FORA ESCA REMEDIATION PROGRAM

2018 Annual Natural Resource Monitoring, Mitigation, and Management Report Covering Activities Conducted from 1 January 2018 through 31 December 2018

Environmental Services Cooperative Agreement Remediation Program Munitions Response Areas

Former Fort Ord
Monterey County, California

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FORT ORD REUSE AUTHORITY

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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)
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Ranking
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)

LUCs	Land Use Controls
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 2018 through 31 December 2018. 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 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 eleventh in a series of Annual Natural Resource Monitoring, Mitigation, and Management Reports produced for the ESCA RP. The ten previous reports covered the 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, and 2017 reporting periods (ESCA RP Team 2009, 2010a, 2011a, 2012a, 2013b, 2014, 2015, 2016, 2017, and 2018).

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 the Army to provide FORA funding to complete munitions response actions required for remedy implementation. In accordance with the ESCA and an Administrative Order on Consent (AOC), FORA is responsible for completion of CERCLA response actions on approximately 3,300 acres (1351.6 hectares [ha]) of the former Fort Ord with funding provided by the Army, except for those responsibilities 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 2017) 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, CTS, 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 3-1,3-2, and 3-3). 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 comprises 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 2018 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 Brittleleaf -Woolly Leaf Manzanita Chaparral, as characterized by CNPS and California Department of Fish and Wildlife (CDFW; Sawyer et. al 2009). *Arctostaphylos* (*crustacea*, *tomentosa*) Shrubland Alliance has a G3/S3 rarity ranking (21-100 viable occurrences and/or 6,400-32,000 acres [2,590-12,950 ha] worldwide and statewide), as listed in the CDFW Natural Communities Hierarchy (CDFW 2018a) and in California Natural Diversity Database (CNDDB; CDFW 2018b).

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 *Salvia mellifera* Shrubland Alliance has global and state ranks of G4/S4 (greater than 100 viable occurrences and/or greater than 32,000 acres [12,950 ha] worldwide and statewide), as listed in the CDFW Natural Communities Hierarchy (CDFW 2018a) and in CNDDB (CDFW 2018b).

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 (80-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 (*Clinopodium 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 CNDDB 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 32,000 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 6,400-32,000 acres [2,590-12,950 ha]), according to the CDFW (CDFW 2018a).

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 2018.

In general, the annual grassland areas would be classified as Non-Native Grasslands in the CNDDB 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 CNDDB (CDFW 2018b).

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 [0.8 ha]) 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 2018 is provided in the following sections. These MRAs are shown in Figures 3a 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 252 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 acres (71.6 ha) are designated as habitat reserve.

On September 25, 2018, the Army recorded the final remedial decision for the FEG MRA in the Record of Decision, Group 4, Future East Garrison Munitions Response Area ("FEG MRA ROD"; Army 2018), documenting the selected remedial alternative of Land Use Controls (LUCs) for managing the risk to future land users from MEC that potentially remain in the FEG MRA. The LUCs for the FEG MRA are described in the Draft Group 4 Land Use Controls Implementation Plan / Operation and Maintenance Plan, Future East Garrison MRA (ESCA RP Team 2018c). The LUCs include but are not limited to: (1) access management measures in areas designated for habitat reserve; (2) restrictions prohibiting residential use in areas designated for non-residential development reuse or for habitat reserve; and (3) restrictions against uses inconsistent with the HMP (USACE 1997). Uses that are inconsistent with the HMP include, but are not limited to, residential, school and commercial /industrial development.

The Future East Garrison MRA was subjected to several munitions responses (e.g., investigations and removal actions). The actions performed by the Army and FORA resulted in the removal of subsurface MEC and other munitions to the depth of detection from the MRA, with the exception of isolated areas with steep terrain having no evidence of munitions use, and areas under existing roadways, structures, paved areas, and fences. Utility corridors were investigated to the depth of detection using best available and appropriate detection technology; however, utilities were not required to be removed and therefore were left in place. FORA also completed a Residential Quality Assurance Implementation Study in the approximately 58 acres designated for future residential reuse in the Future East Garrison MRA. The Implementation Study included a comprehensive review and assessment of data from previous munitions responses (e.g., investigations and removal actions) to identify residual MEC risks or uncertainties. The Implementation Study confirmed the reliability of the data and effectiveness of previous munitions responses (e.g., investigations and removal actions) and indicated no evidence of remaining military munitions hazards.

