--	0.0%	0.0%
<i>Cryptantha micromeres</i>	small-flowered cryptantha	0.1%	0.2%	0.2%	0.3%	33.3%
<i>Lessingia pectinata</i> var. <i>pectinata</i>	common lessingia	2.2%	2.8%	2.3%	7.1%	66.7%
<i>Plantago erecta</i>	California plantain	0.2%	0.2%	0.2%	0.6%	50.0%
<i>Calandrinia ciliata</i>	red maids	0.2%	0.4%	0.3%	0.5%	16.7%
<i>Camissonia strigulosa</i>	strigose suncups	0.9%	1.6%	1.3%	2.8%	50.0%
<i>Deinandra increscens</i> subsp. <i>increscens</i>	coast tarplant	0.7%	1.6%	1.3%	2.2%	33.3%
<i>Trifolium microcephalum</i>	hairy clover, small-headed clover	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Trifolium gracilentum</i>	pinpoint clover	0.5%	0.8%	0.7%	1.6%	33.3%
<i>Heterotheca grandifolia</i>	telegraph weed	0.2%	0.4%	0.3%	0.6%	33.3%
<i>Nuttallanthus texanus</i>	blue toad-flax	0.1%	0.2%	0.2%	0.4%	50.0%
<i>Pectocarya penicillata</i>	winged combseed	0.0%	--	--	0.0%	0.0%
<i>Crassula connata</i>	pygmy weed	0.0%	--	--	0.0%	0.0%
<i>Logfia filaginoides</i>	California filago	0.1%	0.2%	0.2%	0.3%	16.7%
<i>Stylocline gnaphaloides</i>	everlasting neststraw	0.0%	--	--	0.0%	0.0%
<i>Castilleja exserta</i> subsp. <i>latifolia</i>	wideleaf purple owl's clover	0.2%	0.4%	0.3%	0.6%	33.3%
<i>Croton californicus</i>	California croton	0.0%	--	--	0.0%	0.0%
<i>Cryptantha microstachys</i>	Tejon cryptantha	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Eriastrum virgatum</i>	wand woollystar	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Erigeron canadensis</i>	horseweed	0.0%	--	--	0.0%	0.0%
<i>Festuca octoflora</i>	six-weeks fescue	0.2%	0.4%	0.3%	0.5%	16.7%
<i>Galium californicum</i>	California bedstraw	0.0%	--	--	0.0%	0.0%
<i>Trifolium ciliolatum</i>	foothill clover	0.0%	--	--	0.0%	0.0%
Total Cover by Native Herbaceous Species		20.9%			68.3%	
Non-native Herbaceous Species						
<i>Bromus diandrus</i> *	ripgut brome	5.3%	7.7%	6.3%	17.4%	66.7%
<i>Hypochaeris glabra</i> *	smooth cat's-ear	0.8%	0.7%	0.6%	2.5%	83.3%
<i>Festuca myuros</i> *	rattail fescue	0.4%	0.8%	0.7%	1.2%	50.0%
<i>Erodium cicutarium</i> *	red-stemmed filaree	0.2%	0.2%	0.1%	0.5%	83.3%
<i>Petrorhagia dubia</i> *	hairypink	0.6%	0.5%	0.4%	2.0%	83.3%
<i>Cerastium glomeratum</i> *	mouseear chickweed	0.0%	0.0%	--	0.0%	0.0%
<i>Centaurea melitensis</i> *	tocalote	0.4%	0.8%	0.7%	1.3%	66.7%
<i>Aira caryophyllea</i> *	common silver-hair grass	0.1%	0.2%	0.2%	0.3%	16.7%
<i>Avena barbata</i> *	slender wild oat	1.8%	2.5%	2.1%	5.8%	66.7%
<i>Bromus hordeaceus</i> *	soft chess	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Logfia gallica</i> *	narrowleaf cottonrose	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Silene gallica</i> *	windmill pink	0.0%	0.1%	0.0%	0.1%	33.3%
<i>Rumex acetosella</i> *	sheep sorrel	0.0%	--	--	0.0%	0.0%
Total Cover by Non-native Herbaceous Species		9.5%			31.1%	
Total Mean Non-native Grass Species Cover		0.4%				
Total Cover by All Herbaceous Species		30.4%				
Total Mean All Vegetative Cover		30.6%				
Total Mean Native Vegetative Cover		20.2%			66.1%	
Total Mean Bare ground		69.4%				

*non-native species, HMP species in bold

Table A 6-10
2012 - 2017 Cover Frequency of Herbaceous Species in South Range 44 Grassland
(6 Quadrats)

ESCA RP 2017 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Post-activity Data 2017 (Year 6)				
		Six Quadrats in South Range 44 Grassland				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Percent Cover	Mean Frequency
Shrub and Subshrub Species						
<i>Frangula californica</i> subsp. <i>californica</i>	California coffee berry	0.0%	--	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.0%	--	--	0.0%	0.0%
Total Cover by Native Shrub and Subshrub Species		0.0%			0.0%	
Native Herbaceous Species						
<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	8.1%	6.8%	5.6%	10.0%	83.3%
<i>Layia platyglossa</i>	tidytips	6.9%	11.5%	9.5%	8.5%	83.3%
<i>Lupinus nanus</i>	sky lupine	6.3%	10.8%	8.9%	7.8%	83.3%
<i>Acmispon strigosus</i>	Bishop's lotus, strigose lotus	3.9%	4.1%	3.3%	4.9%	66.7%
<i>Eschscholzia californica</i>	California poppy	3.5%	5.1%	4.2%	4.3%	50.0%
<i>Claytonia perfoliata</i>	miner's lettuce	3.0%	7.3%	6.0%	3.7%	16.7%
<i>Cryptantha micromeres</i>	small-flowered cryptantha	2.1%	2.5%	2.0%	2.6%	66.7%
<i>Lessingia pectinata</i> var. <i>pectinata</i>	common lessingia	1.9%	2.2%	1.8%	2.4%	66.7%
<i>Plantago erecta</i>	California plantain	1.7%	2.6%	2.1%	2.1%	50.0%
<i>Calandrinia ciliata</i>	red maids	1.4%	1.8%	1.5%	1.7%	50.0%
<i>Camissonia strigulosa</i>	strigose suncups	0.9%	0.8%	0.7%	1.2%	66.7%
<i>Deinandra increscens</i> subsp. <i>increscens</i>	coast tarplant	0.9%	2.1%	1.7%	1.2%	33.3%
<i>Trifolium microcephalum</i>	hairy clover, small-headed clover	0.7%	1.6%	1.3%	0.8%	16.7%
<i>Trifolium gracilentum</i>	pinpoint clover	0.5%	0.8%	0.7%	0.6%	33.3%
<i>Heterotheca grandifolia</i>	telegraph weed	0.4%	0.5%	0.4%	0.5%	50.0%
<i>Nuttallanthus texanus</i>	blue toad-flax	0.4%	0.4%	0.3%	0.5%	66.7%
<i>Pectocarya penicillata</i>	winged combseed	0.3%	0.0%	--	0.3%	0.0%
<i>Crassula connata</i>	pygmy weed	0.2%	0.5%	0.4%	0.2%	16.7%
<i>Logfia filaginoides</i>	California filago	0.2%	0.5%	0.4%	0.2%	16.7%
<i>Stylocline gnaphaloides</i>	everlasting neststraw	0.1%	0.2%	0.1%	0.1%	16.7%
<i>Castilleja exserta</i> subsp. <i>latifolia</i>	wideleaf purple owl's clover	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Croton californicus</i>	California croton	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Cryptantha microstachys</i>	Tejon cryptantha	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Eriastrum virgatum</i>	wand woollystar	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Erigeron canadensis</i>	horseweed	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Festuca octoflora</i>	six-weeks fescue	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Galium californicum</i>	California bedstraw	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Trifolium ciliolatum</i>	foothill clover	0.0%	0.0%	0.0%	0.0%	0.0%
Total Cover by Native Herbaceous Species		43.3%			52.2%	
Non-native Herbaceous Species						
<i>Bromus diandrus</i> *	ripgut brome	14.1%	14.2%	11.7%	17.4%	100.0%
<i>Hypochaeris glabra</i> *	smooth cat's-ear	10.4%	8.6%	7.1%	12.8%	100.0%
<i>Festuca myuros</i> *	rattail fescue	6.7%	7.3%	6.0%	8.3%	83.3%
<i>Erodium cicutarium</i> *	red-stemmed filaree	1.9%	3.0%	2.5%	2.4%	66.7%
<i>Petrorhagia dubia</i> *	hairypink	1.9%	1.4%	1.2%	2.3%	83.3%
<i>Cerastium glomeratum</i> *	mouseear chickweed	1.7%	4.2%	3.5%	2.1%	16.7%
<i>Centaurea melitensis</i> *	tocalote	1.7%	2.2%	1.8%	2.1%	83.3%
<i>Aira caryophyllea</i> *	common silver-hair grass	0.6%	1.5%	1.2%	0.7%	16.7%
<i>Avena barbata</i> *	slender wild oat	0.4%	1.0%	0.8%	0.5%	16.7%
<i>Bromus hordeaceus</i> *	soft chess	0.1%	0.3%	0.3%	0.2%	16.7%
<i>Logfia gallica</i> *	narrowleaf cottonrose	0.1%	0.2%	0.1%	0.1%	16.7%
<i>Silene gallica</i> *	windmill pink	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Rumex acetosella</i> *	sheep sorrel	0.0%	0.0%	0.0%	0.0%	0.0%
Total Cover by Non-native Herbaceous Species		39.6%			47.8%	
Total Mean Non-native Grass Species Cover		3.4%				
Total Cover by All Herbaceous Species		82.9%				
Total Mean All Vegetative Cover		82.9%				
Total Mean Native Vegetative Cover		43.3%			52.2%	
Total Mean Bare ground		17.1%				

*non-native species, HMP species in bold

Table A 6-11
Interim Action Ranges MRA 2017 Performance Criteria Status

ESCA RP 2017 Annual Natural Resource Report – Appendix A

Activity Category	Location	Performance Category	Performance Metric	Performance Target for Post-activity Area by Monitoring Year							2017 Status	Monitoring Year Status
				Monitoring Years								
				1	2	3	4	5	6	7		
								North Range 44	South Range 44			
Ingress/egress routes (Activity A)		Monterey spineflower presence	% focus (Monterey spineflower) species baseline = present in 2 grids in 2012 baseline ingress/egress survey	100%	70%	60%	50%	30%	20%	10%	Year 7 Targets met in 2015	--
		Sand (Monterey) Gilia presence	% focus (sand gilia) species baseline presence = 0 in ingress/egress routes	100%	50%	40%	30%	20%	10%	0%		--
		Pampas grass and French broom recruits	% total area	<5%	<5%	<5%	<5%	<5%	<5%	--		
Above-ground vegetation cutting followed by target-specific excavation (Activity B)	North Range 44 SCAs, South Range 44 SCAs and Central Area NCAs, part of Range 47 SCA Subarea C ¹	Total native species richness (max. value = 20 species)	% IAR-wide baseline	25%	30%	35%	40%	50%	60%	70%	Year 7 Targets met in 2015	--
		Native vegetation cover	% cover by location	0%	5%	10%	20%	25%	30%	50%	Year 7 Targets met in 2016	--
		HMP shrub species richness (max. value =3 HMP species, or 100%)	% IAR-wide baseline	0%	0%	33%	33%	33%	66%	66%	Year 7 Targets met in 2015	--
		HMP shrub species frequency	% frequency of HMP shrub species	0%	5%	5%	10%	15%	20%	20%		--
		Monterey spineflower presence	% focus species baseline (baseline = 27.2 Monterey spineflower/plot in North Range 44, 40.5 Monterey spineflower/plot in South Range 44, and 6 Monterey spineflower/plot in Range 47 Subarea C)	100%	70%	60%	50%	30%	20%	10%		--
		Sand (Monterey) Gilia presence	% focus (sand gilia) species baseline (baseline = 0 in North Range 44 and Range 47 Subarea C, 2.7 sand gilia/plot in South Range 44)	100%	50%	40%	30%	20%	10%	0%		--
		Seaside bird's beak presence	% focus (seaside bird's-beak) species baseline (baseline = 3.3 seaside bird's beak/plot in North Range 44, 9.3/plot in South Range 44, 0 in Range 47 Subarea C)	10%	10%	5%	5%	5%	5%	5%		--
Pampas grass and French broom recruits	% total area	<5%	<5%	<5%	<5%	<5%	<5%	<5%				

Table A 6-11
Interim Action Ranges MRA 2017 Performance Criteria Status

ESCA RP 2017 Annual Natural Resource Report – Appendix A

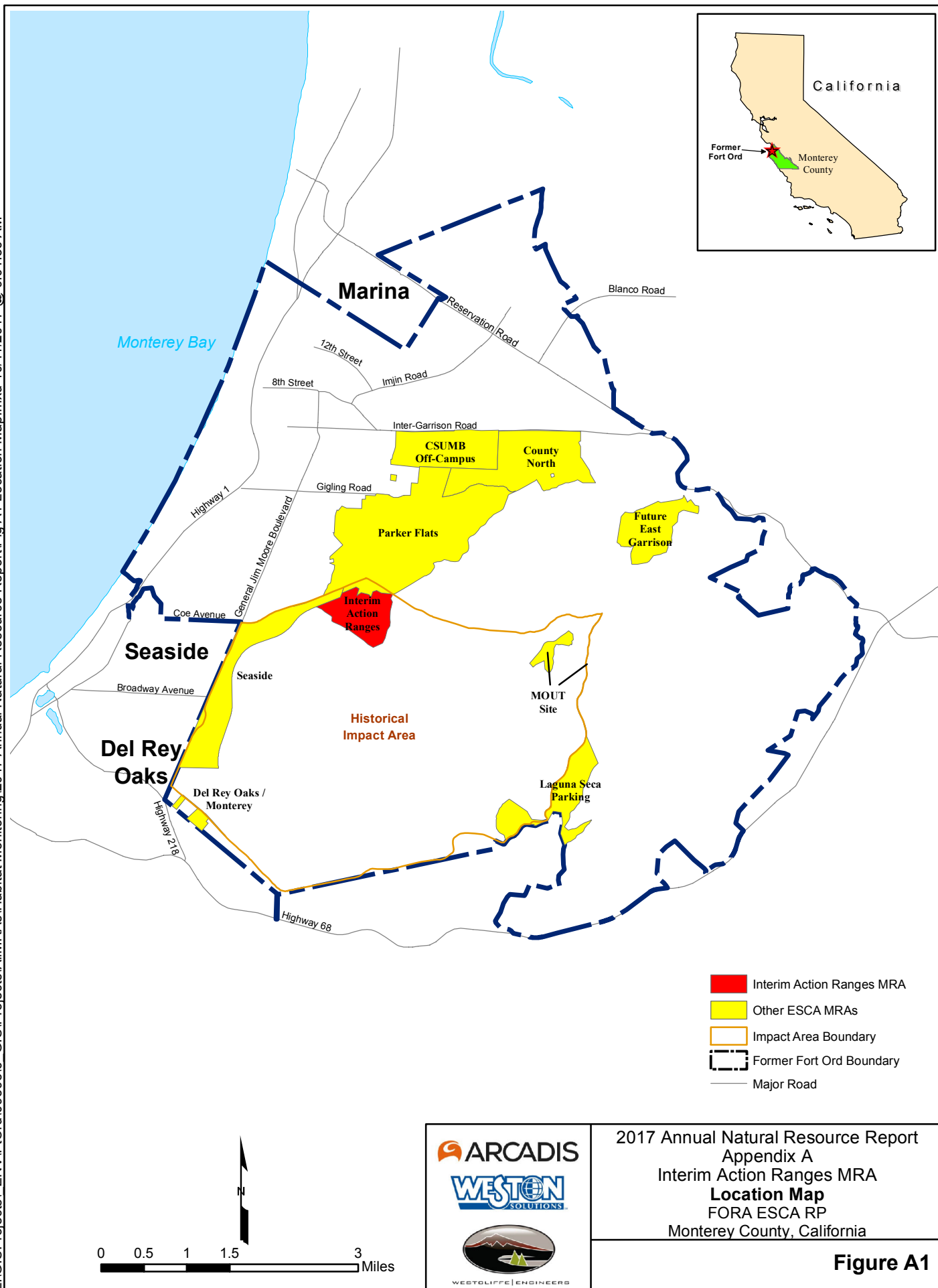
Activity Category	Location	Performance Category	Performance Metric	Performance Target for Post-activity Area by Monitoring Year							2017 Status	Monitoring Year Status
				Monitoring Years								
				1	2	3	4	5	6	7		
								North Range 44	South Range 44			
Small-scale soil excavation (Activity C)	North Range 44 SCAs, South Range 44 SCAs and Central Area NCAs, linear scrape in Range 47 Subarea C	Total native species richness (max value = 20 species)	% of total present	15%	20%	25%	30%	40%	50%	50%	Year 7 Target met in 2015	--
		Native vegetation cover	% cover by location	0%	5%	10%	20%	25%	30%	50%	North Range 44 (Year 5): 16.5 % native cover; South Range 44 (Year 6): 10.6% native cover	North Range 44 and South Range 44 both meet Year 3 target
		HMP shrub species richness (max. value =3 HMP species, or 100%)	% of total present	0%	0%	33%	33%	33%	66%	66%	Year 7 Targets met in 2015	--
		Monterey spineflower presence	% focus species baseline (baseline = 27.2 Monterey spineflower/plot in North Range 44, 40.5 Monterey spineflower/plot in South Range 44, and 6 Monterey spineflower/plot in Range 47 Subarea C)	100%	30%	10%	0%	0%	0%	0%		--
		Sand (Monterey) Gilia presence	% focus species baseline (baseline = 0 in North Range 44 and Range 47 Subarea C, 2.7 sand gilia/plot in South Range 44)	100%	20%	10%	0%	0%	0%	0%		--
		Seaside bird's beak presence	% focus species baseline (baseline = 3.3 seaside bird's beak/plot in North Range 44; no seaside bird's-beak found in baseline conditions where small-scale excavation performed in South Range 44 or Range 47 Subarea C)	0%	0%	0%	5%	5%	5%	5%		--
		Pampas grass, iceplant, and French broom recruits	% total area	<5%	<5%	<5%	<5%	<5%	<5%	<5%		
	Grassland grid cell in South Range 44 SCA	Total Species Richness	% baseline (baseline = 18 species)	10%	20%	30%	40%	45%	50%	50%	Year 7 Target met in 2015	--
		Native vegetation cover	% cover	8%	12%	20%	25%	30%	35%	40%	South Range 44 grassland: 43.3% Year 6 native cover exceeds Year 7 performance target	Year 7
		Monterey spineflower presence	% focus species baseline (baseline = 40.5 Monterey spineflower/plot)	100%	50%	30%	10%	10%	10%	10%	Year 7 Targets met in 2015	--
		Pampas grass, iceplant, and French broom recruits	% total area	<5%	<5%	<5%	<5%	<5%	<5%	<5%		--

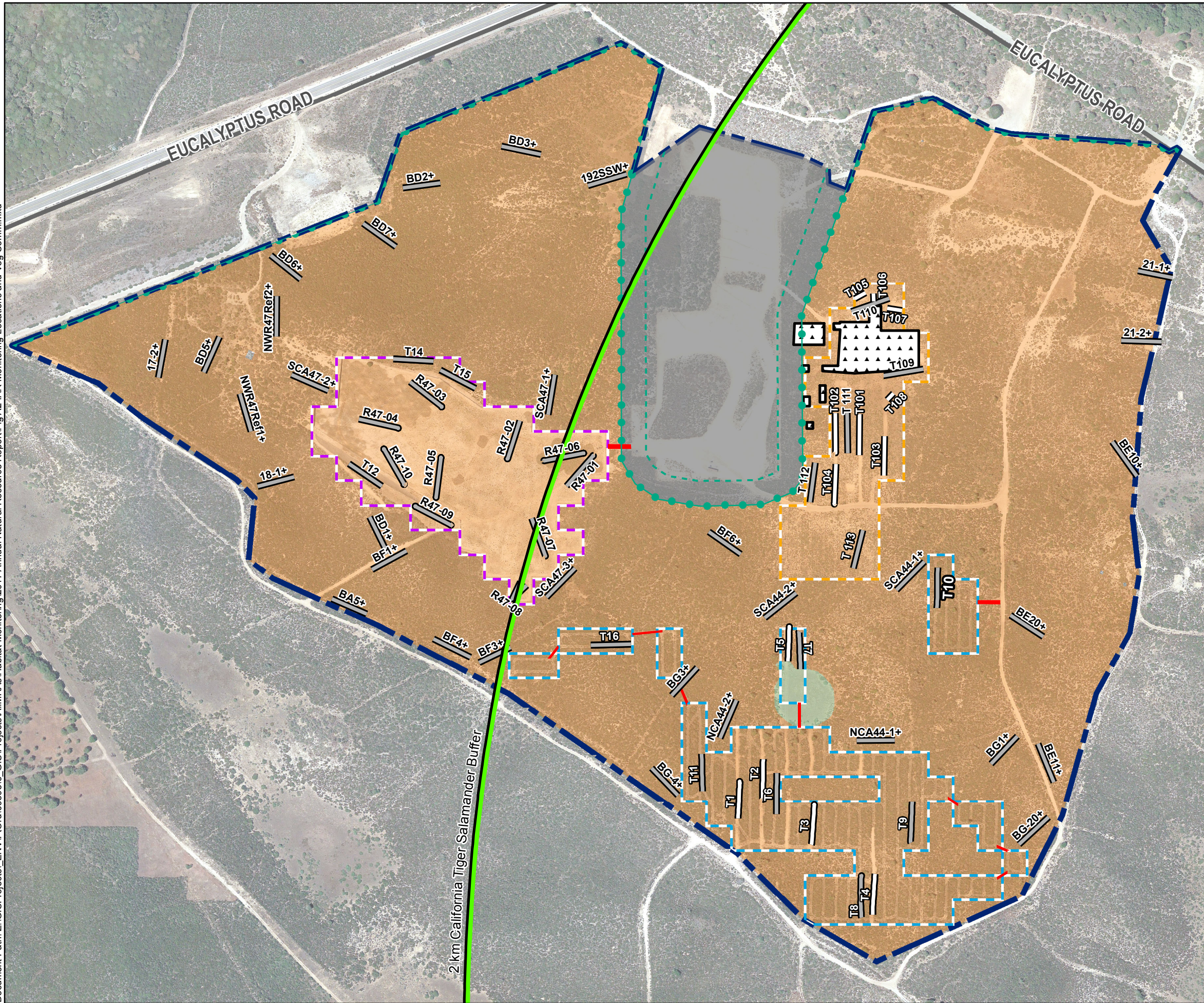
Table A 6-11
Interim Action Ranges MRA 2017 Performance Criteria Status

ESCA RP 2017 Annual Natural Resource Report – Appendix A

Activity Category	Location	Performance Category	Performance Metric	Performance Target for Post-activity Area by Monitoring Year							2017 Status	Monitoring Year Status
				Monitoring Years								
				1	2	3	4	5	6	7		
								North Range 44	South Range 44			
Large-scale soil excavation (Activity D)	Range 47 Subarea A (low recruitment area)	Shrub species richness	% of total present (11 species in baseline)	0%	10%	10%	20%	20%	20%	30%	Year 7 Targets met in 2015	--
		Native vegetation cover	% cover	0%	1%	2%	4%	6%	8%	10%		--
		Monterey spineflower presence	% focus (Monterey spineflower) species baseline (baseline = 6 Monterey spineflower/plot)	0%	0%	30%	10%	10%	10%	10%		--
		Pampas grass, iceplant, and French broom recruits	% total area	<5%	<5%	<5%	<5%	<5%	<5%	--		
	Range 47 Subarea B	Container plant survival	% total planted	0%	60%	60%	60%	50%	50%	50%	Year 7 Targets met in 2015	--
		Shrub species richness (22 shrub species in baseline)	% of total present	0%	20%	30%	40%	50%	60%	70%		--
		Native vegetation cover	% cover	0%	5%	15%	20%	25%	30%	50%		--
		HMP shrub species richness (max. value =3 HMP species, or 100%)	% of total present	0%	0%	33%	33%	33%	66%	66%		--
		HMP shrub species frequency	% frequency of HMP shrub species in IAR-wide baseline (baseline = 44.4%)	0%	0%	33%	33%	33%	66%	66%		--
		Monterey spineflower presence	% focus (Monterey spineflower) species baseline (baseline = 6 Monterey spineflower/plot)	100%	70%	60%	50%	30%	20%	10%		--
		Sand (Monterey) Gilia presence	% focus (sand gilia) species baseline (baseline = 2.0 sand gilia/plot)	100%	50%	40%	30%	20%	10%	0%		--
		Pampas grass, iceplant, and French broom recruits	% total area	<5%	<5%	<5%	<5%	<5%	<5%	<5%		--

¹ Please refer to Section 6 of Appendix A, where each performance category and target are explained in more detail.