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 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 Record of Decision, Interim Action Ranges Munitions Response Area ("IAR MRA ROD": Army 2017), documenting the selected remedial alternative of LUCs 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. The LUCs for the IAR MRA are described in the Final Land Use Controls Implementation Plan / Operation and Maintenance Plan, Interim Action Ranges MRA (ESCA RP Team 2018b). The LUCs include but are not limited to: (1) restrictions prohibiting residential use; and (2) restrictions against uses inconsistent with the HMP (USACE 1997). Uses that are inconsistent with the HMP include, but are not limited to, residential, school and commercial /industrial development.

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 2017) 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 Threatened 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 Team 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 2018.

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 2018.

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 2018.

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 were observed by ESCA RP biologists in two aquatic features in habitat parcels in the FEG MRA during the 2010 aquatic surveys, but were not observed in any of these features in 2011 or subsequent years (ESCA RP Team 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*) – CRPR 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-barked 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). Field 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*) – CRPR 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*) – CRPR 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*) – CRPR 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*) – CRPR 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*) – CRPR 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, 2017, and 2018 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, CRPR 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, CRPR 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 2018, Monterey spineflower was observed by ESCA RP biologists in the FEG and IAR MRAs.

Robust spineflower (*Chorizanthe robusta* var. *robusta*) – Federally Endangered, CRPR 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, CRPR 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 2018, 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, CRPR 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 2018, 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, DR™ 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 m^2]. 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 m^2], 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 2018 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).

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 CNDDB (CDFW 2018b).

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 2018 transects are shown on Figures 6a and 6b.

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 perform munitions investigation in a larger area, successive step-outs were performed on an as-needed basis. This reduced vegetation cutting to only those areas that required 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 (Burleson 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 were 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, 17-19 April; and 2-4 May 2017 (ESCA RP Team 2018a).

2018 – Six Year 8 transects in areas were vegetation was cut in 2010 were monitored on 24, 25, and 26 April 2018.

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:

Vegetation monitoring in the Parker Flats MRA was considered complete in 2017, after eight years of monitoring (ESCA RP Team 2018a). For reporting and tracking purposes monitoring activities between 2008 and 2017 are provided below.

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:

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 on 2 and 4 May 2017.

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 Team 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 6b):

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 6 transects in vegetation-cut areas in South Range 44. An additional 13 Year 5 transects in areas subject to small-scale excavations -- eight in North Range 44 and five in South Range 44 (ESCA RP Team 2018a).

2018 – Twenty-nine transects were monitored on 26 April and on 7, 8, 9, and 10 May 2018. These included eight original and seven additional Year 6 transects in areas subject to small-scale excavations in North Range 44 SCA and five original and nine additional Year 7 transects in South Range 44 SCA and Central Area NCAs. Monitoring results are presented in Appendix A.

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

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 m^2) 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.

In 2018, no supplemental herbaceous vegetation monitoring was conducted in any MRA.

FEG MRA: The six vegetation transects monitored in FEG did not meet the criteria for conducting herbaceous quadrat monitoring (i.e., shrub cover was sufficiently high and herbaceous cover was relatively low).

IAR MRA: Vegetation monitoring in grassland areas the IAR MRA met performance targets for native plant cover in 2017, and monitoring is complete in that area (ESCA RP Team 2018a).

Supplemental herbaceous vegetation monitoring events between 2012 and 2017 described below are provided for reporting and tracking purposes.

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.

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 (Figure 6a).

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. 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.

HMP herbaceous species monitoring in the Parker Flats MRA was complete in 2017.

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). The historical monitoring events described below are included for reporting and tracking purposes.

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.

Between 2014 and 2017, all grids in the FEG MRA were monitored for HMP herbaceous species each spring. In 2018, HMP herbaceous species monitoring was confined to eight grids east of Barloy Road, which had been subject to vegetation cutting in 2013 and represent the remaining Year 5 post-activity areas; no other grids require HMP herbaceous species monitoring in the FEG MRA.

Locations of all grids monitored for HMP herbaceous species in 2018 in the FEG MRA are shown on Figure 6a.

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:

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 (ESCA RP Team 2017).

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 (ESCA RP Team 2017).

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 (ESCA RP Team 2018a).

2018 HMP Herbaceous Species Monitoring – HMP herbaceous species monitoring was conducted on 24 April 2018 in 8 grids subjected to vegetation cutting in 2013 in the east habitat parcel northeast of the ammunition storage bunkers. Areas surveyed in 2018 for HMP herbaceous species in the FEG MRA are shown in Figure 6a.

5.2.3.2 Parker Flats MRA Herbaceous Species Monitoring

HMP herbaceous species monitoring in the Parker Flats MRA was considered complete in 2017, after seven years of monitoring (ESCA RP Team 2018a). For reporting and tracking purposes monitoring activities between 2008 and 2017 are provided below.

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:

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 (ESCA RP Team 2018a).

2018 – No HMP herbaceous species monitoring was required in 2018.

5.2.3.3 Interim Action Ranges MRA Herbaceous Species Monitoring

No HMP herbaceous species monitoring in the IAR MRA was conducted in 2018. Performance criteria were met in 2015; see Appendix A. For reporting and tracking purposes monitoring activities between 2010 and 2017 are provided below.

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 m^2 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 :

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.

2018 – No HMP herbaceous species monitoring was conducted in 2018. 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 table for FEG is presented in Table 6-2. The diversity table also includes 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 2018, 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 data are summarized in Appendix C.

5.2.7 Methods for Weed Monitoring and Management

During 2018, 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). In the IAR MRA, additional weed cover documentation was conducted using CNPS releve vegetation monitoring protocol outlined in the *CDFW-CNPS Protocol for the Combined Vegetation Rapid Assessment and Relevé Field Form (April 28, 2016).* Survey plot locations were identified using a random stratified approach. The survey area was divided into five spatially separate areas and then a plot center was randomly selected using a random number generator placing the plot in the middle of the preestablished 100x100 foot grid cells.

Weed abatement was 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 listed by the California Invasive Plant Council as highly invasive weeds would be also monitored if present in sufficient numbers to threaten sensitive species or habitats (California Invasive Plant Council 2006).

Weed monitoring and abatement documentation is summarized in Appendix D.

5.2.8 Methods for Erosion Monitoring and BMPs

During 2018, 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 7a and 7b). Erosion monitoring events are summarized in Appendix E. Appendix E also includes erosion monitoring reports and photo documentation from 2018.

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 2018 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 and 6-2 present the results from biological monitoring activities in habitat parcels in the FEG MRA.

6.1 Vegetation Monitoring in MRAs

2018 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 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.

2018 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 dominated by 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 2018, six transects were monitored in those areas subject to vegetation cutting (Figure 6a). All transects are considered Year 8 post-activity vegetation transects, and are located in central maritime chaparral and oak woodland vegetation. Summary data are presented in Tables 6-1 and 6-2, as well as in Figures 8 to 11.

Data from six Year 8 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 the same six Year 3 transects collected in 2013 and Year 5 transects collected in 2015. Section 5.2.1 summarizes transect monitoring methods and Figure 6a shows 2018 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 2018, total mean native cover in Year 8 transects was 77.2% and mean shrub cover averaged 72.9% (Table 6-1).

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 8 and 9). Mean Year 8 cover of brittleleaf manzanita (24.8%) was 54% of the baseline cover (45.8%), and was higher than in any previous post-activity year.

Twenty-two associated woody species were present in one or more of the 2018 transects, suggesting considerable shrub richness in these areas. When the total native species within a meter of transects are considered, 75 native plant species were observed in 2018, reflecting robust recovery after vegetation cutting in this area (Table 6-2).

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 (Table 6-1). Mean absolute cover by obligate-seeding shrubs such as Toro manzanita declined after vegetation cutting, from 14.4% average cover in baseline transects to 0.5% in 2015 Year 5 post-activity data, but then rose to 1.9% in 2018 Year 8 post-activity data. Monterey ceanothus, on the other hand, recovered to its relatively low pre-disturbance cover (1.5% cover) with 0.7% mean cover in 2015 and 1.7% in 2018 in Year 8 post-activity transects. Hooker's manzanita, which was absent in baseline surveys, exhibited 0.3% cover in Year 8 transects (Figure 8).

Several plants, including colonizing native subshrubs such as coyote bush (*Baccharis pilularis* subsp. *consanguinea*) and sticky monkeyflower (*Mimulus aurantiacus*) have higher cover in Year 8 transects than during baseline surveys, and both tend to occupy sunny openings in central maritime chaparral vegetation.