Legend

Munitions Response Area

Major Road

Development Parcel

Improved Ingress/Egress
Established by ESCA RP Team

Site 39 (HA44) US Army Action

North Range 44 SCA

South Range 44 SCA/Central Area NCA

Range 47 SCA

2017 Vegetation Transects
(Monitored Annually per HRP)

24

Baseline Transects

Borderland Interface

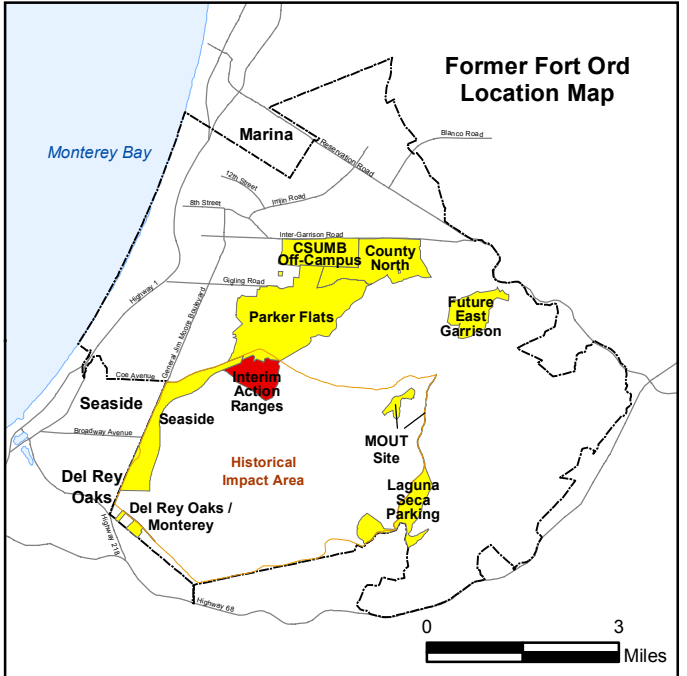
100-Foot Buffer from Borderland Interface

Grassland

Central Maritime Chaparral

Note:
+ = baseline transect

*Source: Flora and Fauna Baseline Study of Fort Ord, California,
Jones and Stokes Association Inc., December 1992.
Vegetation mapping modified from 2011 Annual Natural Resource
Report.



Aerial Source: Google Earth Pro,
Accessed 4/17/2014 - Image Date: 8/25/2013

0 400 800 Feet

2017 Annual Natural Resource Report

Appendix A

Interim Action Ranges MRA

Vegetation Monitoring and HMP

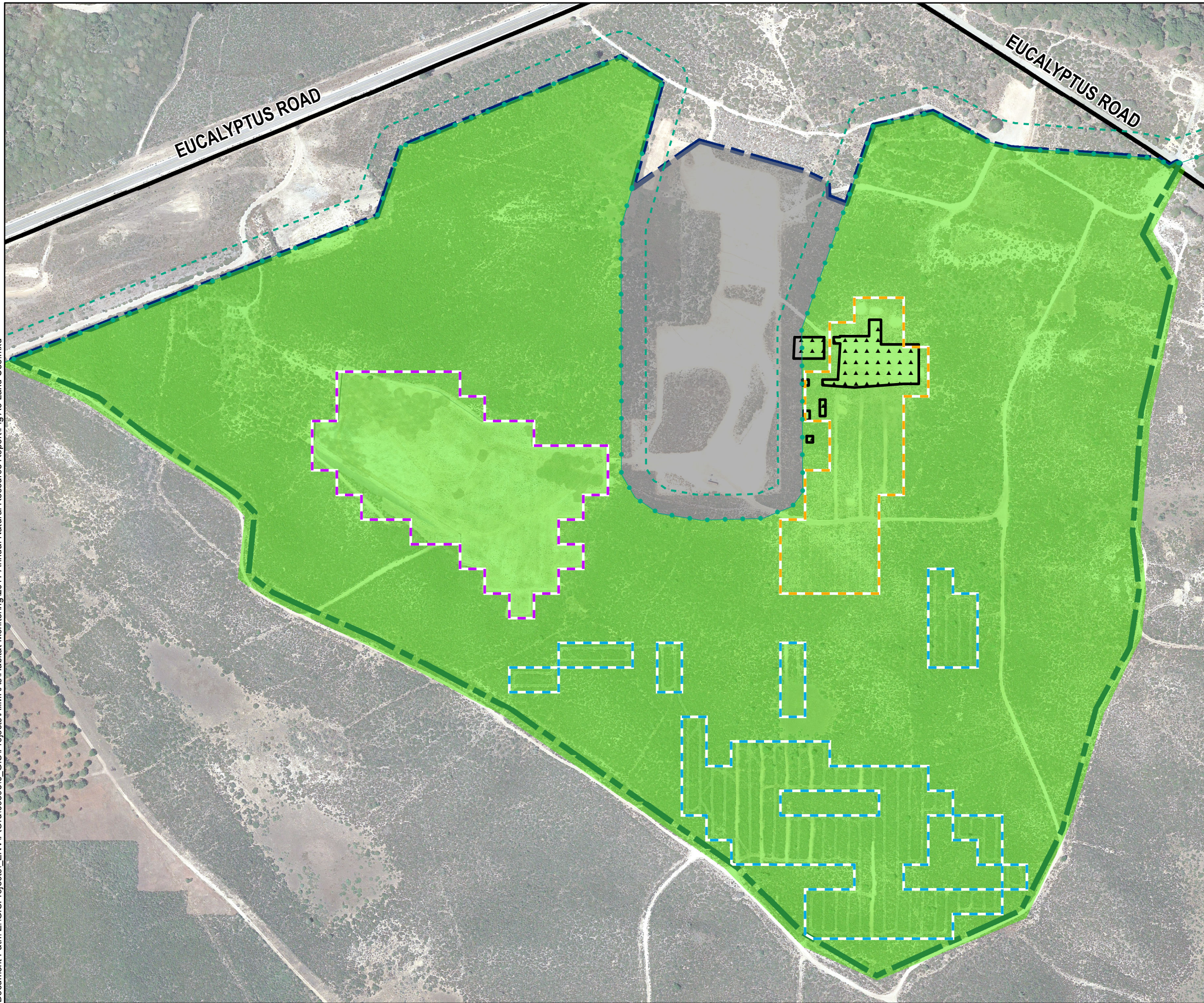
Herbaceous Survey Locations

FORA ESCA RP

Monterey County, California

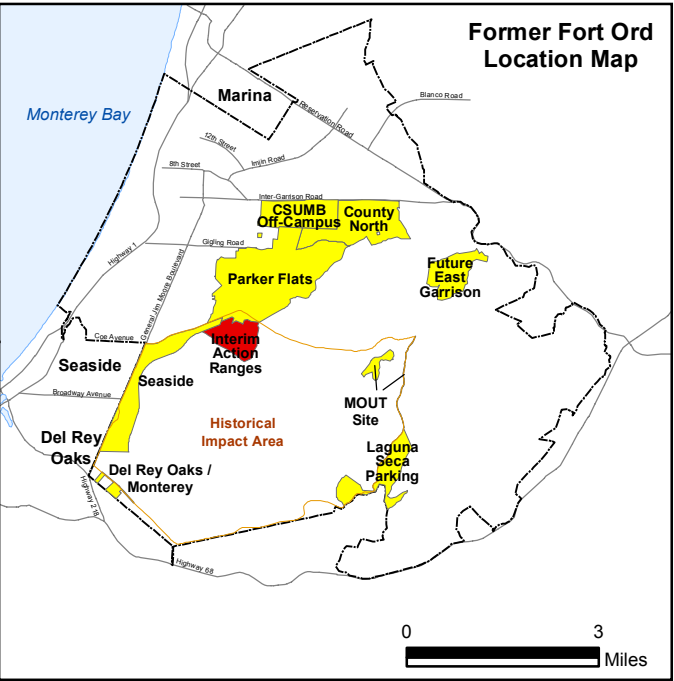
Figure A2

Document Path: Z:\GIS\Projects\ENV\Fort Ord\095956_GIS\Projects\A\IMRAs\Habitat Monitoring\2017 Annual Natural Resource Report\Fig A3 Land Use.mxd



Legend

- Munitions Response Area
- Major Road
- Site 39 (HA44) US Army Action
- North Range 44 SCA
- South Range 44 SCA/Central Area NCAs
- Range 47 SCA
- Borderland Interface
- 100-Foot Buffer from Borderland Interface
- Habitat Reserve
- Development Parcel



Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

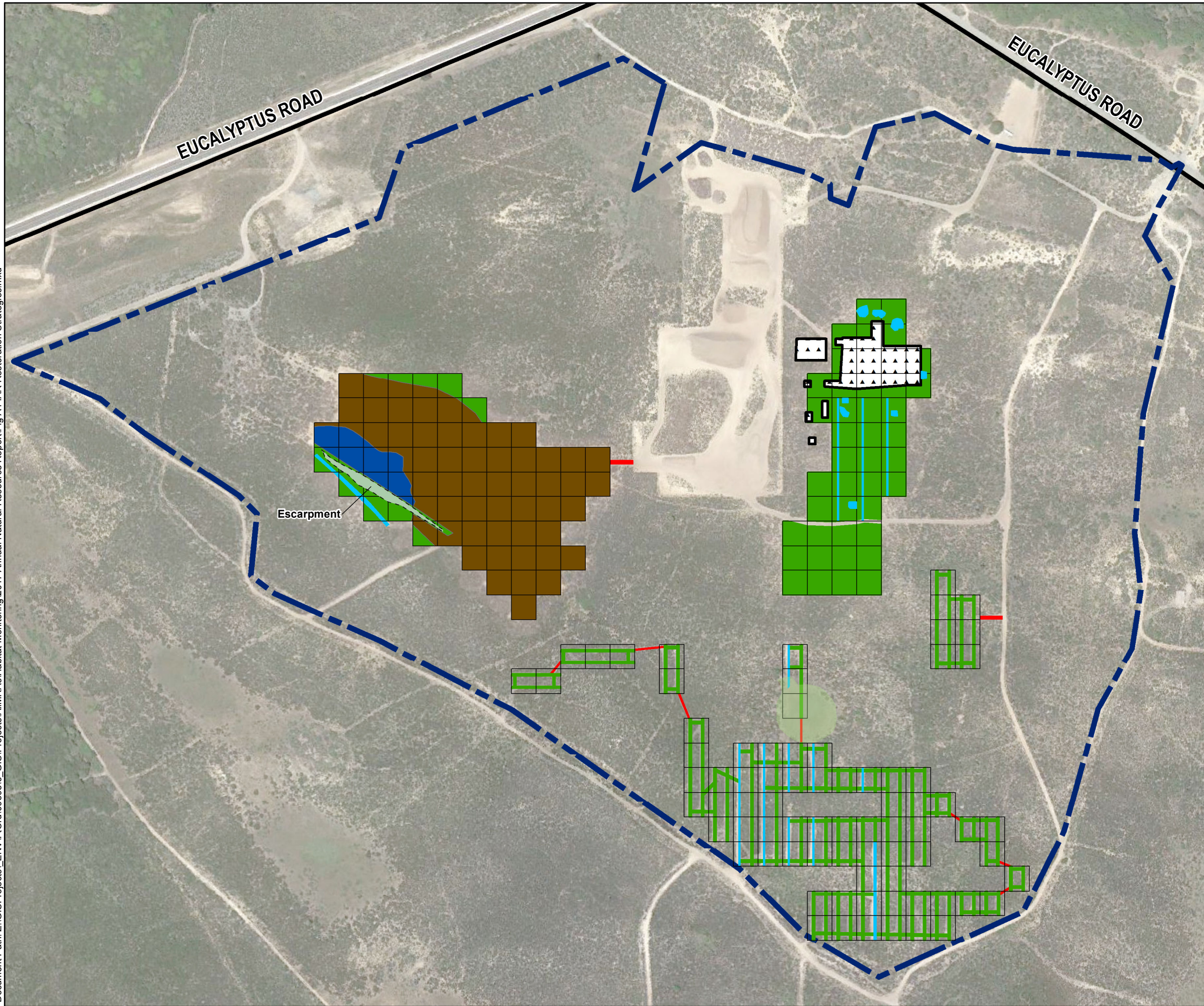
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Feet



2017 Annual Natural Resource Report
Appendix A
Interim Action Ranges MRA
Designated Future Land Use
FORA ESCA RP
Monterey County, California

Figure A3

Document Path: Z:\GISProjects\ENV\FORD\095956_GIS\Projects\AIMPRAs\Habitat Monitoring\2017 Annual Natural Resource Report\Fig A4 IAR Restoration Strategies.mxd



Legend

- Major Road
- Munitions Response Area
- Site 39 (HA44) US Army Action

Monitoring Only

- Monitoring of Improved Ingress/Egress Areas Established by ESCA RP Team
- Monitoring of Vegetation Cutting and Target-specific Areas
- Monitoring of Low-recruitment Escarpment Subject to Small-scale and Target-specific Excavation Areas

Passive Restoration

- Seeding of Small-scale Excavation Areas
- Topsoil Replacement and Seeding of Large-scale Soil Excavation Area

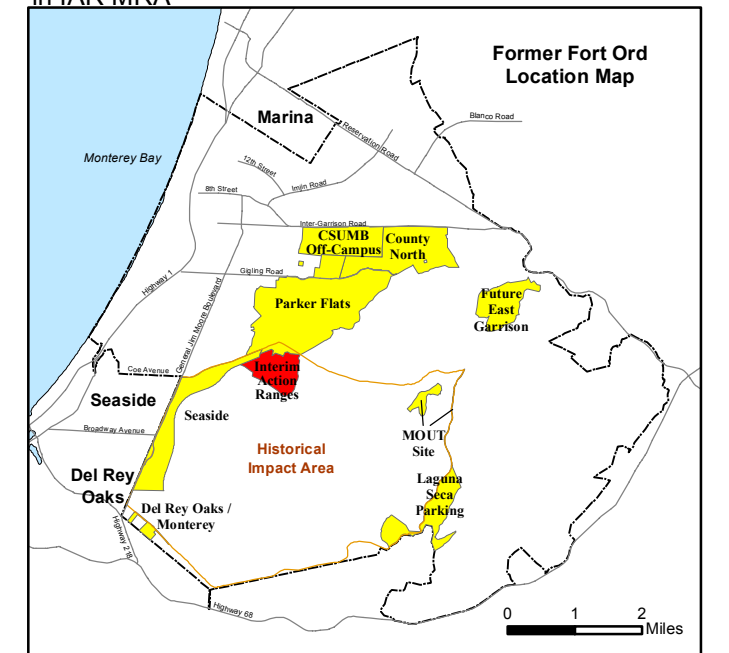
Active Restoration

- Topsoil Replacement, Seeding, and Container Planting of Large-scale Excavation Area

Vegetation Types

- Grassland

NOTE: Schematic representation of restoration activities in IAR MRA



Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

0 400 800 Feet

ARCADIS

WESTON
SOLUTIONS



WESTCLIFFE ENGINEERS

2017 Annual Natural Resource Report
Appendix A

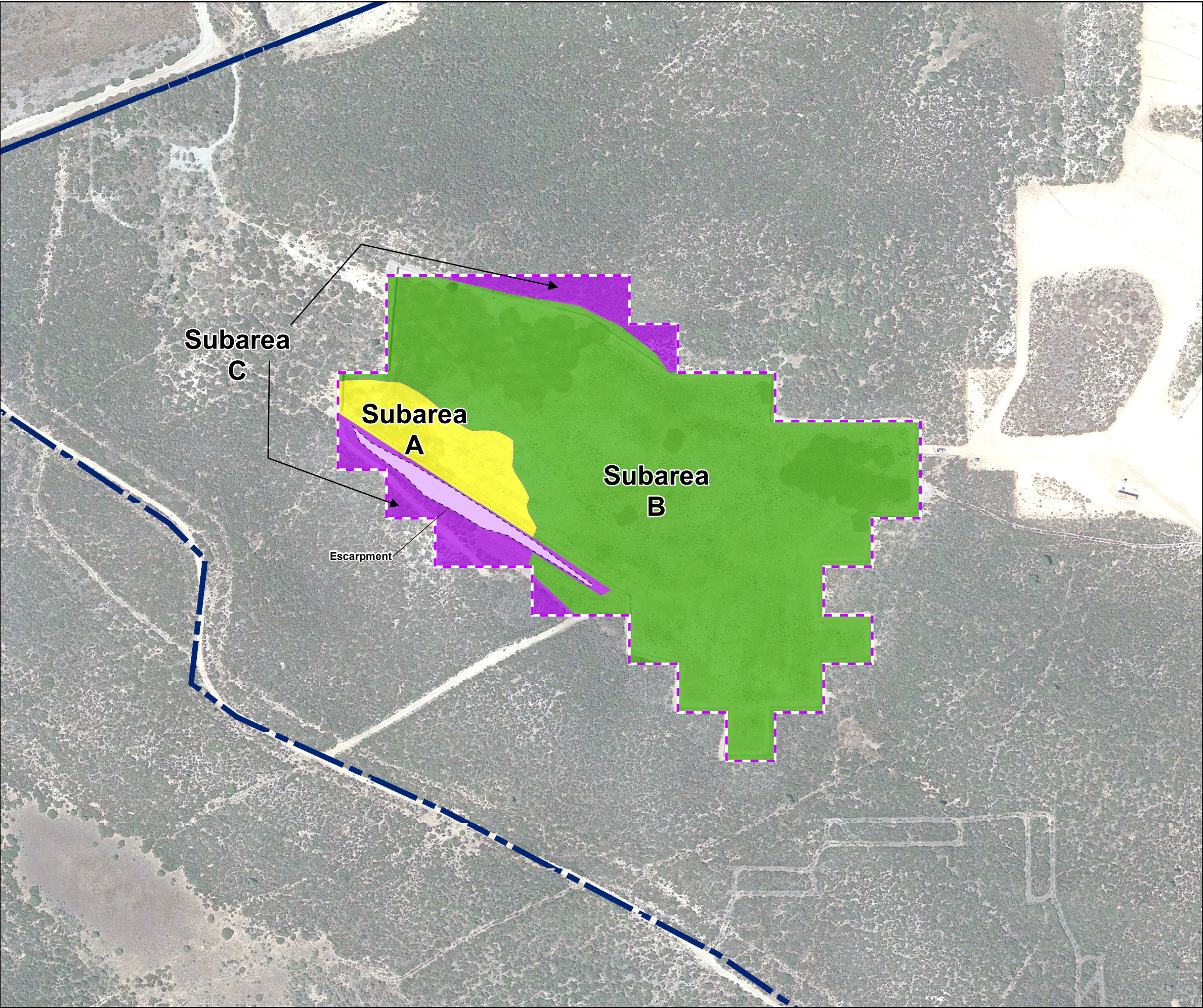
Interim Action Ranges MRA

Restoration Activities

FORA ESCA RP
Monterey County, California

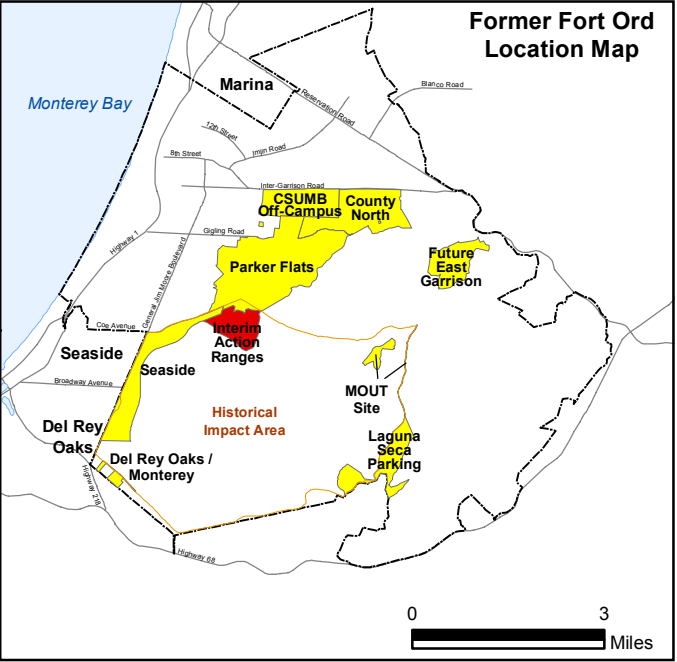
Figure A4

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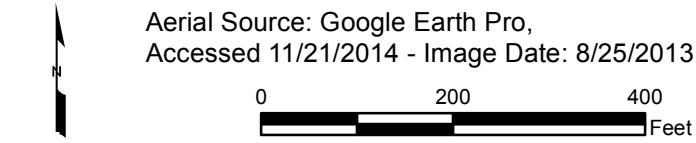


Legend

- Munitions Response Area
- Range 47 SCA
- Subarea A - Topsoil Replacement and Seeding of Large-scale Soil Excavation Area
- Subarea B - Topsoil Replacement, Seeding, and Container Planting of Large-scale Soil Excavation Area
- Subarea C - Vegetation Cutting and Target-specific Areas, and Seeding of Small-scale Excavation Areas
- Subarea C - Low-recruitment Escarpment Subject to Small-scale and Target-specific Excavation Areas



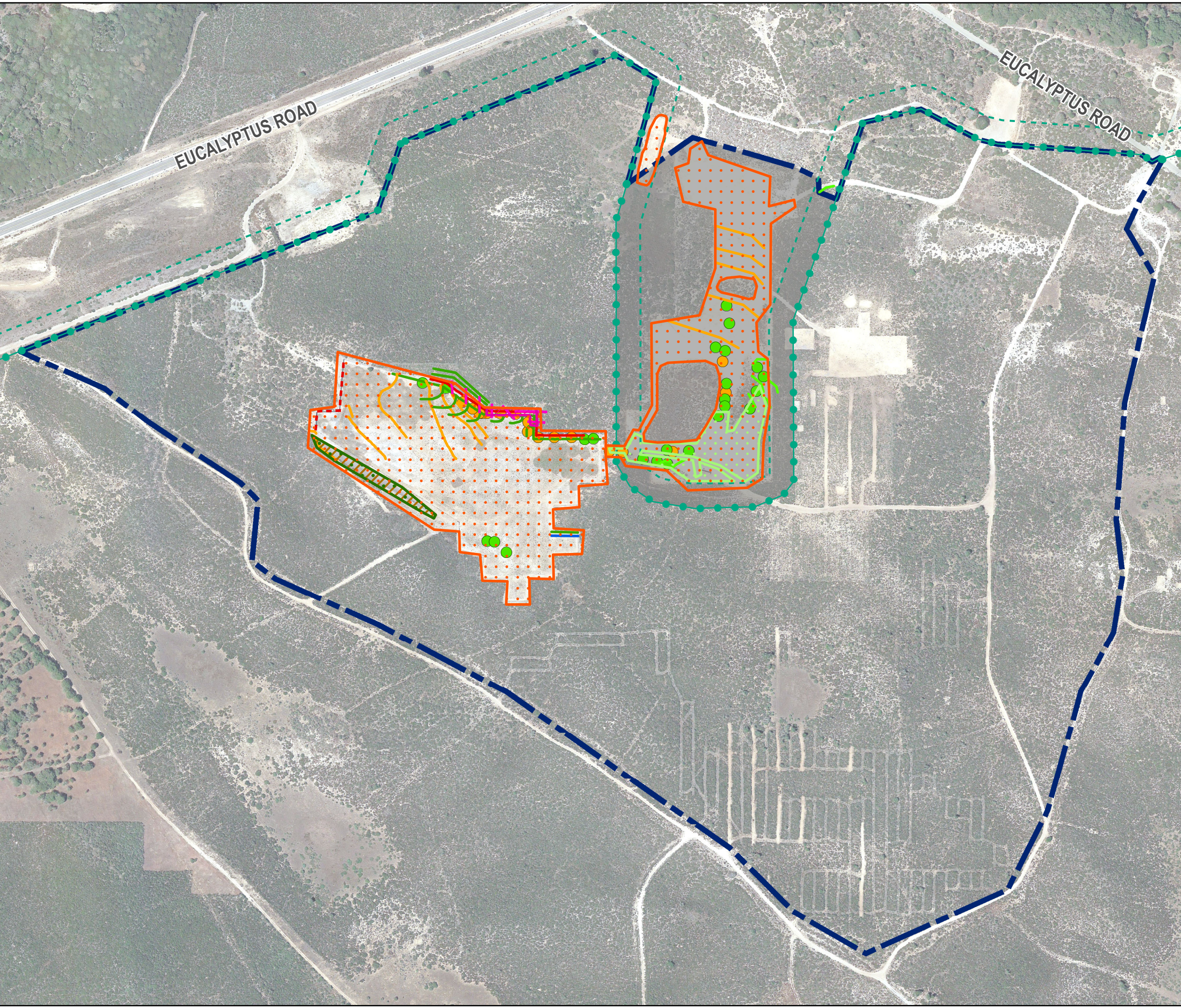
Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013



2017 Annual Natural Resource Report
Appendix A
Interim Action Ranges MRA
Range 47 SCA Subareas
FORA ESCA RP
Monterey County, California

Figure A5

Z:\GISProjects_ENV\FortOrd\06595\6_GIS\Projects\A\IMRAs\Habitat Monitoring\2017 Annual Natural Resource Report\FigA6_appendix_Erosion Monitoring - IAR.mxd 10/11/2017 @ 9:15:57 AM



Legend

- Major Road
- Munitions Response Area
- Development Parcel
- Borderland Interface
- 100-Foot Buffer from Borderland Interface

Erosion Control Measures

- 2013 Silt Fencing
- 2013 Wind Screen
- 2013 Straw Wattles/Water Bars
- 2014 Silt Fencing
- 2014 Straw Wattles/Water Bars
- 2016 Silt Fencing
- 2016 Straw Wattles
- 2013 Sand Bags/Straw Bales/
Erosion Control Blanket
- 2014 Sand Bags/Straw Bales/
Erosion Control Blanket
- 2013 Hydromulch Areas
- 2013 Erosion Control Blanket
- 2014 Hydromulch Areas
- 2014 Hydroseed Areas
- 2016 Erosion Blanket

Former Fort Ord Location Map

Aerial Source: Google Earth Pro,
Accessed 11/21/2014 - Image Date: 8/25/2013

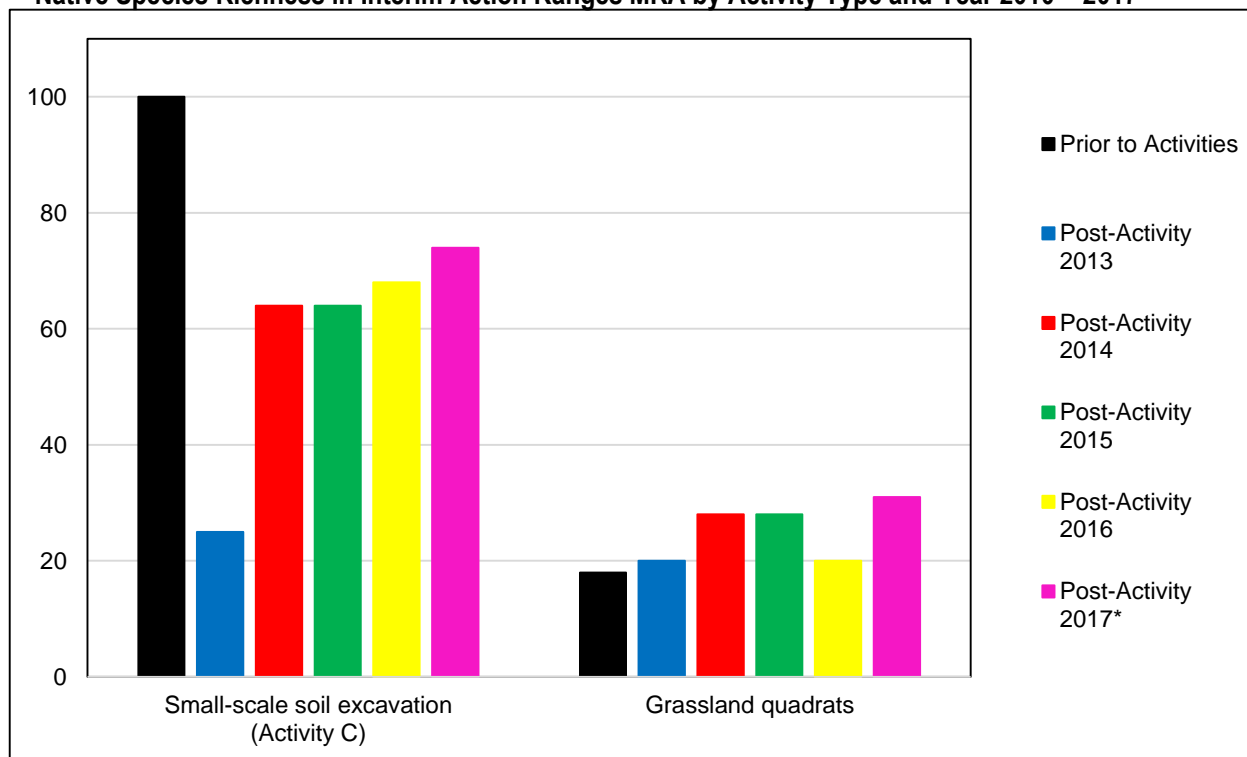
0 400 800 Feet

2017 Annual Natural Resource Report
Appendix A
Interim Action Ranges MRA
Erosion Control BMPs in Interim
Action Ranges MRA

FORA ESCA RP
Monterey County, California

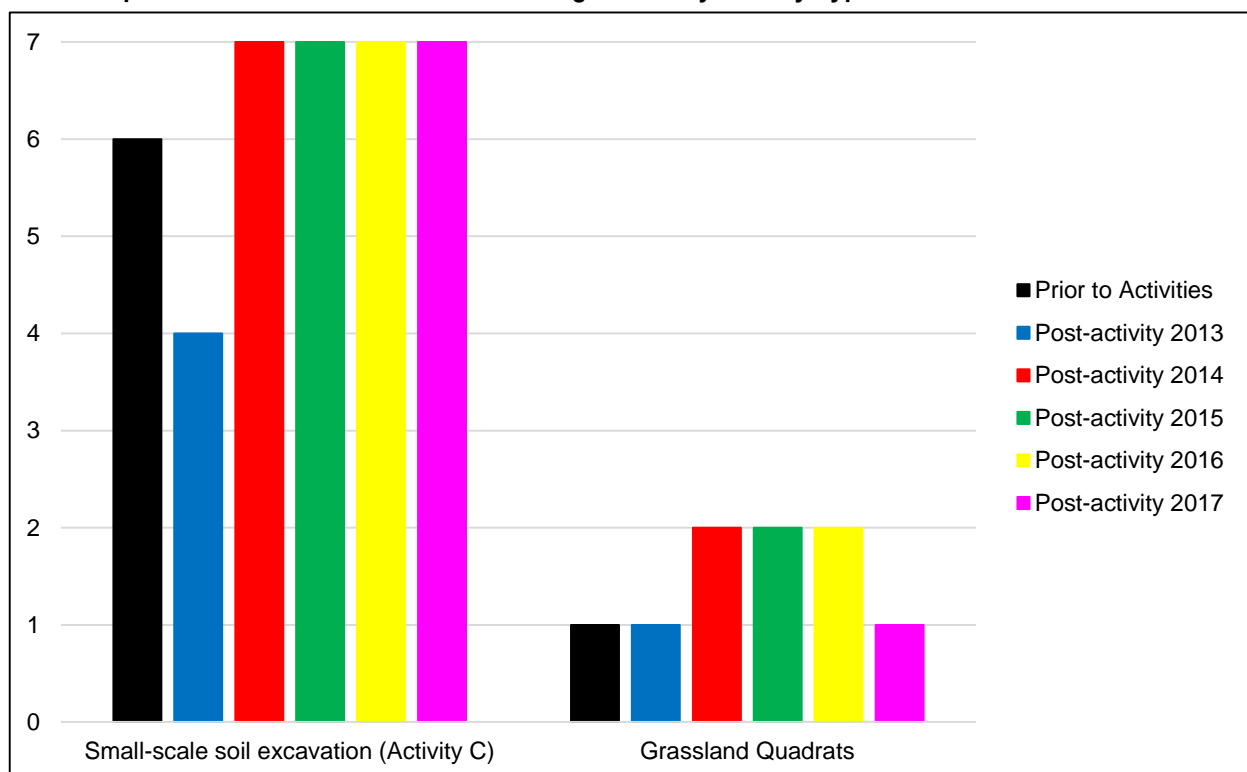
Figure A6

Figure A7
Native Species Richness in Interim Action Ranges MRA by Activity Type and Year 2010 – 2017



*In 2017, only Activity C transects were monitored

Figure A8
HMP Species Presence in Interim Action Ranges MRA by Activity Type and Year 2010 - 2017



Maximum number of HMP species in Interim Action Ranges is seven.

Observed HMP species sandmat manzanita, Monterey ceanothus, Eastwood's ericameria, Monterey spineflower, seaside bird's-beak, coast wallflower, and sand (Monterey) gilia.

Figure A9
North Range 44 SCA– Mean Shrub Cover after Small-scale Excavation

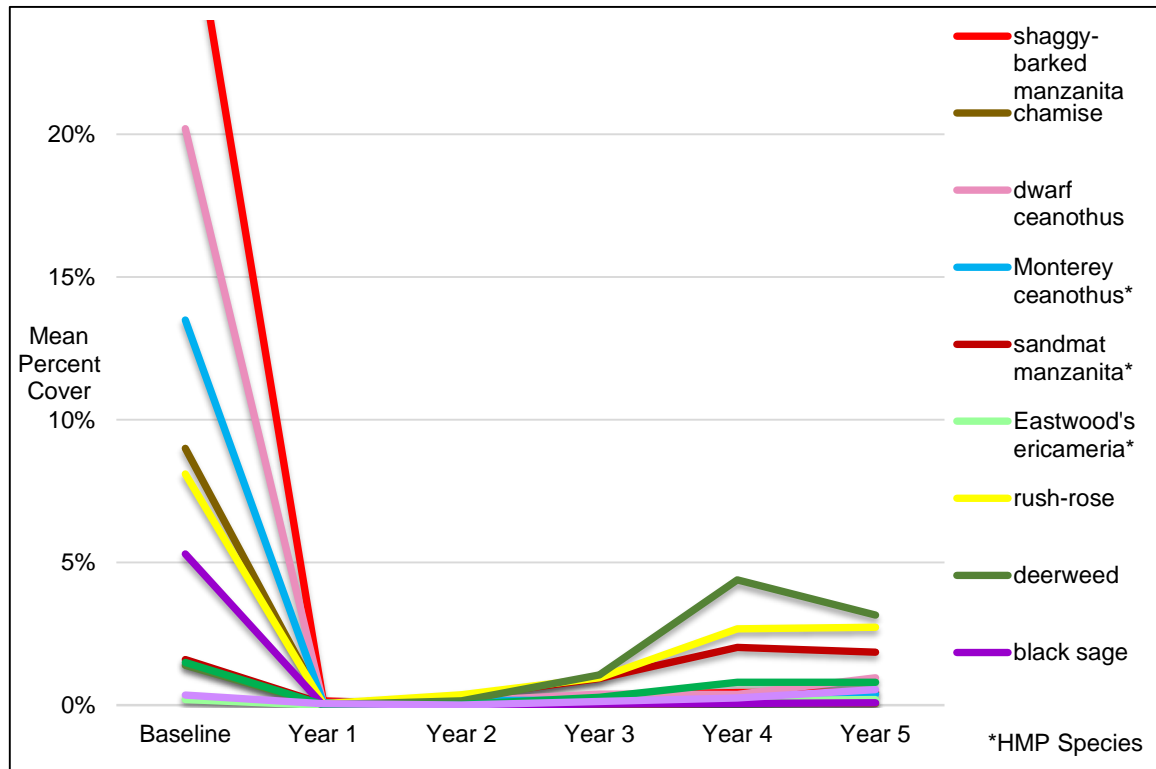


Figure A10
North Range 44 SCA – Mean Frequency of Shrub Species after Small-scale Excavation

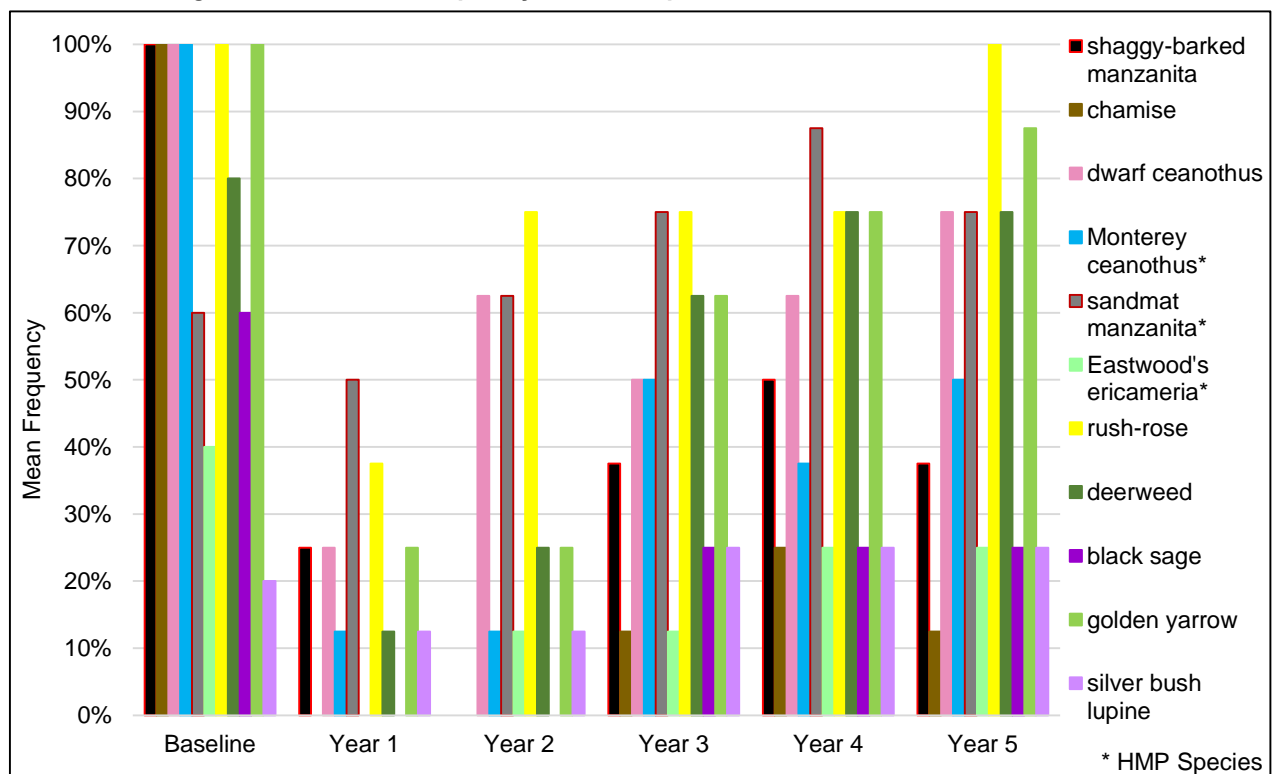


Figure A11
South Range 44 SCA and Central NCAs – Mean Shrub Cover after Small-scale Excavation