Herbaceous mean native cover (native vegetated ground) was 2% in 2011 baseline transects and 2.7% in 2018 Year 8 transects, suggesting recovery of the native herbaceous layer (Table 6.1). Herbaceous cover was not subdivided into native and non-native cover during baseline surveys, but these data have been collected during post-activity surveys. The 2018 Year 8 post-activity transects have lower non-native cover (7.2%) than the 2015 Year 5 post-activity transects (9.9%). Two of the six Year 8 transects were located in the area with the highest non-native species cover near the southern perimeter of the FEG east of Barloy Road, approximately 20% cover, consisting mostly of smooth cat's ear (*Hypochaeris glabra*) and non-native grasses. The other four transects had no non-native cover or only 2% 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 80% before and after vegetation cutting (Figure 9). 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 many of the transects in which they were originally present. Toro manzanita was present in 64.1% of baseline transects and in 50% of 2018 Year 8 transects, or 78% relative frequency in 2018 compared with the baseline. Monterey ceanothus exhibited higher frequency in 2018 (50%) compared with 48.7% frequency in baseline transects. Hooker's manzanita was absent in baseline transects but had 16.7% frequency in 2018.

Openings between shrubs support a range of over 20 native herbaceous species, including fairy lanterns (*Calochortus albus* var. *albus*), California bedstraw (*Galium californicum* subsp. *californicum*), goldenback fern (*Pentagramma triangularis* subsp. *triangularis*), and round-fruited sedge (*Carex globosa*). Approximately 7% of baseline mean cover was categorized as "bare ground," which rose to 35% in Year 3 transects after vegetation cutting and gradually declined to 23.7 % in Year 8 transects as shrub cover increased.

Plant species richness increased after vegetation cutting in the FEG MRA (Table 6-2 and Figure 10). 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 2018, eight years after vegetation cutting, a total of 22 shrub species were recorded in Year 8 transects, with a mean of 9.7 native shrub species per transect and 45 native species on all Year 8 transects combined (Table 6-2). The number of herbaceous species increased from one to 21 between baseline and 2018 Year 8 transect data.

When all species within a meter of 2018 Year 8 transects were compiled, 75 native species were observed in Year 8 transects, including 1 native tree species, 26 native shrub species, and 30 native herbaceous species, and 1 fern (Table 6-2).

6.2 HMP Species Monitoring in MRAs

No HMP herbaceous species monitoring was conducted in 2018 in the Parker Flats MRA since all Parker Flats munitions clearing activities were completed in 2009 and all required Year 5 HMP herbaceous species monitoring in the Parker Flats MRA is complete. No HMP herbaceous species monitoring was conducted in 2018 in the IAR MRA since performance criteria for HMP species in the IAR MRA were met in 2015; see Appendix A.

HMP species monitoring in 2018 was conducted in the FEG MRA in 8 grids and focused primarily on three annuals -- Monterey spineflower, sand (Monterey) gilia, and seaside bird's beak (Figures 6a).

In the FEG MRA vegetation cutting and munitions investigation activities were conducted from 2010 to 2013, and Year 5 HMP herbaceous species monitoring has been previously completed in all but 8 grids. The 8 grids were subject to vegetation cutting in 2013 and were surveyed for HMP herbaceous species in 2018 (Figure 6a).

No HMP herbaceous species have ever been observed in or near these 8 grids, despite HMP herbaceous species monitoring in these 8 grids every year between 2014 and 2018, and no HMP species were observed in these grids in 2018, as expected.

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 not formally surveyed in 2018 for HMP herbaceous species due to absence of known HMP herbaceous species.

6.3 Aquatic Feature Monitoring in the Future East Garrison MRA

During 2010-2018, routine monitoring of three aquatic features was conducted during the rainy season in the FEG MRA former grenade range. One of these aquatic features, AF09-1A (Figure 3a), was subject to munitions investigation activities from fall 2012 through January 2013, and was then restored in late winter 2013 (ESCA RP Team 2014). The other two aquatic features in the same area, AF09-1B and AF09-2, were not disturbed during munitions investigation activities and have served as reference features to assess post-activity recovery of AF09-1A.