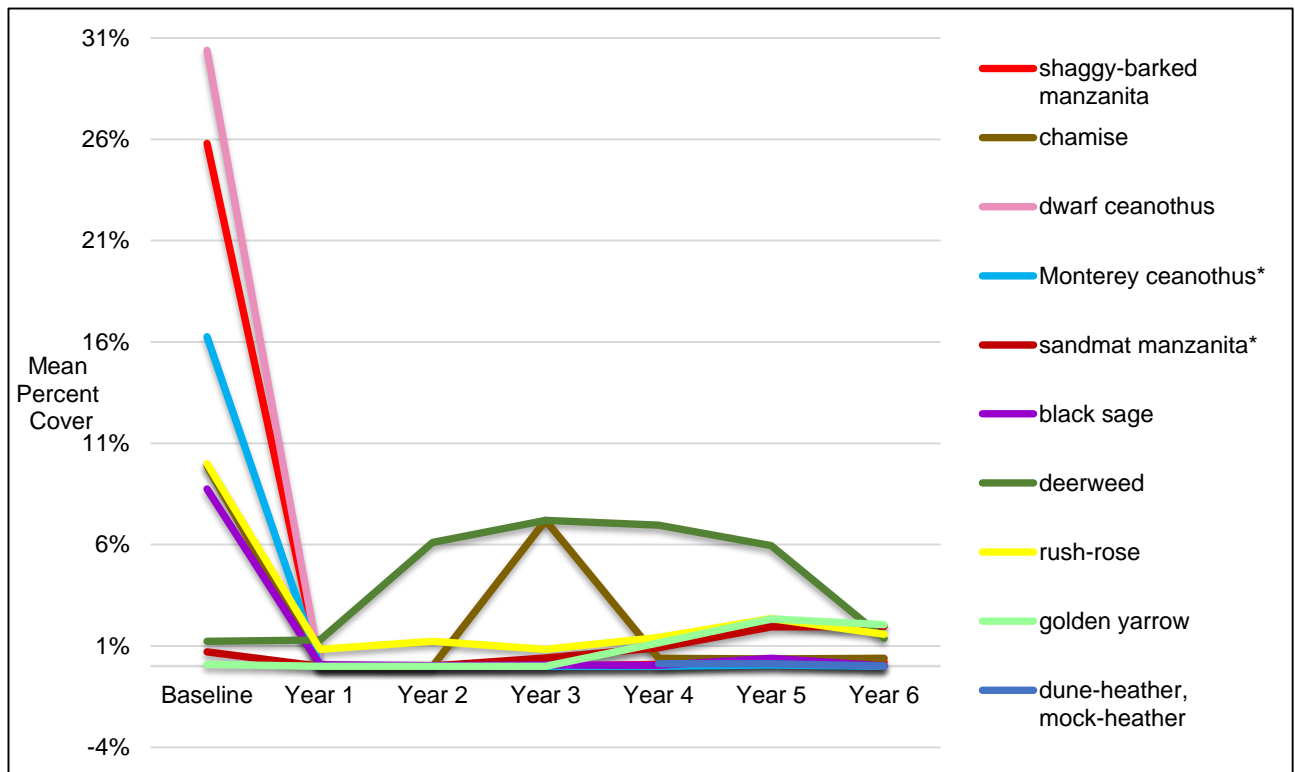


Figure A12
South Range 44 SCA and Central NCAs– Mean Frequency of Shrub Species after Small-scale Excavation

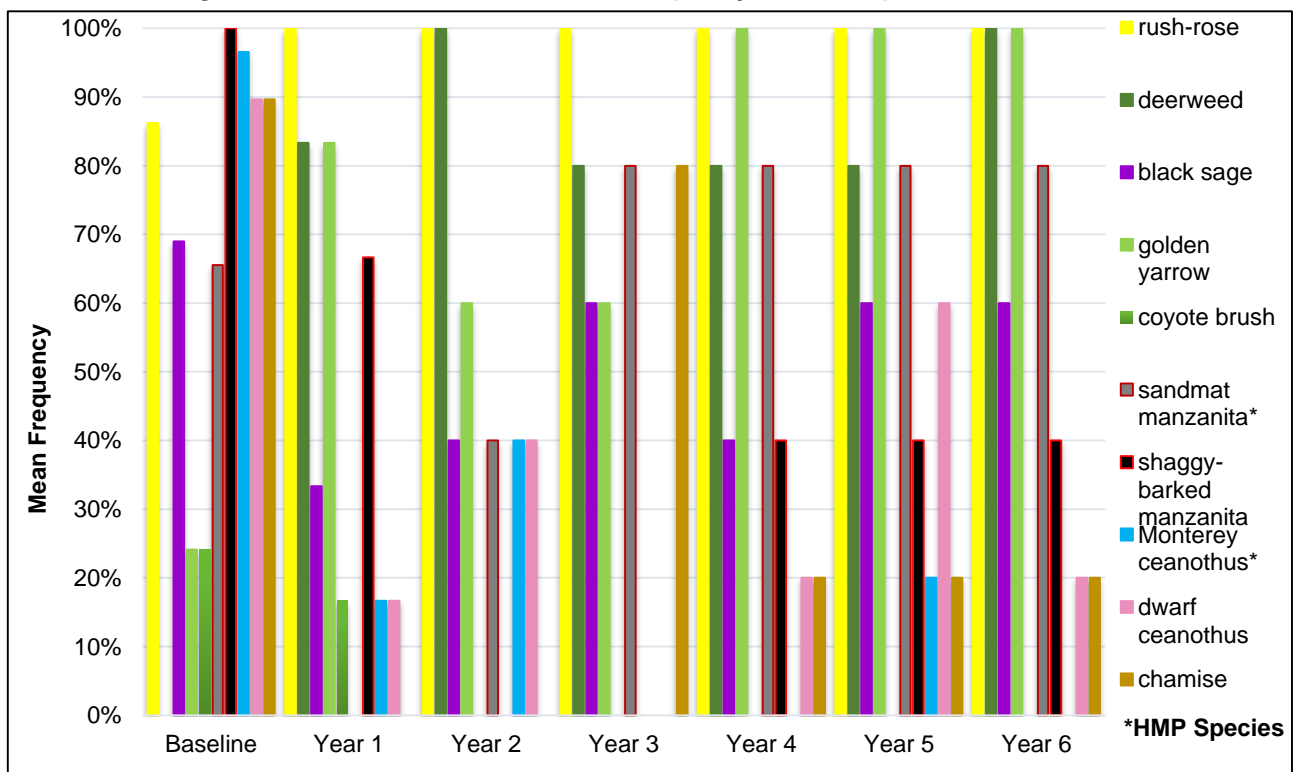
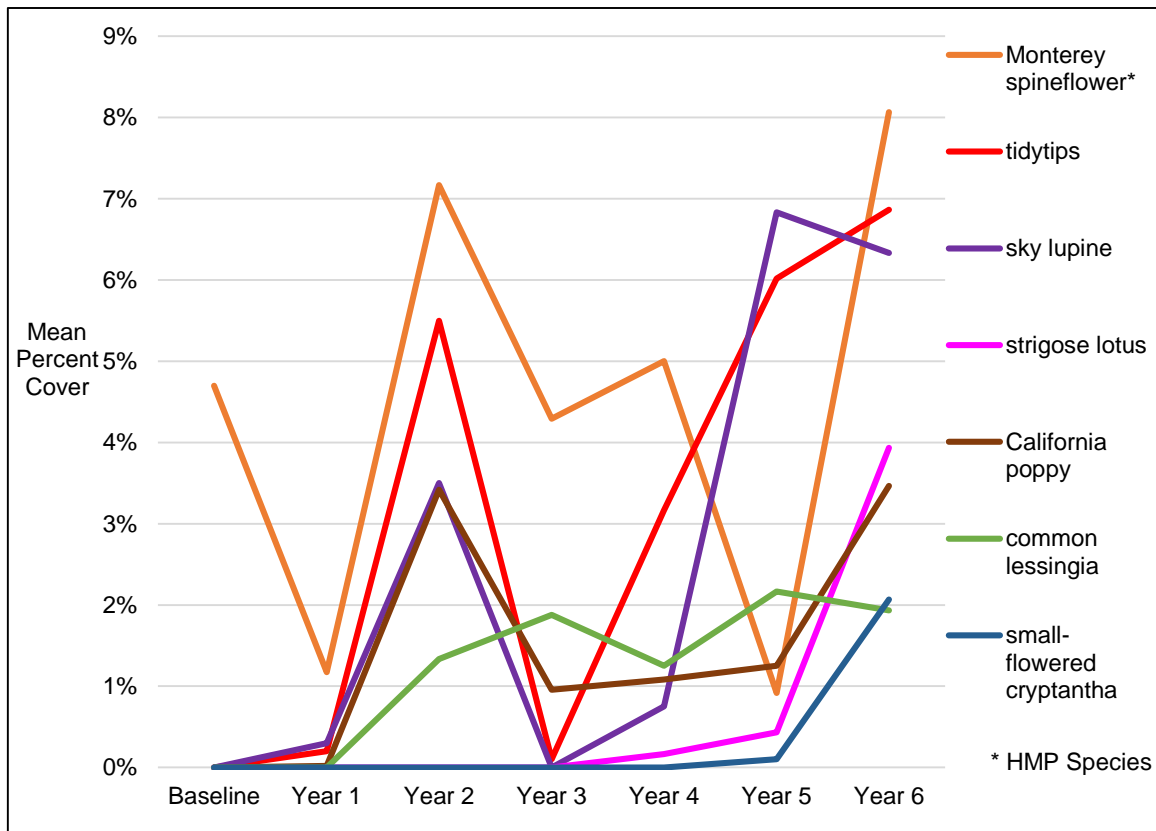


Figure A13
South Range 44 SCA and Central NCAs– Mean Herbaceous in Grassland Quadrats



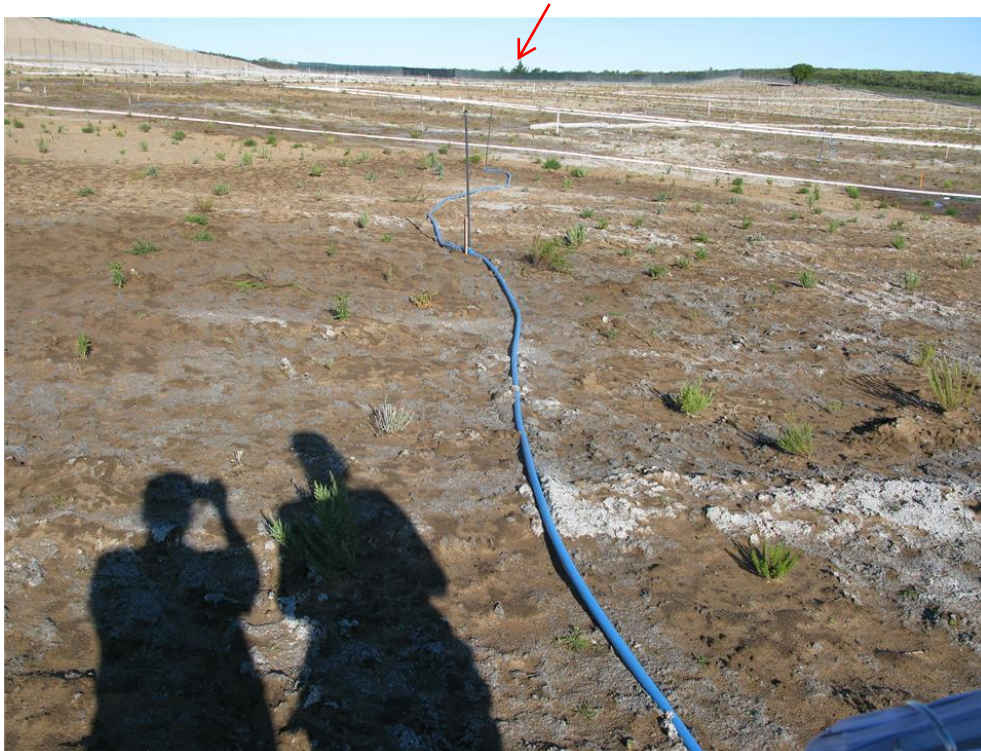


Photograph 1

Range 47
Restoration Area.

Restoration area
after soil
backfilling; west
facing photo
point.

7 January 2013



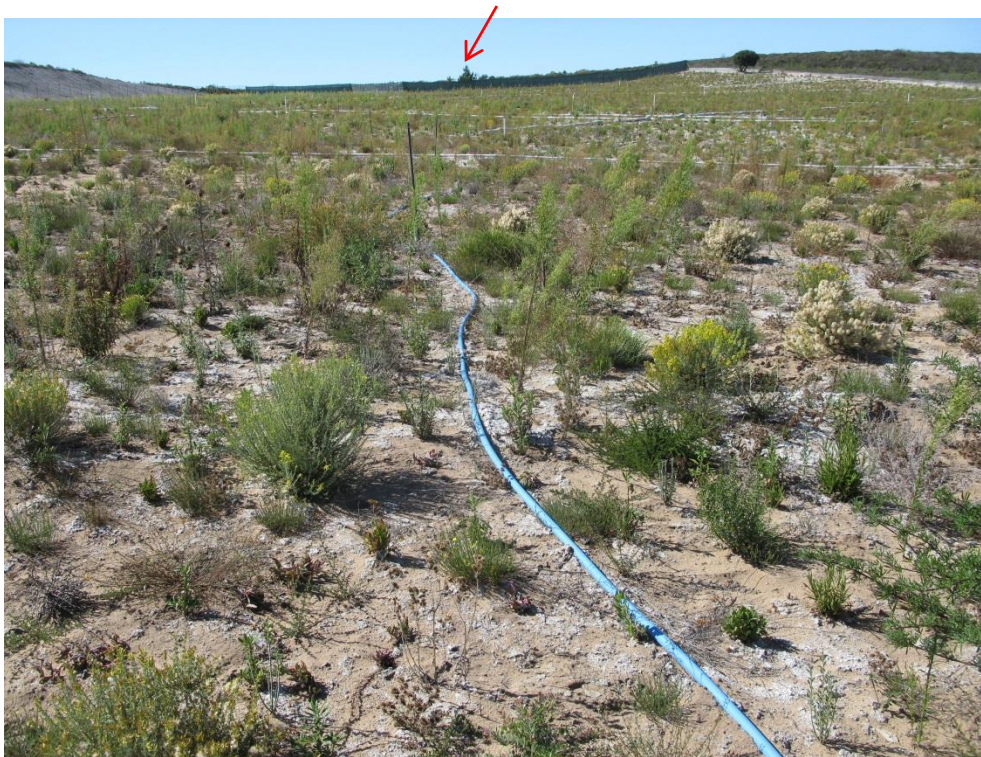
Photograph 2

Range 47
Restoration Area.

After installation of
container plants,
fencing, irrigation
system and erosion
control; west facing
photo point.

11 April 2013

FORA ESCA Remediation Program



Photograph 3

Range 47
Restoration Area.

First year early fall
vegetation; west
facing photo point.

25 September 2013



Photograph 4

Range 47
Restoration Area.

Winter conditions;
west facing photo
point.

12 February 2014

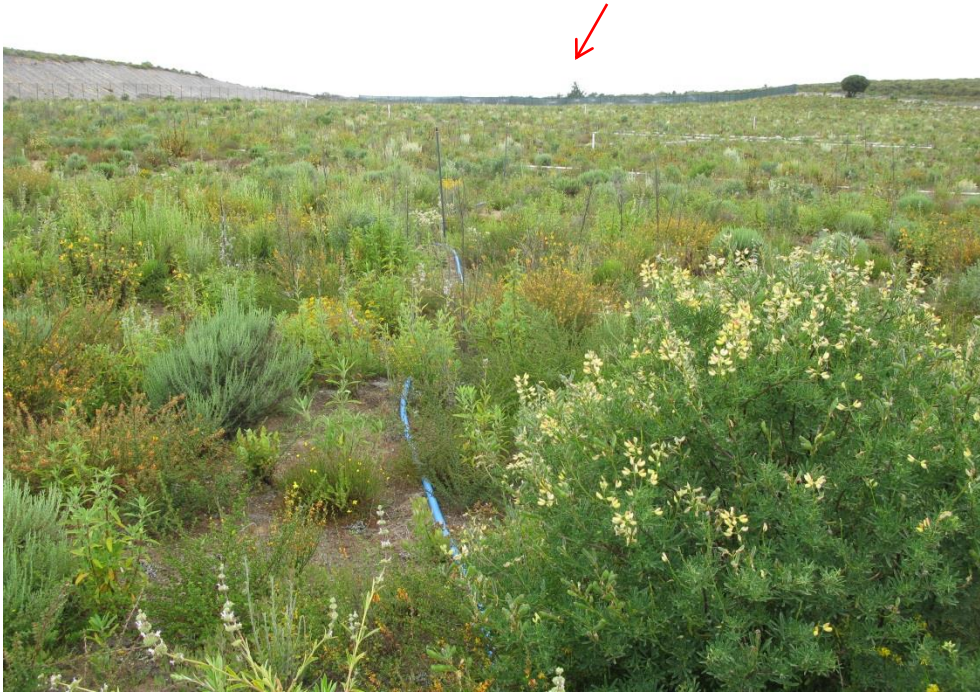
FORA ESCA Remediation Program

Photograph 5

Range 47
Restoration Area.

Late spring
vegetation; west
facing photo point.

13 June 2014

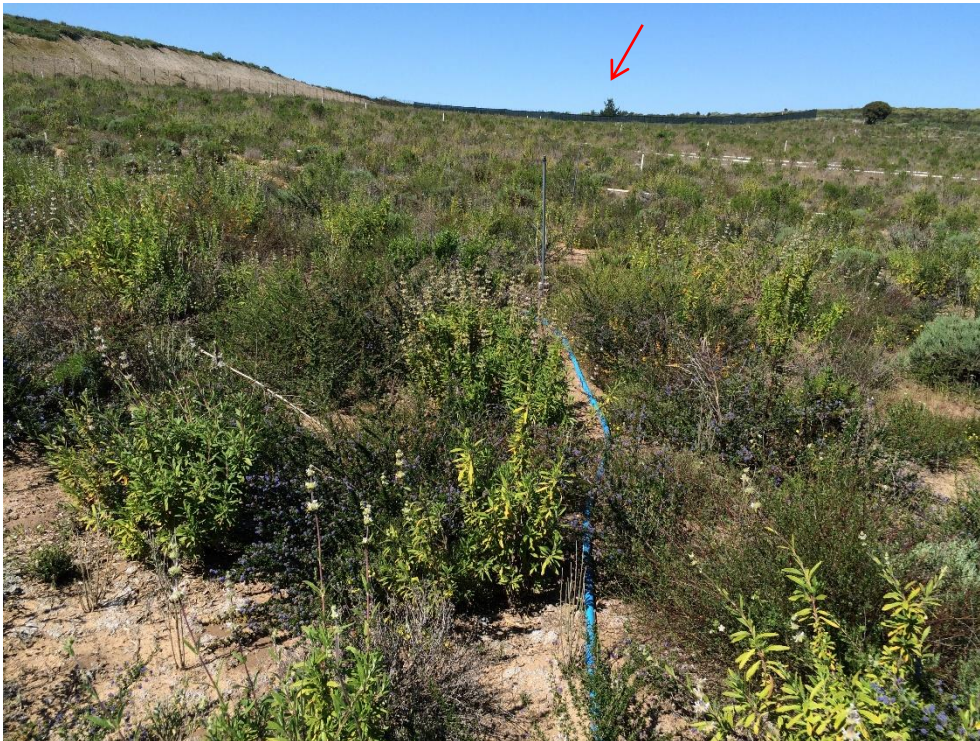


Photograph 6

Range 47
Restoration Area.

Spring 2015
showing drought
conditions; west
facing photo point.

26 March 2015



FORA ESCA Remediation Program



Photograph 7

Range 47
Restoration Area.

Winter vegetation
after removal of all
infrastructure; west
facing photo point.

12 December 2016



Photograph 8

Range 47
Restoration Area.

Winter vegetation;
west facing
photopoint

13 December 2017

FORA ESCA Remediation Program



Photograph 11

Range 44
South Range 44

Small-scale
excavation area
near grassland
(Transect 5) in
2016.

View is facing
south.

June 2016



Photograph 12

Range 47
Restoration Area.

Small-scale
excavation area
near grassland
(Transect 5) in 2017
shows increased
cover of sandmat
manzanita
(*Arctostaphylos
pumila*).

View is facing
south.

June 2017

FORA ESCA Remediation Program



Photograph 11

Range 44
South Range 44

Small-scale
excavation area in
2016.

View is facing
south.

June 2016



Photograph 12

Range 47
Restoration Area.

Small-scale
excavation area in
2017 shows
mortality of sub-
shrubs like rush-
rose
(*Crocanthemum
scoparium*) and
deerweed
(*Acmispon glaber*).

View is facing
south.

June 2017

FORA ESCA Remediation Program



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003



IN REPLY REFER TO:
2008-TA-0164

February 8, 2008

Phillip A. Lebednik, Ph.D.
Ecosystems Services Group
LFR, Inc.
1900 Powell Street, 12th Floor
Emeryville, California 94608-1814

Subject: Authorization of Biologists for the Former Fort Ord Munitions and Explosives
Cleanup (MEC) for ESCA Parcels, Monterey County, California (1-8-05-F-47)

Dear Dr. Lebednik:

We have reviewed your request to approve yourself, John Grattan, Pablo R. Martos, and Mitch C. Siemens to monitor, survey for, capture, and relocate individuals of the federally threatened California tiger salamander (*Ambystoma californiense*), as authorized biologists, during munitions and explosives cleanup (MEC) on the former Fort Ord. Your request, dated December 12, 2007, was received in our office, via electronic mail message, the same day. You would perform the requested activities pursuant to the terms and conditions of the biological opinion (1-8-05-F-47), issued to the U.S. Army on March 14, 2005.

After reviewing the materials you submitted with your request, we have concluded that Mr. Siemens possesses the necessary training and experience to conduct the requested activities for the former Fort Ord MEC project. Therefore, Mr. Siemens is hereby authorized to monitor, survey for, capture, and relocate California tiger salamander pursuant to the terms and conditions of the subject biological opinion.

However, after reviewing the materials you submitted with your request, we have concluded that you, Mr. Grattan, and Mr. Martos do not possess the necessary training and experience to conduct the requested activities for the former Fort Ord MEC project. Therefore, we cannot approve you, Mr. Grattan, or Mr. Martos as authorized biologists at this time.

However, we authorize you, Mr. Grattan, and Mr. Martos to conduct surveys and associated activities for the subject biological opinion under the direct supervision of Mr. Siemens or another Service-approved biologist. Furthermore, you, Mr. Grattan, and Mr. Martos are approved to implement term and condition 6(b), found on page 64 of the March 14, 2005, Biological Opinion: "In unforeseen circumstances, such as when live California tiger salamanders are encountered during a munitions response or soil remediation action, Mr. William Collins, Army biologist, may relocate California tiger salamanders out of the path of danger. When Mr. Collins is unavailable, a resident lead field designee who has received

Phillip A. Lebednik, Ph.D.