All of these features have been routinely monitored between 2010 and 2018, including dip netting to survey for the presence of sensitive aquatic wildlife such as CCTS and California linderiella. CTS has never been observed or reported in the grenade range, despite protocol CTS surveys in 2010-2011 in the former grenade range and elsewhere in the FEG MRA (ESCA RP Team 2011a and 2012a). California linderiella was observed in AF09-1A and AF09-1B in 2010. However, it was not observed in any of the grenade range aquatic features in 2011 or the spring of 2012, prior to munitions investigate activities, nor has it been observed since.

Data collected in these aquatic features include the date that each of the aquatic features became inundated and dry up; turbidity; pH; presence and cover of aquatic vegetation, along with species composition; photo documentation; and other pertinent data, which are provided in Appendix C.

In 2018, the two largest aquatic features (AF09-1A and AF09-2) in the grenade range were inundated from early January through late May. These two larger aquatic features were slow to dry in 2018, with more than a foot (0.3 m) of water in AF09-1A and nearly one foot (0.3 m) water in AF09-2 in late April. Submergent and emergent vegetation was recorded in both AF09-1A and AF09-2 from January through April 2018; and in AF09-1A through May 2018 (Appendix C: Table C-1). The smallest aquatic feature, AF09-1B, did not hold a recordable amount of water, and therefore no emergent or submergent vegetation was observed in 2018, but soils were moist to saturated through most of the late winter and spring.

Table C-2 in Appendix C compares 2018 aquatic feature monitoring data in the former grenade range with pre-disturbance data collected in 2010 and 2011. The footprint of AF09-1A covers the same area prior and subsequent to munitions investigation activities.

Site hydrology and wetland vegetation have been successfully restored in AF09-1A during the past five years, and the presence of a range of aquatic invertebrates also attest to recovered ecological function. A comparison between water depths in the restored water feature AF09-1A shows equivalent to greater depths in the restored water feature between January and April 2010 and 2018, whereas the other aquatic features show slightly more variation. Turbidity data, where available, indicate comparable turbidity between 2010 and 2018 for most months. 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, 21.76 inches [55.27 cm] in 2016/2017, and 13.1 inches [33.3 cm]) in 2017/2018).

The 2018 monitoring results suggest that the aquatic features have met the performance standards outlined in the Installation-wide Multispecies HMP (USACE 1997) after five years of monitoring for restored aquatic features or vernal pools, and monitoring of these aquatic features is considered complete.

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

Habitat restoration implementation and monitoring activities for 2018 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 6 are reported in Appendix A. Restoration monitoring is anticipated to continue in 2019 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 2018.

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 since 2011 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 to10-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 2018 in any MRA. No wildlife species were relocated in 2018 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. No EAT was conducted by ESCA RP Biologists in 2018.

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 2017) 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 2018, weed monitoring occurred periodically, particularly in areas where weeds could easily spread from a development parcel to a habitat parcel. Weed abatement was conducted in the FEG MRA on 12 March, 24 April, 25 May, 22 June, 11 November 2018 and in the IAR MRA on 12 January, 10 October, 7 November 2018. Weed monitoring results show that, of the target invasive plants included in the HMP (iceplant, pampas grass, and French broom), iceplant has been reported most frequently in all MRAs and exhibits less than 10% cover in each MRA, meeting the weed cover performance target (see Section 6.1 and Appendix D).

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 2018. 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 7a). No erosion control BMP maintenance was needed in 2018.

Interim Action Ranges MRA - There were no major erosion issues in the IAR during 2018. No erosion control BMP maintenance was needed, however, to improve seed retention in the topsoil, straw wattle and water bars were installed in a number of the small-scale excavation areas in the IAR MRA (Figure 7b).

ESCA RP erosion monitoring activities are summarized in Appendix E.

9.0 CONCLUSION

No munitions investigation activities were conducted in any ESCA MRAs during 2018. Biological monitoring in 2018 included completion of 35 vegetation transects, along with

surveys on 3 acres (1.2 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% native cover in Year 8 transects in the FEG 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 three HMP shrubs.

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 2018.

Planned activities in FEG, IAR, and Parker Flats MRAs in 2019 include weed and erosion control monitoring and abatement. Habitat monitoring activities expected in 2019 are listed below.

FEG MRA: HMP herbaceous species monitoring in the FEG MRA is considered complete as of 2018. There are 23 Year 8 transects that will be sampled in 2019 for vegetation monitoring in areas subject to vegetation cutting in 2011.