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appropriate training by the Service-authorized biologist, may handle California tiger salamanders for the sole purpose of removing them from the path of danger." This is the only circumstance under which you, Mr. Grattan, and Mr. Martos are authorized to capture or handle a California tiger salamander without being under the direct supervision of a Service-approved biologist.

To receive future approval as an authorized biologist, you should gain additional experience or show that you currently have experience in capture, relocation, and handling techniques for California tiger salamander adults, larvae, and eggs. You can gain this experience while working as a California tiger salamander monitor under the direct supervision of an authorized biologist.

If you have any questions regarding this authorization, please contact Douglass Cooper of my staff at (805) 644-1766, extension 272.

Sincerely,

A handwritten signature in black ink, appearing to read 'David M. Pereksta', with a stylized flourish at the end.

David M. Pereksta
Assistant Field Supervisor

cc: Bill Collins, U.S. Army



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003



IN REPLY REFER TO:
81440-2011-TA-0408

August 12, 2011

Phil Lebednik, Ph.D.
ESCA RP Senior Qualified Biologist
ARCADIS U.S., Inc.
2033 North Main Street, Suite 340
Walnut Creek, California 94596-3727

Subject: Approval of Biologists to Conduct California Tiger Salamander Capture and Relocation Activities during Munitions and Explosives of Concern Cleanup on Former Fort Ord (1-8-04-F-25R)

Dear Dr. Lebednik:

We have reviewed your request, dated July 1, 2011, for our approval of Thomas A. Graham and Joshua T. Tallis, to conduct capture and relocation activities involving the federally threatened California tiger salamander (*Ambystoma californiense*), pursuant to the subject biological opinion. Your request for approval is made pursuant to term and condition 6(b) of the subject biological opinion.

Based on the information you provided, we have determined that Mr. Graham and Mr. Tallis have sufficient training and experience to capture and relocate California tiger salamanders. We therefore approve these individuals as lead field designees pursuant to the subject biological opinion. Please note that this authorization is valid only for activities conducted in association with the biological opinion, Cleanup and Reuse of Former Fort Ord, Monterey, County, California, as it affects California Tiger Salamander and Critical Habitat for Contra Costa Goldfields (1-8-04-F-25R (Service 2005)).

If you have any questions, please contact Lena Chang of my staff at (805) 644-1766, extension 302.

Sincerely,

Douglass M. Cooper
Deputy Assistant Field Supervisor



REFERENCES CITED

- [Service] U.S. Fish and Wildlife Service. 2005. Biological opinion for the cleanup and reuse of former Fort Ord, Monterey County, California, as it affects California tiger salamander and critical habitat for Contra Costa goldfields (1-8-04-F-25R). U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, Ventura, California.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003



IN REPLY REFER TO:
08EVEN00-2012-TA-0484

September 20, 2012

William K. Collins
Fort Ord Base Realignment and Closure Office
Building 4463 Gigling Road, Room 101
P.O. Box 5008
Monterey, CA 93944-5008

Subject: Authorization of Biologists under the Biological Opinion Cleanup and Reuse of
Former Fort Ord, Monterey County, California, as it affects California Tiger
Salamander and Critical Habitat for Contra Costa Goldfields (1-8-04-F-25R)

Dear Mr. Collins:

We have reviewed a request, submitted by ARCADIS U.S., Inc. on August 16, 2012, for our authorization of Cynthia Fenter and Danielle Muir to capture and relocate federally threatened California tiger salamanders (*Ambystoma californiense*). In an electronic message to Kirstina Barry of my staff on August 27, 2012, you confirmed that this request was made on behalf of the U.S. Army. Your request is made pursuant to term and condition 6(b) of the subject biological opinion, which requires our approval of all persons proposed to handle and relocate California tiger salamanders in association with the subject project.

After reviewing the qualifications you submitted with your request, we have concluded that Ms. Fenter and Ms. Muir possess the necessary training and experience to independently conduct the requested activities. We hereby authorize the above-named biologists to capture and relocate federally threatened California tiger salamanders pursuant to the terms and conditions outlined in the biological opinion for the cleanup and reuse former of Fort Ord. Please note that this authorization is valid for the subject project only. We recommend that these biologists review the project description, protective measures, and terms and conditions of biological opinion 1-8-04-F-25R prior to conducting the proposed activities. If you have any questions regarding this authorization, please contact Kirstina Barry at (805) 644-1766, extension 357.

Sincerely,

Douglass M. Cooper
Deputy Assistant Field Supervisor

Table C-1
2017 Aquatic Feature Monitoring in Future East Garrison MRA Grenade Range

ESCA RP 2017 Annual Natural Resource Report

Date	Aquatic Feature Number	Water depth (ft.)	Turbidity	pH	Percent Emergent and Submergent Vegetation**	New or Unusual Flora Observed	Fauna Observed	CTS present?	CA Linderiella present?	Aquatic Invertebrates Present?	Total Rainfall During Last 7 days (in.)	Total Rainfall Since Last Monitoring Event (in.)	Total Rainfall Year to Date (in.)
1/13/2017	AF09-1A*	1.58	Medium	6.5	30% emergent; 15% submergent	<i>Lemna</i> sp., <i>Juncus phaeocephalus</i> , <i>Plantago coronopus</i>	Tree frog eggs; mosquito-like larvae and adults (Culicomorpha)	no	no	yes	2.55	4.95	9.77
	AF09-1B	1.06	Medium	5.8	10% emergent; 10% submergent	<i>Tribolium obliterum</i>	Tree frog eggs (many), white water worms	no	no	yes			
	AF09-2	1.36	Medium	5.8	40% emergent; 10% submergent	<i>Tribolium obliterum</i> , <i>Juncus phaeocephalus</i>	Tree frog eggs and Larva, Anna's hummingbird, boatman, mosquito larvae	no	no	yes			
2/2/2017	AF09-1A*	1.50	Low	7.2	50% emergent; 10% submergent	<i>Callitriche</i> sp.	Tree frog eggs and Larva, adult audible; mosquito-like flies (Culicomorpha)	no	no	yes	0.07	2.42	12.19
	AF09-1B	0.72	Medium	6.6	25% emergent; too cloudy	<i>Callitriche</i> sp.	Tree frog eggs, adult audible; mosquito-like flies (Culicomorpha)	no	no	yes			
	AF09-2	1.25	Low	6.6	50% emergent; too cloudy	<i>Callitriche</i> sp.	Tree frog eggs and Larva, adult audible; mosquito-like flies (Culicomorpha)	no	no	yes			
3/30/2017	AF09-1A*	1.51	Medium	7.2	60% emergent; 10% submergent	-	-	no	no	yes	0.60	7.94	20.29
	AF09-1B	0.77	Medium	6.6	20% emergent; 25% submergent	<i>Callitriche</i> sp.	Tree frog larvae	no	no	yes			
	AF09-2	1.20	Medium	6.6	25% emergent; 25% submergent	-	Tree frog larvae, boatmen	no	no	yes			
4/26/2017	AF09-1A*	1.30	Medium	7.3	45% emergent; 10% submergent	<i>Callitriche</i> sp., <i>Eleocharis macrostachya</i>	Tree frog larvae and adults; water boatmen; water strider	no	no	yes	0.00	1.29	21.58
	AF09-1B	0.00	-	-	-	Tiny <i>Eleocharis</i> , species unconfirmed	-	no	no	no			
	AF09-2	1.02	Medium	7.0	50% emergent; 10% submergent	<i>Eleocharis macrostachya</i> , <i>Juncus phaeocephalus</i>	Tree frog adult; water striders	no	no	yes			
6/13/2017	AF09-1A*	0.00	-	-	-	-	-	no	no	no	0.04	0.06	21.64
	AF09-1B	0.00	-	-	-	-	-	no	no	no			
	AF09-2	0.00	-	-	-	-	-	no	no	no			
Aquatic Features Dry From Spring-Fall 2017													
11/15/2017	AF09-1A*	0.00	-	-	-	-	-	no	no	no	0.14	0.68	0.68
	AF09-1B	0.00	-	-	-	-	-	no	no	no			
	AF09-2	0.00	-	-	-	-	-	no	no	no			

Notes:
* Restored Aquatic Feature
** Percent vegetative cover is based on visual estimate and is affected by water turbidity.

Table C-2
2017 Aquatic Feature Monitoring in Future East Garrison MRA Grenade Range

ESCA RP 2017 Annual Natural Resource Report

Survey	Aquatic Feature Number	Water depth (ft.)			Turbidity**			pH			Percent Emergent and Submergent Vegetation***		
		2010	2011	2017	2010	2011	2017	2010	2011	2017	2010	2011	2017
		Total annual precipitation: 2010 = 23.6 inches, 2011 = 16.6 inches, 2017 = 16.85 inches											
1/13/2010 1/31/2011 and 1/13/2017	AF09-1A*	inundated	0.78	1.58	-	Low	Medium	-	-	6.5	-	-	30% emergent; 15% submergent
	AF09-1B	-	0.14	1.06	-	N/A	Medium	-	-	5.8	-	-	10% emergent; 10% submergent
	AF09-2	inundated	0.94	1.36	-	Medium	Medium	-	-	5.8	-	-	40% emergent; 10% submergent
3/12/2010 3/28-29/2011 and 3/30/2017	AF09-1A*	0.94	0.98	1.51	Low	Low	Medium	-	6.6	7.2	-	-	60% emergent; 10% submergent
	AF09-1B	0.34	0.49	0.77	Medium	Medium	Medium	-	6.9	6.6	-	-	20% emergent; 25% submergent
	AF09-2	1.08	1.08	1.20	Medium	Medium	Medium	-	6.1	6.6	-	-	25% emergent; 25% submergent
4/15/2010 4/21/2011 and 4/26/2017	AF09-1A*	0.96	0.46	1.30	Medium	Low	Medium	6.4	-	7.3		29% emergent; 10% submergent	45% emergent; 10% submergent
	AF09-1B	0.44	0.00	0.00	High	-	-	6.4	-	-		0% submergent	-
	AF09-2	1.06	0.00	1.02	High	-	Medium	6.1	-	7.0		-	50% emergent; 10% submergent

Notes:

* Restored Aquatic Feature

** During baseline monitoring field crews used a turbidity meter that measured in nephelometric turbidity units (NTU). During post-disturbance monitoring a simpler method was used. "Low" turbidity ranged from 0-30 NTU, and is comparable to a relatively clear lake (Nathanson, 2003). "Medium" turbidity ranged from 30-100 NTU. "High" turbidity is greater than 100 NTU and is comparable to muddy water (Joyce, 1996).

*** Percent cover is based on visual estimate and is affected by water turbidity.

References:

Joyce, T.M. et al. 1996. Inactivation of Fecal Bacteria in Drinking Water by Solar Heating. Applied and Environmental Microbiology: Volume 62 (2), pages 399-402.

Nathanson, Jerry A. 2003. Basic Environmental Technology: Water Supply, Waste Management, and Pollution Control. Upper Saddle River, New Jersey: Prentice Hall.

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet

Observer(s): J. Tallis

Date: 1/13/2017

Begin Time: 09:00

End Time: 09:40

Weather: Cloudy, heavy dew

Location: Grenade Range Aquatic Features, Future East Garrison MRA

	Aquatic Feature Number		
	AF09-1A (Restored)	AF09-1B	AF09-2
Water present?	(Y) N	(Y) N	(Y) N
Water depth at deepest point as measured on permanent gauge:	1.58 ft	1.06 ft	1.36 ft
If surface water not present indicate soil conditions:	saturated / moist / dry	saturated / moist / dry	saturated / moist / dry
Water turbidity:	None - Low - <u>Med</u> - High	None - Low - <u>Med</u> - High	None - Low - <u>Med</u> - High
Water pH:	6.5	5.8	5.8
Water surface area (sq. feet)	700	130	250
% ponded with submergent veg.:	15%	10	10
% ponded with emergent veg.:	30%	10	40
Plant species observed and other observations:	lenna, Juncus phaeoceph, Plantago coron. Gilled mushroom	obliterum	obliterum, Junc. phaeoc.
Fauna species observed and other observations:	Hyla eggs, mosquito-like larva + adults	Hyla eggs (many), white worms. in water.	Hyla eggs + larvae, Anna's hummingbird, boatman, mosquito larval.
Other Observations:	-		

Notes:

J. Tallis

End Time:

Location: Grenade Range Aquatic Features, Future East Garrison MRA

Hyla eggs + larva Mosquito-like flies (Culicomorpha)	Hyla eggs Mosquito-like flies (Culicomorpha)	Hyla eggs + larvae mosquito-like flies (Culicomorpha)
--	---	--

Observer(s): T. L. C. Fent

Begin Time: 0730

End Time: 0900

Weather: Partly cloudy

Location: Grenade Range Aquatic Features, Future East Garrison MRA

[illegible]

Observer(s): J. Tallis + C. Nicely

Date: 4/26/2017

Begin Time: 9:15

End Time: 10:00

Weather: Overcast, 60°F

Location: Grenade Range Aquatic Features, Future East Garrison MRA

	Aquatic Feature Number		
	AF09-1A (Restored)	AF09-1B	AF09-2
Water present?	Y/N	Y/N	Y/N
Water depth at deepest point as measured on permanent gauge:	3-1 1.3 ft	—	1.02 ft
If surface water not present indicate soil conditions:	saturated / moist / dry	saturated / moist / dry	saturated / moist / dry
Water turbidity:	None - Low - Med - High	None - Low - Med - High	None - Low - Med - High
Water pH:	7.3	—	7.0
Water surface area (sq. feet)	140	—	140
% ponded with submergent veg.:	10%	—	10
% ponded with emergent veg.:	45%	—	50
Plant species observed and other observations:	Callitriche Eleocharis macrostachya	Eleocharis (tiny)	Eleocharis macrostachya Plantago coronopus
Fauna species observed and other observations:	Eleocharis Pacific chorus frog larvae + adult Boatman water strider	Eleocharis (tiny)	Pacific chorus frog adult - water striders - Juncus phaecephalus
Other Observations:			
Notes:			

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet

Observer(s):

J. Tallis

Date:

6/13/2017

Begin Time:

1315

End Time:

1345

Weather:

Clear

Location: Grenade Range Aquatic Features, Future East Garrison MRA

	Aquatic Feature Number		
	AF09-1A (Restored)	AF09-1B	AF09-2
Water present?	Y / <u>N</u>	Y / <u>N</u>	Y / <u>N</u>
Water depth at deepest point as measured on permanent gauge:	—	—	—
If surface water not present indicate soil conditions:	saturated / moist / <u>dry</u>	saturated / moist / <u>dry</u>	saturated / moist / <u>dry</u> <i>on surface</i>
Water turbidity:	None - Low - Med - High	None - Low - Med - High	None - Low - Med - High
Water pH:	—	—	—
Water surface area (sq. feet)	<u>0</u>	<u>0</u>	<u>0</u>
% ponded with submergent veg.:	—	—	—
% ponded with emergent veg.:	—	—	—
Plant species observed and other observations:	—	—	—
Fauna species observed and other observations:	—	—	—
Other Observations:			

Notes:

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet

Observer(s): J. Tallis

Date: 11/15/2017

Begin Time: 10:30

End Time: 11:00

Weather: Partly cloudy, 78°F

Location: Grenade Range Aquatic Features, Future East Garrison MRA

	Aquatic Feature Number		
	AF09-1A (Restored)	AF09-1B	AF09-2
Water present?	Y/N <input checked="" type="radio"/>	Y/N <input checked="" type="radio"/>	Y/N <input checked="" type="radio"/>
Water depth at deepest point as measured on permanent gauge:	—	—	—
If surface water not present indicate soil conditions:	saturated / moist / <input checked="" type="radio"/> dry	saturated / moist / <input checked="" type="radio"/> dry	saturated / moist / <input checked="" type="radio"/> dry
Water turbidity:	None - Low - Med - High	None - Low - Med - High	None - Low - Med - High
Water pH:	—	—	—
Water surface area (sq. feet)	—	—	—
% ponded with submergent veg.:	—	—	—
% ponded with emergent veg.:	—	—	—
Plant species observed and other observations:	—	—	—
Fauna species observed and other observations:	—	—	—
Other Observations:			

Notes:

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet

Observer(s):

J. Tallis

Date:

12/13/2017

Begin Time:

0900

End Time:

0930

Weather:

Clear, 65°F

Location: Grenade Range Aquatic Features, Future East Garrison MRA

	Aquatic Feature Number		
	AF09-1A (Restored)	AF09-1B	AF09-2
Water present?	Y/N	Y/N	Y/N
Water depth at deepest point as measured on permanent gauge:	—	—	—
If surface water not present indicate soil conditions:	saturated / moist / dry	saturated / moist / dry	saturated / moist / dry
Water turbidity:	None - Low - Med - High	None - Low - Med - High	None - Low - Med - High
Water pH:	—	—	—
Water surface area (sq. feet)	—	—	—
% ponded with submergent veg.:	—	—	—
% ponded with emergent veg.:			
Plant species observed and other observations:	No new species observed. Conditions are very dry and veg has not starting resping to new rain.		
Fauna species observed and other observations:			Recent deer prints in mud.
Other Observations:			

Notes:

Aquatic features may have held water after rains during past month but likely only AF09-2 because it is the wettest.

Appendix C – Aquatic Feature Monitoring and Maintenance Photo-documentation



Photograph 1

Future East
Garrison (FEG)
Munitions Response
Area (MRA),
Grenade Range

Aquatic Feature
AF09-2 (right) and
restored aquatic
feature AF09-1A
during wet season

13 January 2017



Photograph 2

FEG MRA,
Grenade Range

Aquatic Feature
AF09-1B

13 January 2017

FORA ESCA Remediation Program

Appendix C – Aquatic Feature Monitoring and Maintenance Photo-documentation



Photograph 3

FEG MRA,
Grenade Range

Flies on restored
Aquatic Feature
AF09-1A during
wet season

13 January 2017



Photograph 4

FEG MRA,
Grenade Range

Restored Aquatic
Feature AF09-1A

2 February 2017

FORA ESCA Remediation Program

Appendix C – Aquatic Feature Monitoring and Maintenance Photo-documentation



Photograph 5

FEG MRA,
Grenade Range

ESCA RP qualified biologist surveying for California tiger salamander and California linderella in restored Aquatic Feature AF09-1A.

25 April 2017



Photograph 6

FEG MRA,
Grenade Range

ESCA RP qualified biologist netting for California tiger salamander and California linderella in control Aquatic Feature AF09-2.

25 April 2017

FORA ESCA Remediation Program

Appendix C – Aquatic Feature Monitoring and Maintenance Photo-documentation



Photograph 7

FEG MRA,
Grenade Range

Native vernal pool
species smooth
goldfields
(*Lasthenia
glaberrima*) and
aquatic pygmy
weed (*Crassula
aquatica*) in
restored Aquatic
Feature AF09-1A

13 June 2017



Photograph 8

FEG MRA,
Grenade Range

Aquatic Feature
AF09-1A shortly
after drying.

13 June 2017

FORA ESCA Remediation Program

Appendix C – Aquatic Feature Monitoring and Maintenance Photo-documentation



Photograph 9

FEG MRA,
Grenade Range

Reference Aquatic
Feature AF09-2
shortly after drying.

13 June 2017



Photograph 10

FEG MRA,
Grenade Range

Reference Aquatic
Feature AF09-1B.

13 June 2017

FORA ESCA Remediation Program

Appendix C – Aquatic Feature Monitoring and Maintenance Photo-documentation



Photograph 11

FEG MRA,
Grenade Range

Reference Aquatic
Feature AF09-2
during fall.

15 November 2017



Photograph 12

FEG MRA,
Grenade Range

Restored Aquatic
Feature AF09-1A
during fall and prior
to filling.

15 November 2017

FORA ESCA Remediation Program

Table D-1
2017 Weed Monitoring and Maintenance

2017 Annual Natural Resource Report - Appendix D

Date	MRA	Location	Type	Findings	Treatment
3/29/2017	IAR	Range 47	Monitoring	-A few young pampas grass plants observed. -Iceplant observed in south Range 47 above escarpment.	NA
4/10/2017	FEG	East Habitat Parcel	Monitoring and treatment	-French broom seedlings observed. -Veldt grass plants observed in FEG in northeast corner where they have been observed just outside the MRA during prior year monitoring.	-All French broom hand pulled. -All veldt grass plants in FEG MRA hand pulled.
6/13/2017	FEG	Grenade Range	Monitoring and treatment	-Minimal recruitment of iceplant seedlings, mainly on eastern slope. -Capetown grass (<i>Tribolium oblitterum</i>) widespread.	-8 iceplant seedlings hand pulled.
9/25/2017	SEA	Blue line road	Monitoring and treatment	-Iceplant present between blue line road and the Natural Resource Management Area fence line. -About 10 pampas grass adults present in northeast end of MRA.	-Spray all iceplant and pampas grass between blue line road and the Natural Resource Management Area fence line using 3% glyphosate.
9/26/2017	SEA	Blue line road	Treatment	-	-Spray all iceplant and pampas grass between blue line road and the Natural Resource Management Area fence line using 3% glyphosate.

Table D-1
2017 Weed Monitoring and Maintenance

2017 Annual Natural Resource Report - Appendix D

Date	MRA	Location	Type	Findings	Treatment
9/27/2017	SEA	Blue line road	Treatment	-	-Spray all iceplant and pampas grass between blue line road and the Natural Resource Management Area fence line using 3% glyphosate.
9/27/2017	PF	Bat Wing	Monitoring and treatment	-6 pampas grass flower south of Eucalyptus road.	-Spray all pampas grass individuals (6) using 3% glyphosate.
9/27/2017	IAR	Range 47 and development parcel	Monitoring and treatment	-10 non-flowering pampas grass individuals observed. -iceplant present above escarpment in south Range 47.	-Spray all pampas grass and iceplant using 3% glyphosate.
9/27/2017	MOUT	Central developed area	Monitoring and treatment	-Flowering and non-flowering	-Spray pampas grass and French broom using 3% glyphosate.
9/27/2017	FEG	Grenade Range and east habitat parcel	Monitoring and treatment	-Flowering and non-flowering pampas grass observed between Ammo Supply Point and grenade range	-Spray pampas grass individuals using 3% glyphosate.

Table D-1
2017 Weed Monitoring and Maintenance

2017 Annual Natural Resource Report - Appendix D

Date	MRA	Location	Type	Findings	Treatment
CNPS Rapid Assessment forms for measuring target weeds in areas without annual vegetation monitoring					
8/11/2017	IAR	North Range 44	Monitoring	-Conduct CNPS Rapid Assessment form #IARN0001 -0% cover of ice plant, pampas grass, and French broom in 400 square meter survey area.	NA
8/11/2017	IAR	North Range 44	Monitoring	-Conduct CNPS Rapid Assessment form #IARN0002 -2% ice plant cover in 400 square meter survey area. 0% cover pampas grass and French broom.	NA
8/11/2017	IAR	North Range 44	Monitoring	-Conduct CNPS Rapid Assessment form #IARN0003 -0% cover of ice plant, pampas grass, and French broom in 400 square meter survey area.	NA
8/11/2017	IAR	North Range 44	Monitoring	-Conduct CNPS Rapid Assessment form #IARN0004 -0% cover of ice plant, pampas grass, and French broom in 400 square meter survey area.	NA
8/11/2017	IAR	North Range 44	Monitoring	-Conduct CNPS Rapid Assessment form #IARN0005 -0% cover of ice plant, pampas grass, and French broom in 400 square meter survey area.	NA

Table D-1
2017 Weed Monitoring and Maintenance

2017 Annual Natural Resource Report - Appendix D

Date	MRA	Location	Type	Findings	Treatment
11/15/2017	IAR	Range 47	Monitoring	-Conduct CNPS Rapid Assessment form #IARR4701 -0.1% cover of ice plant in 400 square meter survey area. -0% cover pampas grass and French broom	NA
11/15/2017	IAR	Range 47	Monitoring	-Conduct CNPS Rapid Assessment form #IARR4702 -<1% cover of ice plant in 400 square meter survey area. -0% cover pampas grass and French broom	NA
11/15/2017	IAR	Range 47	Monitoring	-Conduct CNPS Rapid Assessment form #IARR4701 -0.1% cover of ice plant in 400 square meter survey area. -0% cover pampas grass and French broom	NA
11/15/2017	IAR	Range 47	Monitoring	-Conduct CNPS Rapid Assessment form #IARR4704 -0% cover of ice plant, pampas grass, and French broom in 400 square meter survey area.	NA
11/15/2017	IAR	Range 47	Monitoring	-Conduct CNPS Rapid Assessment form #IARN0002 -2% ice plant cover in 400 square meter survey area. 0% cover pampas grass and French broom.	NA

Table D-1
2017 Weed Monitoring and Maintenance

2017 Annual Natural Resource Report - Appendix D

Date	MRA	Location	Type	Findings	Treatment
4/27/2017	IAR	South Range 44	Monitoring	-Conduct CNPS Rapid Assessment form #IARS0001 -1% cover of ice plant in 400 square meter survey area. -0% cover pampas grass and French broom	NA
4/27/2017	IAR	South Range 44	Monitoring	-Conduct CNPS Rapid Assessment form #IARS0002 -0% cover of ice plant, pampas grass, and French broom in 400 square meter survey area.	NA
11/15/2017	IAR	South Range 44	Monitoring	-Conduct CNPS Rapid Assessment form #IARS0003 -1% cover of ice plant in 400 square meter survey area. -0% cover pampas grass and French broom	NA
11/15/2017	IAR	South Range 44	Monitoring	-Conduct CNPS Rapid Assessment form #IARS0004 -1% cover of ice plant in 400 square meter survey area. -0% cover pampas grass and French broom	NA
11/15/2017	IAR	South Range 44	Monitoring	-Conduct CNPS Rapid Assessment form #IARS0005 -1% cover of ice plant in 400 square meter survey area. -0% cover pampas grass and French broom	NA

IAR-R47 Erosion Monitoring Date: 3/29/2017

Weed

1-2
pampas

3-5
pampas

ice plant
in very cut
areas

1 pampas

1 pampas

check if this area very cut

ESCA RP at the Former Fort Ord
Weed Management Program
Target Weed Monitoring and Treatment Field Form

Date: <i>April 10, 2017</i>	Time begin monitoring/treatment: <i>10:00</i>	Time end monitoring/treatment: <i>10:30</i>
Observer(s) - please list all persons present: <i>J. Tallis, C. Nicely</i>		
Weather conditions: <i>Clear, 60°F</i>		
General location (MRA, nearby crossroads, etc): <i>E. habitat</i>	Specific location description: <i>NE corner</i>	
Coordinates: <i>parcel</i>		
Describe any ongoing human disturbance in location where infestation occurs along with any related observations: <i>Near gas pipeline corridor</i>		
Target (or other highly invasive) weed species observed: <i>French broom</i>		
Diagnostic features observed: <i>Flowering!</i>		
Estimated population size:	<i>1</i>	<i>2-30</i>
31-100	101-500	>500
Proportion of population with reproductive structures (indicate buds, flowers, fruits):	<1%	1-10%
11-25%	26-50%	<i>>50%</i>
Surrounding vegetation type: <i>Maritime chaparral + oak woodland</i>		
Wildlife observed in area (if relevant to weed treatment efforts):		
Weed treatment activities: <i>All French broom hand pulled</i>		
Photographs:		
Notes, non-target weeds observed or treated: <i>7 velvet grass plants / clumps hand pulled in NE corner of MRA</i>		
Followup activities and dates:		

ESCA RP at the Former Fort Ord
Weed Management Program
Target Weed Monitoring and Treatment Field Form

Date: 6/13/2017	Time begin monitoring/treatment: 13:30	Time end monitoring/treatment: 13:50
Observer(s) - please list all persons present: J. Tallis		
Weather conditions: Clear		
General location (MRA, nearby crossroads, etc): FEG	Specific location description: Grenade Range	
Coordinates: -		
Describe any ongoing human disturbance in location where infestation occurs along with any related observations: None		
Target (or other highly invasive) weed species observed: Iceplant		
Diagnostic features observed: Non-flowering plant		
Estimated population size:	1	2-30
31-100	101-500	>500
Proportion of population with reproductive structures (indicate buds, flowers, fruits):	<1%	1-10%
11-25%	26-50%	>50%
Surrounding vegetation type: Central Maritime Vegetation Chaparral		
Wildlife observed in area (if relevant to weed treatment efforts): -		
Weed treatment activities: 8 iceplant seedlings hand pulled		
Photographs: yes		
Notes, non-target weeds observed or treated: Capetown grass (Tribolium abigerum)		
Followup activities and dates: -		

ESCA RP at the Former Fort Ord
Weed Management Program
Target Weed Monitoring and Treatment Field Form

Date: 9/25-27/2017	Time begin monitoring/treatment: 0700	Time end monitoring/treatment: 16:00
Observer(s) - please list all persons present: J. Tallis, Jose Martinez, Benny Martinez		
Weather conditions: Clear		
General location (MRA, nearby crossroads, etc): SEA	Specific location description: Blue line Road	
Coordinates: -		
Describe any ongoing human disturbance in location where infestation occurs along with any related observations: Road has been graded, removing much ice plant		
Target (or other highly invasive) weed species observed: Ice plant, pampas grass		
Diagnostic features observed: Pampas was beginning to flower		
Estimated population size:	1	(2-30) → Pampas
31-100	101-500	(>500) → ice plant
Proportion of population with reproductive structures (indicate buds, flowers, fruits):	<1%	(1-10%) ice plant
11-25%	26-50%	(>50%) Pampas
Surrounding vegetation type: Central Maritime chaparral		
Wildlife observed in area (if relevant to weed treatment efforts): -		
Weed treatment activities: Ice plant and pampas sprayed with 3% glyphosate for 3 days		
Photographs: yes		
Notes, non-target weeds observed or treated: -		
Followup activities and dates: -		

ESCA RP at the Former Fort Ord
Weed Management Program
Target Weed Monitoring and Treatment Field Form

Date: 9/27/2017	Time begin monitoring/treatment: 0900	Time end monitoring/treatment: 10:00
Observer(s) - please list all persons present: J. Tallis, J. Martinez, B. Martinez		
Weather conditions: Clear		
General location (MRA, nearby crossroads, etc): IAR	Specific location description: Range 47 and development parcel	
Coordinates: —		
Describe any ongoing human disturbance in location where infestation occurs along with any related observations: No		
Target (or other highly invasive) weed species observed: Iceplant and pampas grass		
Diagnostic features observed:		
Estimated population size:	1	2-30 pampas
31-100 iceplant	101-500	>500
Proportion of population with reproductive structures (indicate buds, flowers, fruits):	<1%	1-10% iceplant + pampas-
11-25%	26-50%	>50%
Surrounding vegetation type: Central Maritime Chaparral		
Wildlife observed in area (if relevant to weed treatment efforts):		
Weed treatment activities: Spray w/ 3% glyphosate		
Photographs: yes		
Notes, non-target weeds observed or treated: —		
Followup activities and dates: —		

ESCA RP at the Former Fort Ord
Weed Management Program
Target Weed Monitoring and Treatment Field Form

Date: 9/27/2017	Time begin monitoring/treatment: 9:30	Time end monitoring/treatment: 10:00
Observer(s) - please list all persons present: J. Tallis, J. Martinez, B. Martinez		
Weather conditions: Clear		
General location (MRA, nearby crossroads, etc): PF	Specific location description: Bat wing (south PF)	
Coordinates: 36.628103, -121.791420		
Describe any ongoing human disturbance in location where infestation occurs along with any related observations: —		
Target (or other highly invasive) weed species observed: Pampas grass		
Diagnostic features observed: —		
Estimated population size:	1	2-30
31-100	101-500	>500
Proportion of population with reproductive structures (indicate buds, flowers, fruits):	<1%	1-10%
11-25%	26-50%	>50%
Surrounding vegetation type: Central Maritime Chaparral		
Wildlife observed in area (if relevant to weed treatment efforts): —		
Weed treatment activities: Spray all (6) pampas grass plants with 3% glyphosate		
Photographs: yes		
Notes, non-target weeds observed or treated: —		
Followup activities and dates: —		

ESCA RP at the Former Fort Ord
Weed Management Program
Target Weed Monitoring and Treatment Field Form

Date: 9/27/2017	Time begin monitoring/treatment: 10:30	Time end monitoring/treatment: 11:00
Observer(s) - please list all persons present: J. Tallis, J. Martinez, B. Martinez		
Weather conditions: Clear		
General location (MRA, nearby crossroads, etc): FEG	Specific location description: Barlog Canyon Rd. and	
Coordinates: —	East Habitat Parcel	
Describe any ongoing human disturbance in location where infestation occurs along with any related observations: Vegetation removal due to Army remediation		
Target (or other highly invasive) weed species observed: Ice plant, pampas grass, French broom		
Diagnostic features observed: —		
Estimated population size:	1	2-30 Pampas
31-100 Ice plant	101-500	>500
Proportion of population with reproductive structures (indicate buds, flowers, fruits):	<1%	1-10%
11-25%	26-50%	>50%
Surrounding vegetation type: Central Maritime Chaparral		
Wildlife observed in area (if relevant to weed treatment efforts):		
Weed treatment activities:		
Photographs:		
Notes, non-target weeds observed or treated: Acacia sp observed		
Followup activities and dates: A		

ESCA RP at the Former Fort Ord
Weed Management Program
Target Weed Monitoring and Treatment Field Form

Date: 9/27/2017	Time begin monitoring/treatment: 1400	Time end monitoring/treatment: 1500
Observer(s) - please list all persons present: J. Tallis, B. Martiney, J. Martiney		
Weather conditions: Clear, 70's °F		
General location (MRA, nearby crossroads, etc): MOUT	Specific location description: South side	
Coordinates: 36.617602, -121.754615		
Describe any ongoing human disturbance in location where infestation occurs along with any related observations: —		
Target (or other highly invasive) weed species observed: Pampas grass and French broom		
Diagnostic features observed: Mature plants		
Estimated population size:	1	(2-30) Pampas grass
(31-100) French broom	101-500	>500
Proportion of population with reproductive structures (indicate buds, flowers, fruits):	(<u><1%</u>) French broom	1-10%
11-25%	26-50%	(<u>>50%</u>) Pampas grass
Surrounding vegetation type: Central Maritime Chaparral		
Wildlife observed in area (if relevant to weed treatment efforts): —		
Weed treatment activities: Spray broom + pampas w/ 3% glyphosate		
Photographs: yes		
Notes, non-target weeds observed or treated: —		
Followup activities and dates: —		

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			circle: Relevé or RA
Database #: IARS0001	Date: 4/27/2017	Name of recorder: Joshua Tallis	
	Location Name: IAR-SR44	Other surveyors: Cynthia Nicely	
GPS name: Garmin 78sc		For Relevé only: Bearing°, left axis at ID point ____ of Long / Short side	
UTME	UTMN	Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____	
Decimal degrees: LAT 36.37.130		LONG 121.47.400	
GPS within stand? (Yes) / No		If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____	
and record: Base point ID ____		Projected UTM: UTME ____ UTMN ____	
Camera Name: JT iPhone		Cardinal photos at ID point: North and South ends	
Other photos:			
Stand Size (acres): <1, (1-5) , >5		Plot Size (m²): 100 / 400 Plot Shape 3 x 132 m RA Radius ____ m	
Exposure, Actual °: 0 NE NW SE SW Flat Variable Steepness, Actual °: ____ 0° (1-5°) >5-25° >25			
Topography: Macro: top upper mid (lower) bottom		Micro: convex flat concave (undulating)	
Geology code: DUNE Soil Texture code: SAND		Upland or Wetland/Riparian (circle one)	
% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)			
H20: 0 BA Stems: 1 Litter: 1 Bedrock: 0 Boulder: 0 Stone: 0 Cobble: 0 Gravel: 0 Fines: 98=100%			
% Current year bioturbation 0 Past bioturbation present? Yes / (No) % Hoof punch 0			
Fire evidence: Yes / (No) (circle one) If yes, describe in Site history section, including date of fire, if known.			
Site history, stand age, comments: All vegetation cut in 2011.			
Disturbance code / Intensity (L,M,H): ____ / ____ / ____ "Other" Vegetation cutting/H			
II. HABITAT DESCRIPTION			
Tree DBH: T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)			
Shrub: S1 seedling (<3 yr. old), (S2) young (<1% dead), (S3) mature (1-25% dead), S4 decadent (>25% dead)			
Herbaceous: (H1) (<12" plant ht.), H2 (>12" ht.)			
Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)			
Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)			
III. INTERPRETATION OF STAND			
Field-assessed vegetation Alliance name: Arctostaphylos tomentosa shrubs alliance			
Field-assessed Association name (optional):			
Adjacent Alliances/direction:			
Confidence in Alliance identification: L M (H) Explain: Used MCV in field			
Phenology (E,P,L): Herb P Shrub P Tree ____ Other identification or mapping information:			

Database #: LARS00001

(Revised April 28, 2016)

SPECIES SHEET

% Cover -

Conifer tree / Hardwood tree:

% NonVasc cover: 0 Total % Vasc Veg cover: 50


Regenerating Tree:

Shrub: 49

Herbaceous:

Height Class - Conifer tree / Hardwood tree:

Regenerating Tree:

Shrub: 

Herbaceous:

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

[illegible]

Unusual species:

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised April 28, 2016)

For Office Use:	Final database #: <u>1AR 000</u>	Final vegetation type: Alliance Association	
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			circle: Relevé or <u>RA</u>
Database #: <u>1ARS0002</u>	Date: <u>4/27/17</u>	Name of recorder: <u>Alysha Nicely</u>	
	Location Name:	Other surveyors: <u>Joshua Tallis</u>	
GPS name: <u>GARMIN 785C</u>		For Relevé only: Bearing°, left axis at ID point _____ of Long / Short side	
UTME _____ UTMN _____		Zone: <u>11</u> NAD83 GPS error: ft./ m./ PDOP _____	
Decimal degrees: LAT <u>36.37.323</u>		LONG <u>121.47.335</u>	
GPS within stand? <u>Yes</u> / No If No, cite from GPS to stand: distance (m) _____ bearing ° _____ inclination ° _____			
and record: Base point ID _____ Projected UTM's: UTM _____ UTMN _____			
Camera Names: <u>iPhone</u>		Cardinal photos at ID point: <u>North & South points towards plot</u>	
Other photos: <u>CD4JT</u>			
Stand Size (acres): <u><1, 1-5, >5</u> Plot Size (m²): <u>100 / 400</u> Plot Shape <u>10 x 132m</u> RA Radius _____ m			
Exposure, Actual °: <u>75</u> <u>NE</u> NW SE SW Flat Variable Steepness, Actual °: _____ 0° <u>1-5°</u> >5-25° >25			
Topography: Macro: top upper <u>mid</u> lower bottom Micro: convex flat concave <u>undulating</u>			
Geology code: <u>DUNE</u> Soil Texture code: <u>SAND</u> <u>Upland</u> or Wetland/Riparian (circle one)			
% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)			
H2O: <u>X</u> BA Stems: <u>1</u> Litter: <u>2</u> Bedrock: <u>X</u> Boulder: <u>X</u> Stone: <u>X</u> Cobble: <u>X</u> Gravel: <u>X</u> Fines: <u>97</u> =100%			
% Current year bioturbation <u>X</u> Past bioturbation present? Yes / <u>No</u> % Hoof punch <u>X</u>			
Fire evidence: Yes / <u>No</u> (circle one) If yes, describe in Site history section, including date of fire, if known.			
Site history, stand age, comments: <u>Vegetation cutting occurred in 2011/2012</u>			
Disturbance code / Intensity (L,M,H): _____ / _____ / _____ / _____ / _____ "Other" Vegetation cutting/H			
II. HABITAT DESCRIPTION			
Tree DBH : <u>T1</u> (<1" dbh), <u>T2</u> (1-6" dbh), <u>T3</u> (6-11" dbh), <u>T4</u> (11-24" dbh), <u>T5</u> (>24" dbh), <u>T6</u> multi-layered (T3 or T4 layer under T5, >60% cover)			
Shrub: <u>S1</u> seedling (<3 yr. old), <u>S2</u> young (<1% dead), <u>S3</u> mature (1-25% dead), <u>S4</u> decadent (>25% dead)			
Herbaceous: <u>H1</u> (<12" plant ht.), <u>H2</u> (>12" ht.)			
Desert Riparian Tree/Shrub: <u>1</u> (<2ft. stem ht.), <u>2</u> (2-10ft. ht.), <u>3</u> (10-20ft. ht.), <u>4</u> (>20ft. ht.)			
Desert Palm/Joshua Tree: <u>1</u> (<1.5" base diameter), <u>2</u> (1.5-6" diam.), <u>3</u> (>6" diam.)			
III. INTERPRETATION OF STAND			
Field-assessed vegetation Alliance name: <u>Adenostoma fasciculatum Salvia mellifera Shrubland Alliance</u>			
Field-assessed Association name (optional): _____			
Adjacent Alliances/direction: _____ / _____ / _____			
Confidence in Alliance identification: L M <u>H</u> Explain: _____			
Phenology (E,P,L): Herb <u>P</u> Shrub <u>P</u> Tree <u>NA</u> Other identification or mapping information: _____			

(Revised April 28, 2016)

SPECIES SHEET

% NonVasc cover: 1 Total % Vasc Veg cover: 62

Regenerating Tree: 0 Shrub: 59 Herbaceous: 3

Regenerating Tree: MA Shrub: 2 Herbaceous: 1

□ □ □

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

7	
7	
18	18
2	
18	18
	3
	2
	2

Unusual species:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			circle: Relevé or RA
Database #: IAR50003	Date: 11/15/2017	Name of recorder: Joshua Tallis	
	Location Name: IAR-SR44	Other surveyors:	
GPS name: JT iPhone 7+		For Relevé only: Bearing°, left axis at ID point ____ of Long / Short side	
UTME ____ UTMN ____		Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____	
Decimal degrees: LAT 36.620009		LONG 121.790699	
GPS within stand? Yes / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____			
and record: Base point ID ____ Projected UTM: UTM ____ UTMN ____			
Camera Name: JT iPhone Cardinal photos at ID point: N + S ends			
Other photos: ____			
Stand Size (acres): <1 , 1-5, >5 Plot Size (m²): 400 Plot Shape 3 x 32 m RA Radius ____ m			
Exposure, Actual °: 360 NE NW SE SW Flat Variable Steepness, Actual °: ____ 0° 1-5° > 5-25° > 25			
Topography: Macro: top upper mid lower bottom Micro: convex flat concave undulating			
Geology code: DUNE Soil Texture code: SAND Upland or Wetland/Riparian (circle one)			
% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)			
H2O: 0 BA Stems: 1 Litter: 6 Bedrock: 0 Boulder: 0 Stone: 0 Cobble: 0 Gravel: 0 Fines: 93 =100%			
% Current year bioturbation 6 Past bioturbation present? Yes / No % Hoof punch ____			
Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.			
Site history, stand age, comments: Top 6 inches of soil removed in 2011			
Disturbance code / Intensity (L,M,H): ____ / ____ / ____ "Other" Veg removal, NA			
II. HABITAT DESCRIPTION			
Tree DBH: T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)			
Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)			
Herbaceous: H1 (<12" plant ht.), H2 (>12" ht.)			
Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)			
Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)			
III. INTERPRETATION OF STAND			
Field-assessed vegetation Alliance name: Arctostaphylos tomentosa shrub alliance			
Field-assessed Association name (optional): ____			
Adjacent Alliances/direction: ____			
Confidence in Alliance identification: L M H Explain: Surrounding veg undisturbed.			
Phenology (E,P,L): Herb L Shrub P Tree ____ Other identification or mapping information: ____			