IAR MRA (small-scale excavation areas in SCAs and NCAs) required 2019 monitoring includes:

- 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 (ESCA RP Team 2018a).

Habitat monitoring indicates that native vegetation establishment in the FEG MRA, IAR MRA, and remaining ESCA properties are on a trajectory for full recovery with natural recruitment, therefore we will recommend monitoring of these areas cease after 2019.

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.

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Table 1-1
Vegetation Monitoring Activities in Habitat Parcels of MRAs
2008 - 2018

ESCA RP 2018 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]	2018[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	Post-activity			
Future East Garrison	Vegetation transects	-	-	-	-	-	-	39	-	2	-	6	17	32	23	19	6	**41**	**103**	**144**
	Herbaceous quadrats	-	-	-	-	-	-	-	-	-	-	-	18	18	6	0	0	**0**	**42**	**42**
	HMP herbaceous species plots	-	-	-	-	5	-	-	-	-	5	6	15	14	21	15	0	**5**	**76**	**81**
	HMP annual surveys (acres)*	-	-	-	-	-	-	-	-	-	-	64.7	71.6	138.2	227.1	217.6	2.9	**0**	**722**	**722.1**
	Toro manzanita surveys (acres)*	-	-	-	-	-	-	-	-	-	29	26.4	26.4	0	0	0	0	**0**	**82**	**81.8**
Interim Action Ranges-Army Remediation Areas	Vegetation transects	-	30	-	-	-	20	-	-	-	-	-	-	0	0	0	0	**0**	**50**	**50**
	Herbaceous quadrats	-	12	-	-	-	-	-	-	-	-	-	-	0	0	0	0	**0**	**12**	**12**
	HMP herbaceous species plots	-	63	-	-	-	63	-	-	-	-	-	-	0	0	0	0	**0**	**126**	**126**
Interim Action Ranges-ESCA Remediation Areas (SCAs/NCAs)	Vegetation transects	-	-	-	-	17	-	2	-	-	16	28	28	38	20	13	29	**19**	**172**	**191**
	Herbaceous quadrats	-	-	-	-	-	-	-	6	-	53	96	96	6	6	11	0	**0**	**274**	**274**
	HMP herbaceous species plots	-	-	-	-	187	-	-	-	-	44	173	161	263	0	0	0	**187**	**641**	**828**
	HMP annual surveys (acres)*	-	-	-	-	-	-	-	-	-	-	27.5	30.8	57.6	0	0	0	**0**	**116**	**115.9**

Table 1-1
Vegetation Monitoring Activities in Habitat Parcels of MRAs
2008 - 2018

ESCA RP 2018 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]	2018[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	Post-activity			
Parker Flats Phase II	Vegetation transects	11	-	-	-	-	-	-	-	-	11	-	11	0	0	11	0	**11**	**33**	**44**
	Herbaceous quadrats	-	-	-	-	-	-	-	-	-	6	-	6	0	0	0	0	**0**	**12**	**12**
	HMP herbaceous species plots	10	-	-	-	-	-	-	10	-	10	6	5	0	0	3	0	**10**	**34**	**44**
	HMP annual surveys (acres)*	-	-	-	-	-	-	-	-	-	-	16.8	87.5	0	0	77	0	**0**	**181**	**181.4**
Parker Flats Phase I	Vegetation transects	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	**0**	**0**	**0**
	Herbaceous quadrats	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	**0**	**0**	**0**
	HMP annual plots	-	-	-	-	-	-	-	-	-	-	-	32	0	0	0	0	**0**	**32**	**32**
	HMP annual surveys (acres)*	-	-	-	-	-	-	-	-	-	-	-	93.2	0	0	0	0	**0**	**93**	**93.2**
County North	HMP herbaceous species plots	-	-	15	-	-	-	-	-	-	-	-	-	0	0	0	0	**15**	**0**	**15**
Total Vegetation Transects		**11**	**30**	**0**	**0**	**17**	**20**	**41**	**0**	**2**	**27**	**34**	**56**	**70**	**43**	**43**	**35**	**71**	**358**	**429**
Total Herbaceous Quadrats		**0**	**12**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**59**	**96**	**120**	**24**	**12**	**11**	**0**	**0**	**340**	**340**
Total HMP Herbaceous Species Plots		**10**	**63**	**15**	**0**	**192**	**63**	**0**	**10**	**0**	**59**	**185**	**181**	**277**	**21**	**18**	**0**	**217**	**877**	**1094**
Total Acres for HMP Herbaceous Species Surveys*		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**109**	**283**	**196**	**227**	**295**	**3**	**-**	**1113**	**1113**
Total Acres for Toro Manzanita Surveys*		-	-	-	-	-	-	-	-	**-**	**29**	**26**	**26**	**0**	**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 2018 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					
Ambystoma californiense	California tiger salamander	Federally Threatened/ 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
Rana draytonii	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					
Charadrius nivosus nivosus	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					
Euphilotes enoptes smithi	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
Linderiella occidentalis	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 2018 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					
Sorex ornatus salarius	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					
Anniella pulchra nigra	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					
Chorizanthe pungens var. *pungens*	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, 2010-2018 FEG, 2008-2018 IAR, 2008-2017 PF, 2012-2016 SEA
Chorizanthe robusta var. *robusta*	robust spineflower	Federally Endangered/CNPS 1B.1	Coastal strand, coastal scrub areas below 300 meters elevation from Marin to Monterey Counties.	None	None
Cordylanthus rigidus ssp. *littoralis*	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	2013-2018 FEG, 2008-2018 IAR

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

ESCA RP 2018 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
Annuals					
Gilia tenuiflora subsp. *arenaria*	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	2008-2018 IAR, 2010-2018 FEG, 2010 SEA
Herbaceous Perennials					
Erysimum ammophilum	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	2013-2018 IAR, 2013-2014 SEA
Piperia yadoni	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					
Arctostaphylos hookeri subsp. *hookeri*	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	2012-2018 FEG, 2012, 2014, 2016, 2017 PF
Arctostaphylos montereyensis	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	2010-2018 FEG, 2008-2014 PF
Arctostaphylos pumila	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	2008-2018 IAR, 2008-2014 SEA

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

ESCA RP 2018 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
Shrubs					
Ceanothus rigidus	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	2010-2018 FEG, 2008-2018 IAR, 2013-2014 PF
Ericameria fasciculata	Eastwood's ericameria, Eastwood's goldenbush	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	2010-2018 FEG, 2008-2018 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 2008-2018

ESCA RP 2018 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										
Acacia baileyana	Cootamundra wattle, Bailey's acacia						x			
Acacia melanoxylon	blackwood acacia			lim			x		x	
Acacia saligna	orange wattle						x			
Arbutus menziesii	**Pacific madrone**					**x**	**x**	**x**		
Eucalyptus camaldulensis	red river gum			lim			x			
Hesperocyparis macrocarpa	**Monterey cypress**		**1B.2**			**x**	**x**	**x**	**x**	
Juniperus sp.	Juniper						**x**			
Myoporum laetum	myoporum			mod			x		x	
Pinus radiata	**Monterey pine**		**1B.1**			**x**	**x**	**x**	**x**	**x**
Populus trichocarpa	**black cottonwood**					**x**	**x**			
Quercus agrifolia	**coast live oak**				**x**	**x**	**x**	**x**	**x**	**x**
Quercus wislizenii* var. *wislizenii	**interior live oak**						**x**			
Salix lasiolepis	**arroyo willow**				**x**	**x**	**x**	**x**	**x**	
Shrubs and Subshrubs										
Acmispon glaber	**deerweed**				**x**	**x**	**x**	**x**	**x**	**x**
Adenostoma fasciculatum	**chamise**				**x**	**x**	**x**	**x**	**x**	**x**
Arctostaphylos crustacea* subsp. *crustacea	**brittleleaf manzanita**						**x**	**x**		
Arctostaphylos hookeri	**Hooker's manzanita**	**HMP**	**1B.2**				**x**	**x**		**x**
Arctostaphylos montereyensis	**Toro manzanita**	**HMP**	**1B.2**				**x**	**x**		**x**
Arctostaphylos pajaroensis	**Pajaro manzanita**						**x**			
Arctostaphylos pumila	**sandmat manzanita**	**HMP**	**1B.2**		**x**	**x**		**x**	**x**	**x**
Arctostaphylos tomentosa* subsp. *tomentosa	**shaggy-barked manzanita**				**x**	**x**		**x**	**x**	**x**
Artemisia californica	**California sagebrush**				**x**	**x**	**x**	**x**	**x**	**x**
Baccharis pilularis* subsp. *consanguinea	**coyote bush, coyote brush**				**x**	**x**	**x**	**x**	**x**	**x**
Baccharis pilularis* subsp. *pilularis	**coyote brush**					**x**				
Ceanothus dentatus	**dwarf ceanothus**				**x**	**x**	**x**	**x**	**x**	**x**
Ceanothus incanus	**coast whitethorn**						**x**			
Ceanothus rigidus	**Monterey ceanothus**	**HMP**	**4.2**		**x**	**x**	**x**	**x**	**x**	**x**
Ceanothus thyrsiflorus	**blue blossom**						**x**	**x**		
Cistus incanus	hairy rock-rose						x	x		x
Cistus salvifolius	rock-rose								x	
Crocanthemum scoparium	**rush-rose**				**x**	**x**	**x**	**x**	**x**	**x**