Database #:

(Revised April 28, 2016)

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 Total % Vasc Veg cover: 19

% Cover - Conifer tree / Hardwood tree: 0 / 0 Regenerating Tree: 1 Shrub: 11 Herbaceous: 8

Height Class - Conifer tree / Hardwood tree: 1 / 1 Regenerating Tree: 1 Shrub: 1 Herbaceous: 1

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
A	<i>Acrotaphus pumila</i>	3		
A	<i>Acrotaphus tomentosa</i>	4		<i>ssp. tomentosa</i>
A	<i>Salvia mellifera</i>	3		
E	<i>Eriogonum fasciculatum</i>	1		
H	<i>Horkelia cuneata</i>	3		
A	<i>Ceanothus rigidus</i>	21		
H	<i>Crocanthemum scoparium</i>	1		
H	<i>Gnaphalium glaberrimum</i>	1		
H	<i>Eriophyllum confertiflorum</i>	3		
<p>No iceplant, pampas grass or French broom</p>				

Unusual species:

(Revised April 28, 2016)

[illegible]

Combined Vegetation Rapid Assessment and Relevé Field Form

Database #: 1AR50004

(Revised April 28, 2016)

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% Cover - Conifer tree / Hardwood tree: 0/0 Regenerating Tree: - Shrub: 15 Herbaceous: 6
 Height Class - Conifer tree / Hardwood tree: -1- Regenerating Tree: 3 Shrub: 1 Herbaceous: 1
 Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = Sapling, E = Seedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
A	Arctostaphylos tomentosa	6		sap. tomentosa
A	Ceanothus dentatus	2		
H	Eriophyllum confertifolium	2		
S	Ceanothus rigidus	1		
H	Navaretia humata	<1		
H	Groenlandia scoparium	2		
H	Carex globosa	<1		
A	Baccharis pilularis	1		
A	Salvia mellifera	2		
A	Arctostaphylos pumila	3		
H	Horkelia cuneata	1		
H	Acmispon glaber	1		

No iceplant, pampas
grass, or French broom

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			circle: Relevé or <u>RA</u>
Database #:	Date:	Name of recorder:	Other surveyors:
<u>IAR SP005</u>	<u>11/15/2017</u>	<u>J. Tallis</u>	
Location Name: <u>IAR-SR44</u>			
GPS name: <u>JT iPhone 7+</u>		For Relevé only: Bearing°, left axis at ID point _____ of Long / Short side	
UTME _____		UTMN _____ Zone: 11 NAD83 GPS error: ft./ m./ PDOP _____	
Decimal degrees: LAT <u>36.619802</u> LONG <u>121.791726</u>			
GPS within stand? <u>Yes</u> / No If No, cite from GPS to stand: distance (m) _____ bearing ° _____ inclination ° _____			
and record: Base point ID _____ Projected UTMs: UTME _____ UTMN _____			
Camera Name: <u>JT iPhone</u> Cardinal photos at ID point: <u>ends of transect, N + S.</u>			
Other photos: _____			
Stand Size (acres): <1, <u>1-5</u> , >5 Plot Size (m²): <u>100 / 400</u> Plot Shape <u>3 x 132</u> m RA Radius _____ m			
Exposure, Actual °: <u>360</u> NE NW SE SW Flat Variable Steepness, Actual °: _____ 0° <u>1-5°</u> <u>>5-25°</u> >25			
Topography: Macro: top <u>upper</u> mid lower bottom Micro: <u>convex</u> flat concave undulating			
Geology code: <u>DUNE</u> Soil Texture code: <u>SAND</u> Upland or Wetland/Riparian (circle one)			
% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)			
H2O: <u>0</u> BA Stems: <u>4</u> Litter: <u>1</u> Bedrock: <u>0</u> Boulder: <u>0</u> Stone: <u>0</u> Cobble: <u>0</u> Gravel: <u>0</u> Fines: <u>99</u> =100%			
% Current year bioturbation <u>0</u> Past bioturbation present? Yes / <u>No</u> % Hoof punch _____			
Fire evidence: Yes / <u>No</u> (circle one) If yes, describe in Site history section, including date of fire, if known.			
Site history, stand age, comments:			
<u>Top 6 inches of soil and all veg removed in 2011</u>			
Disturbance code / Intensity (L,M,H): _____ / _____ / _____ "Other" <u>Veg removal / NA</u>			
II. HABITAT DESCRIPTION			
Tree DBH: <u>T1</u> (<1" dbh), <u>T2</u> (1-6" dbh), <u>T3</u> (6-11" dbh), <u>T4</u> (11-24" dbh), <u>T5</u> (>24" dbh), <u>T6</u> multi-layered (T3 or T4 layer under T5, >60% cover)			
Shrub: <u>S1</u> seedling (<3 yr. old), <u>S2</u> young (<1% dead), <u>S3</u> mature (1-25% dead), <u>S4</u> decadent (>25% dead)			
Herbaceous: <u>H1</u> (<12" plant ht.), <u>H2</u> (>12" ht.)			
Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)			
Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)			
III. INTERPRETATION OF STAND			
Field-assessed vegetation Alliance name: <u>Arctostaphylos tomentosa shrubland Alliance</u>			
Field-assessed Association name (optional): _____			
Adjacent Alliances/direction: _____			
Confidence in Alliance identification: L M <u>H</u> Explain: <u>Nearby veg is undisturbed</u>			
Phenology (E,P,L): Herb <u>L</u> Shrub <u>P</u> Tree _____ Other identification or mapping information: _____			

Database #: LAR 80005

SPECIES SHEET

% Cover - Conifer tree / Hardwood tree:

% NonVasc cover: 0 Total % Vasc Veg cover: 11

% Cover - Conifer tree / Hardwood tree: 0/0 Regenerating Tree: 0 Shrub: 7 Herbaceous: 4

Height Class - Conifer tree / Hardwood tree: — / — Regenerating Tree: — Shrub: — Herbaceous: —
 Regenerating Tree: — Shrub: — Herbaceous: —

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
A	<i>Arctostaphylos tomentosa</i>	5		
A	<i>Adenostoma fasciculatum</i>	1		
H	<i>Crocodyloneurum scoparium</i>	2		
E	<i>Mimulus aurantiacus</i>	1		
H	<i>Carex globosa</i>	1		
H	<i>Adonis vernalis</i>	1		
H	<i>Eriophyllum confertiflorum</i>	1		
A	<i>Ceanothus rigidus</i>	1		

No carobrotus/iceplant,
pampas grass, or French broom.

Unusual species:

(Revised April 28, 2016)

Page 1

Database #: IARN0001

SPECIES SHEET

% NonVasc cover: 0 Total % Vasc Veg cover: 64

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Unusual species:

(Revised April 28, 2016)

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Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

Database #: IARN0002

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 Total % Vasc Veg cover: 75

% Cover - Conifer tree / Hardwood tree: 0/0 Regenerating Tree: 0 Shrub: 56 Herbaceous: 19

Height Class - Conifer tree / Hardwood tree: 0+0 Regenerating Tree: — Shrub: 3 Herbaceous: 1

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A=SApling, E=SEedling, S=Shrub, H=Herb, N=Non-vascular

% Cover Intervals for reference: r=trace, +=<1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	<i>Quercus agrifolia</i>	<1		
S	<i>Baccharis pilularis</i>	2		
S	<i>Eriocameria ericoides</i>	6		
S	<i>Arctostaphylos pumila</i>	20		
S	<i>Arctostaphylos tomentosa</i>	2		
S	<i>Franseria californica</i>	2		
S	<i>Crocanthemum scoparium</i>	2		
S	<i>Toxicodendron diversilobum</i>	2		
H	<i>Croton californicus</i>	3		
S	<i>Acnison scoparium</i>	6		
H	<i>Pseudopapilion ramosissimum</i>	1		
H	<i>Lessingia pectinata</i>	3		ssp. pectinata
H	<i>Monardella</i>	<1		
H	<i>Cercaria macrantha</i>	<1		
H	<i>Bromus madriensis</i>	<1		
-	ssp. rubens	#		ssp. rubens
H	<i>Horkelia cuneata</i>	5		
H	<i>Deinandra (yellow) ssp.</i>	2		
H	<i>Navaretia humata</i>	1		
S	<i>Adiantum fasciculata</i>	7		
H	<i>Contarea melitensis</i>	<1		
H	<i>Goser white-leaved</i>	1		
S	<i>Ceanothus rigidus</i>	1		
S	<i>Eriophyllum confertifolium</i>	3		
S	<i>Solanum umbelliferum</i>	3		
S	<i>Ceanothus dentatus</i>	3		
H	<i>Chorizanthe pungens</i>	1		
-	ssp. pungens	<1		
H	<i>Carpobrotus edulis</i>	2		

2% iceplant, 0% ↓ pampas grass, and French broom

Unusual species:

(Revised April 28, 2016)

[illegible]

(Revised April 28, 2016)

SPECIES SHEET

% NonVasc cover: _____ Total % Vasc Veg cover: _____

Height Class - Conifer tree / Hardwood tree: — / — Regenerating Tree: — Shrub: — Herbaceous: —

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

Stratum	Species	% cover	C	Final species determination
S	Arctostaphylos pumila	18		
S	A. tridentata dentosa	40		
S	Ceanothus rigidus	6		
S	C. dentatus	6		
S	Adenostoma fasciculatum	7		
S	Salvia mellitara	5.2		
S	Crocanthemum scoparium	6		
H	Hebe cuneata	6		
S	Helianthemum scoparium	2		
H	Chorizanthe diffusa	<1		
H	Chorizanthe pungens ssp.	<1		
-	pungens	-		
H	Navaretia laevis	<1		
S	Quercus agrifolia	1		
S	Toxicodendron diversilobum	3		
S	Eriocaulon ericoides	2		
S	Symphoricarpos mollis	<1		
H	Carex globosa	<1		
H	Aster white-violet	1		
S	Acmispon glaber	6		Corethrogyne filaginifolia

0% ice plant, pampas grass, and French broom.

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(Revised April 28, 2016)

[illegible]

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

Database #: IARN0004

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: _____ Total % Vasc Veg cover: _____

% Cover - Conifer tree / Hardwood tree: 0/0 Regenerating Tree: 0 Shrub: _____ Herbaceous: _____

Height Class - Conifer tree / Hardwood tree: ~ / ~ Regenerating Tree: ~ Shrub: _____ Herbaceous: _____

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A=SAPling, E=SEedling, S=Shrub, H=Herb, N=Non-vascular

% Cover Intervals for reference: r=trace, +=<1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	<i>Quercus agrifolia</i>	5		
S	<i>Heteromeles arbutifolia</i>	3		
S	<i>Arctostaphylos pumila</i>	8		→ 8%
S	<i>Adiantum tamentosa</i>	20		
S	<i>Adiantum fasciculata</i>	14		
S	<i>Ceanothus rigidus</i>	5		
S	<i>C. dentatus</i>	3		
S	<i>Salvia mellifera</i>	22		
S	<i>Ericameria fasciculata</i>	4		
—	<i>Helianthemum scoparium</i>	—		
S	<i>Acnispou glaber</i>	7		
S	<i>Helianthemum scoparium</i>	18		
—	<i>Crocotomum</i>	—		
S	<i>Eriophyllum goniatifolium</i>	4		
H	<i>Navaretia lanata</i>	<1		
H	<i>Horkelia cuneata</i>	10		
H	<i>Aster white-lavender</i>	1		→ <i>Corethrogyne filaginifolia</i>

0% iceplant, pampas grass,
and French broom.

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			circle: Relevé or RA
Database #: 1AR N0005	Date: 8/11/2017	Name of recorder: J. Tallis	
	Location Name: 1AR-NR44	Other surveyors:	
GPS name: ST iPhone 7+		For Relevé only: Bearing°, left axis at ID point ____ of Long / Short side	
UTME 608201 UTMN 4053518		Zone: 18S NAD83 GPS error: ft./ m./ PDOP ____	
Decimal degrees: LAT ____		LONG ____	
GPS within stand? Yes / No		If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____	
and record: Base point ID ____		Projected UTM's: UTME ____ UTMN ____	
Camera Name: ST iPhone		Cardinal photos at ID point: 15:20 N, E, S, W	
Other photos:			
Stand Size (acres): <1 1-5, >5		Plot Size (m²): 100+ 400 Plot Shape 20 x 20 m RA Radius ____ m	
Exposure, Actual °: ____ NE NW SE SW Flat Variable		Steepness, Actual °: ____ 0° 1-5° > 5-25° > 25	
Topography: Macro: top upper mid lower bottom		Micro: convex flat concave undulating	
Geology code: DUNE Soil Texture code: SAND		Upland or Wetland/Riparian (circle one)	
% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)			
H2O: 0 BA Stems: 3 Litter: 27 Bedrock: 0 Boulder: 0 Stone: 0 Cobble: 0 Gravel: 0 Fines: 70 =100%			
% Current year bioturbation 1 Past bioturbation present? Yes / No		% Hoof punch 0	
Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.			
Site history, stand age, comments: Plot veg cut to ground level in 2011/2012.			
Disturbance code / Intensity (L,M,H): ____ / ____ / ____ "Other" Veg cutting/H			
II. HABITAT DESCRIPTION			
Tree DBH: T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)			
Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)			
Herbaceous: H1 (<12" plant ht.), H2 (>12" ht.)			
Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)			
Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)			
III. INTERPRETATION OF STAND			
Field-assessed vegetation Alliance name: Arctostaphylos (tomentosa) Provisional shrub			
Field-assessed Association name (optional): Alliance			
Adjacent Alliances/direction: ____ / ____ / ____			
Confidence in Alliance identification: L M H Explain: ____			
Phenology (E,P,L): Herb L Shrub L Tree L Other identification or mapping information: ____			

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

Database #: LARN0005

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 Total % Vasc Veg cover:

% Cover - Conifer tree / Hardwood tree: 0/0 Regenerating Tree: 0 Shrub: Herbaceous:

Height Class - Conifer tree / Hardwood tree: -/- Regenerating Tree: - Shrub: Herbaceous:

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	Quercus agrifolia	5		
S	Aucostaphylos tanacetosa	38		ssp. tanacetosa
S	A. pumila	22		
S	Salvia mellifera	18		
S	Adenostoma fasciculatum	12		
S	Ceanothus rigidus	4		
S	C. dentatus	3		
S	Crocanthemum scoparium	8		
H	Horsetail	8		
S	Eriophyllum confertifolium	4		
S	Aster white-lavender	1		Corethrogyne filaginifolia
S	Ericameria fasciculata	1		
S	Acmispon glaber	2		
H	Carex glabrata	<1		
H	Nanvetia nanata	<1		

0% Ice Plant, Pampas Grass, and French Broom

Unusual species:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

For Office Use:	Final database #:	Final vegetation type:	Alliance
			Association
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			circle: Relevé or <u>RA</u>
Database #:	Date:	Name of recorder:	
<u>IARR4701</u>	<u>11/15/2017</u>	<u>J. Tallis</u>	
		Other surveyors:	
	Location Name:	<u>IAR - Range 47</u>	
GPS name:	<u>IARR47-01</u>		
	For Relevé only: Bearing°, left axis at ID point ____ of Long / Short side		
UTME	UTMN	Zone:	11 NAD83 GPS error: ft./ m./ PDOP ____
Decimal degrees:	LAT <u>36.623592</u> LONG <u>-121.793920</u>		
GPS within stand?	<u>Yes</u> / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____		
and record:	Base point ID	Projected UTMs:	UTME ____ UTMN ____
Camera Name:	<u>ST iPhone</u> Cardinal photos at ID point: <u>Yes</u>		
Other photos:	____		
Stand Size (acres):	<u><1, 1-5, >5</u>	Plot Size (m²):	100 <u>400m²</u> Plot Shape ____ x ____ m RA Radius <u>1.2</u> m
Exposure, Actual °:	<u>345</u> NE NW SE SW Flat Variable Steepness, Actual °: ____ 0° <u>1-5°</u> > 5-25° > 25		
Topography: Macro:	top upper <u>mid</u> lower bottom Micro: convex <u>flat</u> concave undulating		
Geology code:	<u>DUNE</u> Soil Texture code: <u>SAND</u> <u>Upland</u> or Wetland/Riparian (circle one)		
% Surface cover:	(Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)		
H20:	0	BA Stems:	4 Litter: <u>10</u> Bedrock: ____ Boulder: ____ Stone: ____ Cobble: ____ Gravel: ____ Fines: <u>86</u> =100%
% Current year bioturbation	<u>0</u> Past bioturbation present? Yes / <u>No</u> % Hoof punch ____		
Fire evidence:	Yes / <u>No</u> (circle one) If yes, describe in Site history section, including date of fire, if known.		
Site history, stand age, comments:			
<u>Site bare soil 4 years earlier. All veg has been restored but still @ early successional state.</u>			
Disturbance code / Intensity (L,M,H): ____ / ____ / ____ "Other" <u>Vegetation</u> <u>NA</u>			
II. HABITAT DESCRIPTION			
Tree DBH: <u>T1</u> (<1" dbh), <u>T2</u> (1-6" dbh), <u>T3</u> (6-11" dbh), <u>T4</u> (11-24" dbh), <u>T5</u> (>24" dbh), <u>T6</u> multi-layered (T3 or T4 layer under T5, >60% cover)			
Shrub: <u>S1</u> seedling (<3 yr. old), <u>S2</u> young (<1% dead), <u>S3</u> mature (1-25% dead), <u>S4</u> decadent (>25% dead)			
Herbaceous: <u>H1</u> (<12" plant ht.), <u>H2</u> (>12" ht.)			
Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)			
Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)			
III. INTERPRETATION OF STAND			
Field-assessed vegetation Alliance name: <u>Autostaphylos tomentosa shrubland alliance</u>			
Field-assessed Association name (optional): ____			
Adjacent Alliances/direction: ____			
Confidence in Alliance identification: L M <u>H</u> Explain: <u>Surrounding veg undisturbed.</u>			
Phenology (E,P,L): Herb <u>L</u> Shrub <u>P</u> Tree ____ Other identification or mapping information: ____			

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

SPECIES SHEET

Database #: ARR4701

IV. VEGETATION DESCRIPTION

% Cover - Conifer tree / Hardwood tree: 0/0 % NonVasc cover: 0 Total % Vasc Veg cover: 61
 Regenerating Tree: - Shrub: 53 Herbaceous: 6
 Height Class - Conifer tree / Hardwood tree: -1- Regenerating Tree: - Shrub: 62,3 Herbaceous: 1
 Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = Sapling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	Baccharis pilularis	15		ssp. consanguinea
S	Adenostoma fasciculatum	3		
S	Mimulus aurantiacus	6		
A	Ericameria ericoides	4		
A	Erigeron fasciculatus	1		
A	Salvia mellifera	6		
H	Horkelia cuneata	6		
E	Ceanothus dentatus	2		
E	Ceanothus rigidus	3		
A	Actostaphylos pumila	9		
H	Carpobrotus edulis	0.1		0.1%
H	Crocotomum scoparium	2		
E	Actostaphylos tomentosa	4		ssp. tomentosa

0.1% iceplant cover. No
 pampas grass or French broom

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised April 28, 2016)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			
Database #:	Date:	Name of recorder:	circle: Relevé or (RA)
1ARR4702	11/15/2017	J. Tallis	
Location Name:		Other surveyors:	
Central range 47			
GPS name: 1ARR4702		For Relevé only: Bearing°, left axis at ID point ____ of Long / Short side	
UTME ____		UTMN ____ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____	
Decimal degrees: LAT 36.623482		LONG 121.794866	
GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____			
and record: Base point ID ____ Projected UTM's: UTME ____ UTMN ____			
Camera Name: ST. phone Cardinal photos at ID point: yes			
Other photos: ____			
Stand Size (acres): <1, 1-5, >5 Plot Size (m²): 100 400m² Plot Shape ____ x ____ m RA Radius 11.2m			
Exposure, Actual °: 15 NE NW SE SW Flat Variable Steepness, Actual °: ____ 0° (1-5°) > 5-25° > 25			
Topography: Macro: top upper (mid) lower bottom Micro: convex (flat) concave undulating			
Geology code: DUNE Soil Texture code: SAND (Upland) or Wetland/Riparian (circle one)			
% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)			
H2O: 0 BA Stems: 3 Litter: 9 Bedrock: ____ Boulder: ____ Stone: ____ Cobble: ____ Gravel: ____ Fines: 88 =100%			
% Current year bioturbation 12 Past bioturbation present? Yes / (No) % Hoof punch ____			
Fire evidence: Yes / (No) (circle one) If yes, describe in Site history section, including date of fire, if known.			
Site history, stand age, comments: See form 1ARR4702 01			
Disturbance code / Intensity (L,M,H): ____ / ____ / ____ "Other" veg removal NA			
II. HABITAT DESCRIPTION			
Tree DBH: T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)			
Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)			
Herbaceous: H1 (<12" plant ht.), H2 (>12" ht.)			
Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)			
Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)			
III. INTERPRETATION OF STAND			
Field-assessed vegetation Alliance name: Arctostaphylos tomentosa shrubland alliance			
Field-assessed Association name (optional): ____			
Adjacent Alliances/direction: ____			
Confidence in Alliance identification: L M (H) Explain Surrounding veg undisturbed			
Phenology (E,P,L): Herb L Shrub P Tree ____ Other identification or mapping information: ____			

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

Database #: IARR4702

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 Total % Vasc Veg cover: 66

% Cover - Conifer tree / Hardwood tree: 0/0 Regenerating Tree: - Shrub: 58 Herbaceous: 8

Height Class - Conifer tree / Hardwood tree: -/- Regenerating Tree: - Shrub: 1,2,3 Herbaceous: 1,2

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	<i>Baccharis pilularis</i>	33		
A	<i>Arctostaphylos tomentosa</i>	3		ssp. <i>tomentosa</i>
A	<i>Arctostaphylos pumila</i>	1		
A	<i>Ceanothus rigens</i>	4		
H	<i>Ceanothus densatus</i>	6		
H	<i>Crocanthemum scoparium</i>	3		
H	<i>Hesleria cuneata</i>	3		
H	<i>Heterotheca grandiflora</i>	2		
A	<i>Adenostoma fasciculatum</i>	7		
S	<i>Salvia mellifera</i>	4		
H	<i>Carpobrotus edulis</i>	<1		

<1% Iceplant No pampas grass or French broom

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised April 28, 2016)

For Office Use:		Final database #:		Final vegetation type: Alliance	
				Association	
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION					
Database #: <u>IA4703</u>		Date: <u>11/15/2017</u>		Name of recorder: <u>J. Tallis</u>	
				Other surveyors: <u>—</u>	
		Location Name: <u>AR - Range 47</u>			
GPS name: <u>ARR4703</u>		For Relevé only: Bearing°, left axis at ID point <u>—</u> of Long / Short side			
UTME <u>—</u>		UTMN <u>—</u>		Zone: 11 NAD83 GPS error: ft./m./PDOP <u>—</u>	
Decimal degrees: LAT <u>36.623408</u> LONG <u>-121.796629</u>					
GPS within stand? <u>(Yes)</u> / No If No, cite from GPS to stand: distance (m) <u>—</u> bearing ° <u>—</u> inclination ° <u>—</u>					
and record: Base point ID <u>—</u>		Projected UTMs: UTME <u>—</u>		UTMN <u>—</u>	
Camera Name: <u>ST, Phone</u> Cardinal photos at ID point: <u>Yes</u>					
Other photos: <u>—</u>					
Stand Size (acres): <u>1.5</u> Plot Size (m²): <u>100</u> Plot Shape <u>—</u> x <u>—</u> m RA Radius <u>11.2</u> m					
Exposure, Actual °: <u>360</u> NE NW SE SW Flat Variable Steepness, Actual °: <u>0°</u> 1-5° > 5-25° > 25					
Topography: Macro: top upper mid <u>(lower)</u> bottom Micro: convex <u>(flat)</u> concave undulating					
Geology code: <u>DUNE</u> Soil Texture code: <u>SAND</u> <u>(Upland)</u> or Wetland/Riparian (circle one)					
% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)					
H2O: <u>0</u> BA Stems: <u>3</u> Litter: <u>15</u> Bedrock: <u>0</u> Boulder: <u>0</u> Stone: <u>0</u> Cobble: <u>0</u> Gravel: <u>0</u> Fines: <u>82</u> =100%					
% Current year bioturbation <u>0</u> Past bioturbation present? Yes / <u>(No)</u> % Hoof punch <u>—</u>					
Fire evidence: Yes <u>(No)</u> (circle one) If yes, describe in Site history section, including date of fire, if known.					
Site history, stand age, comments: <u>Veg removed and soil removed and replaced in 2013. Vegetation restored only be seedling.</u>					
Disturbance code / Intensity (L,M,H): <u>—</u> / <u>—</u> / <u>—</u> "Other" <u>Veg Removal NA</u>					
II. HABITAT DESCRIPTION					
Tree DBH: <u>T1</u> (<1" dbh), <u>T2</u> (1-6" dbh), <u>T3</u> (6-11" dbh), <u>T4</u> (11-24" dbh), <u>T5</u> (>24" dbh), <u>T6</u> multi-layered (T3 or T4 layer under T5, >60% cover)					
Shrub: <u>S1</u> seedling (<3 yr. old), <u>S2</u> young (<1% dead), <u>S3</u> mature (1-25% dead), <u>S4</u> decadent (>25% dead)					
Herbaceous: <u>H1</u> (<12" plant ht.), <u>H2</u> (>12" ht.)					
Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)					
Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)					
III. INTERPRETATION OF STAND					
Field-assessed vegetation Alliance name: <u>Arctostaphylos tomentosa shrubland alliance.</u>					
Field-assessed Association name (optional): <u>—</u>					
Adjacent Alliances/direction: <u>—</u>					
Confidence in Alliance identification: L M <u>(H)</u> Explain: <u>Nearby habitat undisturbed</u>					
Phenology (E,P,L): Herb <u>L</u> Shrub <u>P</u> Tree <u>—</u> Other identification or mapping information: <u>—</u>					

Database #: 1ARK4763

SPECIES SHEET

% NonVasc cover: 0 Total % Vasc Veg cover: 55.2

% Cover - Conifer tree / Hardwood tree: 0/0 Regenerating Tree: - Shrub: 47 Herbaceous: 8

Height Class - Conifer tree / Hardwood tree: — / — Regenerating Tree: — Shrub: 12 Herbaceous: 1

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
A	<i>Adenostoma fasciculatum</i>	8		
A	<i>Ericameria ericoides</i>	15		
A	<i>Ceanothus dentatus</i>	12		
A	<i>Ericameria fasciculata</i>	2		
A	<i>Ceanothus rigidus</i>	3		
E	<i>Arctostaphylos tomentosa</i>	1		<i>sep. tomentosa</i>
A	<i>Salvia mellifera</i>	5		
H	<i>Horkelia cuneata</i>	5		
H	<i>Crocunthemum scoparium</i>	3		
E	<i>Mimulus aurantiacus</i>	1		
A	<i>Baccharis pilularis</i>	0.09		$\rightarrow 0.1\%$
H	<i>Carpobrotus edulis</i>	0.01		$\rightarrow 0.1\%$
0.1% Iceplant cover. No pampas grass or French broom.				

Unusual species:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			circle: Relevé or RA
Database #: IARR4704	Date: 4/15/2017	Name of recorder: J. Tallis	
Location Name:		Other surveyors:	
GPS name: IARR4704		For Relevé only: Bearing°, left axis at ID point ____ of Long / Short side	
UTME ____	UTMN ____	Zone: 11 NAD83 GPS error: ft./m./PDOP ____	
Decimal degrees: LAT 36.622461		LONG 121.795506	
GPS within stand? Yes / No		If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____	
and record: Base point ID ____		Projected UTMs: UTME ____ UTMN ____	
Camera Name: iPhone		Cardinal photos at ID point: yes	
Other photos: ____			
Stand Size (acres): <1, 1-5, >5		Plot Size (m²): 100 / 400m² Plot Shape ____ x ____ m RA Radius 11.2 m	
Exposure, Actual °: 350 NE NW SE SW Flat Variable		Steepness, Actual °: ____ 0° 1-5° >5-25° > 25	
Topography: Macro: top upper mid lower bottom		Micro: convex flat concave undulating	
Geology code: DUNE Soil Texture code: SAND		Upland or Wetland/Riparian (circle one)	
% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)			
H2O: 0 BA Stems: 4 Litter: 15 Bedrock: 0 Boulder: 0 Stone: 0 Cobble: 0 Gravel: 6 Fines: 81 =100%			
% Current year bioturbation 0 Past bioturbation present? Yes / No		% Hoof punch ____	
Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.			
Site history, stand age, comments: Soil and veg removed in 2013. Veg restoration planting in 2013			
Disturbance code / Intensity (L,M,H): ____ / ____ / ____ "Other" Veg removed, NA			
II. HABITAT DESCRIPTION			
Tree DBH: T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)			
Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)			
Herbaceous: H1 (<12" plant ht.), H2 (>12" ht.)			
Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)			
Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)			
III. INTERPRETATION OF STAND			
Field-assessed vegetation Alliance name: Arctostaphylos tomentosa shrubland alliance			
Field-assessed Association name (optional): ____			
Adjacent Alliances/direction: ____			
Confidence in Alliance identification: L M H Explain: Nearby veg undisturbed			
Phenology (E,P,L): Herb L Shrub P Tree ____ Other identification or mapping information: ____			

Database #: 1ARR4704

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 Total % Vasc Veg cover: 59

% Cover - Conifer tree / Hardwood tree: 0/0 Regenerating Tree: - Shrub: 52 Herbaceous: 7

Height Class - Conifer tree / Hardwood tree: — / — Regenerating Tree: — Shrub: 1, 2 Herbaceous: 1

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = Sapling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover intervals for reference: 1 = trace, + = 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%							C	Final species determination	
		1	2	3	4	5	6	7			
A	<i>Pracchans pilularis</i>										
A	<i>Ceanothus rigidus</i>										
A	<i>Ceanothus dentatus</i>										
E	<i>Mimulus aurantiacus</i>										
E	<i>Arctostaphylos tomentosa</i>										ssp. <i>tomentosa</i>
A	<i>Salvia mellifera</i>										
A	<i>Ericameria ericoides</i>										
A	<i>Ericameria fasciculata</i>										
H	<i>Carex globosa</i>										
H	<i>Arctostaphylos pumila</i>										
H	<i>Crocantennium sphaerum</i>										
H	<i>Horakia cuneata</i>										
H	<i>Rumex acetosella</i>										

No iceplant, pampas grass, or French broom.

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised April 28, 2016)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			circle: Relevé or <u>RA</u>
Database #: <u>ARR4705</u>	Date: <u>11/15/2017</u>	Name of recorder: <u>J. Tallis</u>	
		Other surveyors:	
Location Name: <u>ARR, Range 47</u>			
GPS name: <u>ARR4705</u>		For Relevé only: Bearing°, left axis at ID point _____ of <u>Long</u> / <u>Short</u> side	
UTME _____		UTMN _____ Zone: <u>11</u> NAD83 GPS error: ft./ m./ PDOP _____	
Decimal degrees: LAT <u>36.623103</u> LONG <u>-121.796962</u>			
GPS within stand? <u>(Yes)</u> / No If No, cite from GPS to stand: distance (m) _____ bearing ° _____ inclination ° _____			
and record: Base point ID _____ Projected UTMs: UTME _____ UTMN _____			
Camera Name: <u>ST. Phone</u> Cardinal photos at ID point: <u>yes</u>			
Other photos: _____			
Stand Size (acres): <1, 1-5, <u>>5</u> Plot Size (m²): <u>100 / 400m²</u> Plot Shape _____ x _____ m RA Radius <u>11.2</u> m			
Exposure, Actual <u>360</u> NE NW SE SW Flat Variable Steepness, Actual °: _____ 0° 1-5° >5-25° >25			
Topography: Macro: top <u>upper</u> mid lower bottom Micro: convex <u>flat</u> concave undulating			
Geology code: <u>DUNE</u> Soil Texture code: <u>SAND</u> <u>Upland</u> or Wetland/Riparian (circle one)			
% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)			
H2O: <u>0</u> BA Stems: <u>4</u> Litter: <u>20</u> Bedrock: _____ Boulder: _____ Stone: _____ Cobble: _____ Gravel: _____ Fines: <u>76</u> =100%			
% Current year bioturbation <u>0</u> Past bioturbation present? Yes / <u>No</u> % Hoof punch _____			
Fire evidence: Yes / <u>No</u> (circle one) If yes, describe in Site history section, including date of fire, if known.			
Site history, stand age, comments: <u>Soil and veg regressed Veg cut to ground level in 2012 and allowed to regrow.</u>			
Disturbance code / Intensity (L,M,H): _____ / _____ / _____ "Other" <u>Veg cut, NA</u>			
II. HABITAT DESCRIPTION			
Tree DBH: <u>T1</u> (<1" dbh), <u>T2</u> (1-6" dbh), <u>T3</u> (6-11" dbh), <u>T4</u> (11-24" dbh), <u>T5</u> (>24" dbh), <u>T6</u> multi-layered (T3 or T4 layer under T5, >60% cover)			
Shrub: <u>S1</u> seedling (<3 yr. old), <u>S2</u> young (<1% dead), <u>S3</u> mature (1-25% dead), <u>S4</u> decadent (>25% dead)			
Herbaceous: <u>H1</u> (<12" plant ht.), <u>H2</u> (>12" ht.)			
Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)			
Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)			
III. INTERPRETATION OF STAND			
Field-assessed vegetation Alliance name: _____			
Field-assessed Association name (optional): _____			
Adjacent Alliances/direction: _____ / _____ / _____			
Confidence in Alliance identification: L M H Explain: _____			
Phenology (E,P,L): Herb <u>L</u> Shrub <u>P</u> Tree _____ Other identification or mapping information: _____			
<u>↳ Herb is largely all dead.</u>			

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised April 28, 2016)

Database #:

ARR4705

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% Cover - Conifer tree / Hardwood tree: 0/0 Regenerating Tree: - Shrub: 67 Herbaceous: 9
 Height Class - Conifer tree / Hardwood tree: -/- Regenerating Tree: - Shrub: 1,2,3 Herbaceous: 1
 Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m
 % NonVasc cover: 0 Total % Vasc Veg cover: 76

Stratum categories: T=Tree, A = Sapling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
A	Arctostaphylos tomentosa	30		ssp. tomentosa
A	Aderostoma fasciculata	10		
H	Acnospora glabra	3		
H	Crocodylus eximius	4		
A	Salvia mellifera	8		
A	Ceanothus dentatus	6		
H	Carpobrotus edulis	2		(Plants have been sprayed w/ glyphosate and are yellowing)
A	Baccharis pilularis	2		
H	Navaretia hawaiiensis	<1		
H	Carex globosa	<1		
E	Ericameria ericoides	1		
A	Ceanothus rigidus	3		
A	Eriophyllum confertifolium	1		
S	Pitcher sage	6		Lepechinia calycina

2% Iceplant cover. No pampas grass or French broom

Unusual species:

Appendix D - Weed Monitoring and Maintenance Photo-documentation



Photograph 1

Seaside Munitions
Response Area
(MRA) North Blue
Line Road

Iceplant along the
Natural Resource
Management Area
boundary sprayed
with 3% glyphosate.

25 September 2017



Photograph 2

Parker Flats MRA
Bat Wing

Individual pampas
grass plants sprayed
with 3% glyphosate.

27 September 2017

FORA ESCA Remediation Program

Appendix D - Weed Monitoring and Maintenance Photo-documentation



Photograph 3

Interim Action
Ranges (IAR) MRA
Range 47

Six pampas grass
seedlings observed
on east end of
Range 47.

13 January 2017



Photograph 4

IAR MRA
Development parcel

Dead pampas grass
recently sprayed
with 3% glyphosate.

15 November 2017

FORA ESCA Remediation Program

Appendix D - Weed Monitoring and Maintenance Photo-documentation



Photograph 5

FEG MRA
Grenade Range

Weed, orange wattle (*Acacia saligna*), seedlings hand pulled in Grenade Range.

15 November 2017



Photograph 6

IAR MRA
Range 47-Subarea C (south side)

Dead and dying iceplant (red) recently sprayed with glyphosate.

15 November 2017

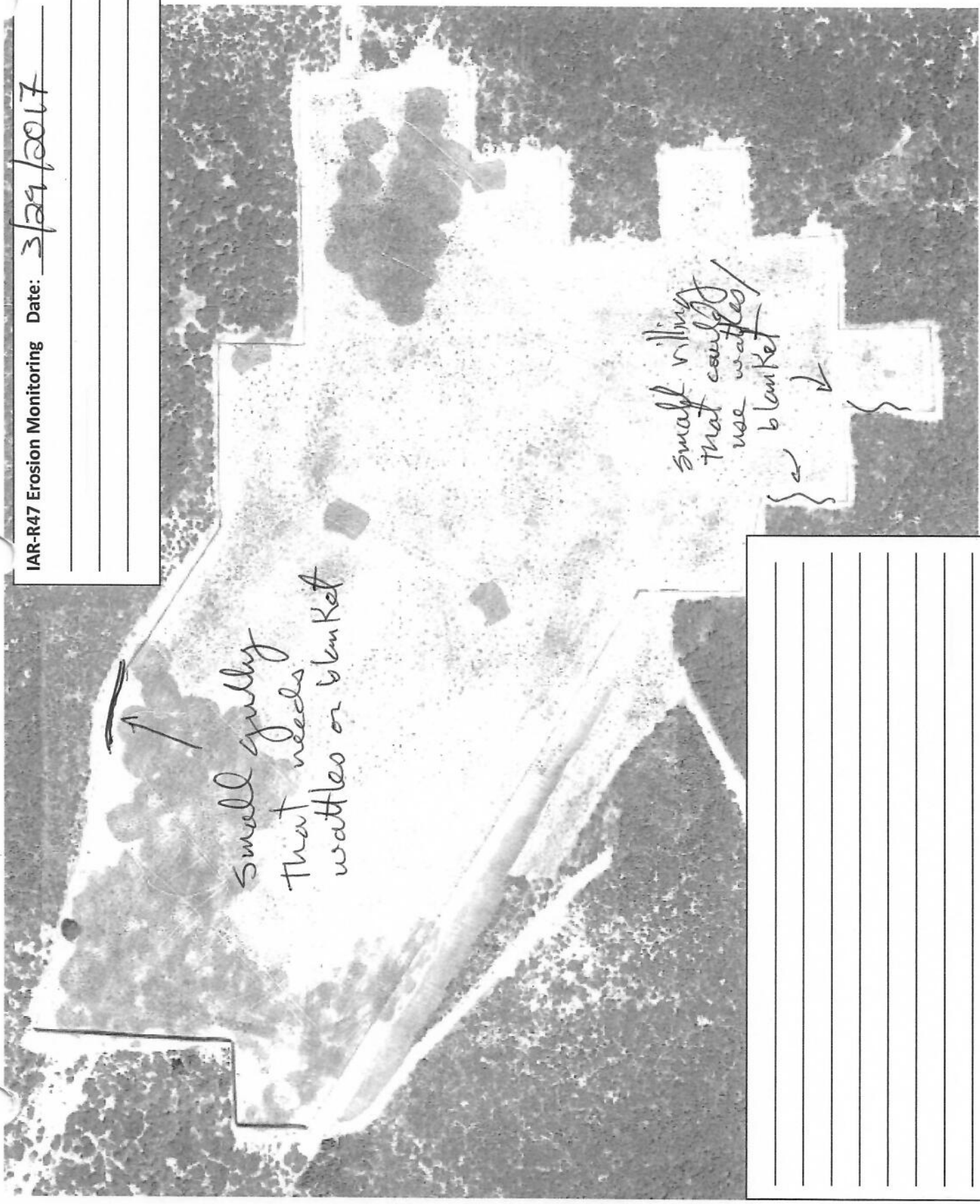
FORA ESCA Remediation Program

Table E-1
2017 Erosion Monitoring and Maintenance

ESCA RP 2017 Annual Natural Resource Report - Appendix E

Date	MRA	Location	Type of Monitoring	Findings	Actions
3/29/2017	IAR	Range 47	Post rain event	-Small gully forming on north side of Range 47. -Small rills on south slope (north facing) that could use some wattles or erosion blanket.	-None
6/13/2017	FEG	Grenade Range	Routine	-Wattles, water bars, and sand bags working properly. -Site is revegetating quickly and more thoroughly than before remediation.	-None

IAR-R47 Erosion Monitoring Date: 3/29/2017



Small gully
that needs
wattles or blanket

small villing
that can't
use waffles/
blanket

ESCA RP Erosion Monitoring Form

Conducted By: J. TallisMonitoring Date: 6/13/2017MRA: FEGWeather: Clear

Type of Monitoring: Pre-rain event - Post rain-event - Routine - Other

1. Existing Erosion/Sediment Control Measures Present? Y or N. If N skip to 2.

Type	Functioning Properly? (Evidence of overtopping, undermining or flow around?)	Need repair or correction?	Comments/Notes
Wattles	<u>Y</u>	<u>N</u>	
Blanket	<u>-</u>	<u>-</u>	
Silt Fence	<u>-</u>	<u>-</u>	
Sand Bags	<u>Y</u>	<u>N</u>	

2. Are there signs of water erosion? Y - N - N/A

Rilling - gully - Loss of fines from surface - Sand/silt deposit in fans/basins

Comments:

3. Are there signs of wind erosion? Y - N - N/A

Loss of fines on surface - Dunes - Soil on leaves - Other

Comments:

4. Are there areas of ponding?

Y/N Size and depth:

5. Work Areas

Stockpiles are surrounded with wattles, covered, compacted, not present? (Circle applicable)

Describe:

6. Do you have other erosion concerns?

No. Site is revegetating well!

Note: Photograph all BMPs and areas where flow might become concentrated. In IAR photograph the steep, bare parts of the development parcel adjacent to range 47.

Appendix E - Erosion Monitoring and Maintenance Photo-documentation



Photograph 1

Interim Action
Ranges (IAR)
Munitions Response
Area (MRA)
Range 47

Erosion control
blanket functioning
as designed after
removal of
perimeter fencing in
the IAR MRA.

13 January 2017



Photograph 2

IAR MRA
Range 47

Water has undercut
straw wattle on
north side of IAR
MRA.

13 January 2017

FORA ESCA Remediation Program

Appendix E - Erosion Monitoring and Maintenance Photo-documentation



Photograph 3

Future East
Garrison (FEG)
MRA
Grenade Range

East facing slope in
Future East
Garrison MRA
Grenade Range is
well vegetated and
stable.

15 November 2017



Photograph 4

FEG MRA
Grenade Range

Remediated Grenade
Range is revegetating
more thoroughly than
prior to grading.

15 November 2017

FORA ESCA Remediation Program

<u>Copies</u>	<u>Name</u>	<u>Organization</u>	<u>Address</u>	<u>City and State</u>	<u>Zip</u>
1	Stan Cook	Fort Ord Reuse Authority	920 2 nd Avenue, Suite A	Marina, CA	93933
1	Michael Houlemard	Fort Ord Reuse Authority	920 2 nd Avenue, Suite A	Marina, CA	93933
5	William K Collins	Department of the Army	BRAC, Bldg. #4463 Gigling Road	Seaside, CA	93955
1	Project File	ARCADIS, Attention: Jane Thompson	100 Smith Ranch Road, Suite 329	San Rafael, CA	94903

Approved:



Christopher G. Spill, P.G.
ESCA Remediation Program Manager
ARCADIS U.S., Inc.