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2018

ESCA RP 2018 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										
Ericameria ericoides	**dune-heather, mock-heather**				**x**	**x**	**x**	**x**	**x**	**x**
Ericameria fasciculata	**Eastwood's ericameria, Eastwood's goldenbush**	**HMP**	**1B.1**		**x**	**x**	**x**	**x**	**x**	**x**
Eriodictyon californicum	**California yerba santa**						**x**	**x**		
Eriogonum fasciculatum* var. *foliolosum	**California buckwheat**							**x**		
Eriophyllum confertiflorum	**golden yarrow**				**x**	**x**	**x**	**x**	**x**	**x**
Frangula californica* subsp. *californica	**California coffeeberry**				**x**	**x**	**x**	**x**	**x**	**x**
Frangula californica* subsp. *tomentella	**California coffeeberry**				**x**	**x**	**x**	**x**	**x**	**x**
Garrya elliptica	**coast silk-tassel**				**x**	**x**	**x**	**x**	**x**	
Genista monspessulana	French broom			high			x	x	x	
Heteromeles arbutifolia	**toyon**				**x**	**x**	**x**	**x**	**x**	**x**
Lepechinia calycina	**pitcher sage**				**x**	**x**	**x**	**x**		
Lupinus arboreus	**coastal bush lupine**				**x**	**x**	**x**	**x**	**x**	**x**
Lupinus chamissonis	**silver bush lupine**				**x**	**x**	**x**	**x**	**x**	**x**
Mimulus aurantiacus	**bush monkeyflower**				**x**	**x**	**x**	**x**	**x**	**x**
Pyracantha sp.	firethorn			lim				x		
Ribes malvaceum	**chaparral currant**				**x**	**x**	**x**	**x**	**x**	**x**
Ribes speciosum	**fuchsia-flowered gooseberry**				**x**	**x**	**x**	**x**	**x**	**x**
Rosa californica	**California wild rose**						**x**			
Rosa gymnocarpa* var. *gymnocarpa	**dwarf wood rose**						**x**			
Rubus ursinus	**California blackberry**						**x**	**x**	**x**	
Salvia mellifera	**black sage**				**x**	**x**	**x**	**x**	**x**	**x**
Solanum umbelliferum	**blue witch nightshade**				**x**	**x**		**x**	**x**	
Symphoricarpos mollis	**creeping snowberry**				**x**	**x**	**x**	**x**	**x**	
Toxicodendron diversilobum	**poison-oak**				**x**	**x**	**x**	**x**	**x**	**x**
Vaccinium ovatum	**California huckleberry, evergreen huckleberry**						**x**			
Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)										
Acaena pinnatifida* var. *californica	**biddy biddy**							**x**		
Achillea millefolium	**common yarrow**				**x**	**x**	**x**	**x**	**x**	**x**
Acmispon americanus* var. *americanus	**Spanish lotus**							**x**		
Acmispon heermannii var. orbicularis	**wooly lotus**				**x**	**x**	**x**	**x**	**x**	
Acmispon parviflorus	**hill lotus**						**x**			
Acmispon strigosus	**Bishop's lotus**				**x**	**x**	**x**	**x**	**x**	
Agoseris apargioides	**seaside dandelion**						**x**	**x**		

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2018

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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)										
Agrostis exarata* var. *pacifica	**spike bentgrass**						**x**	**x**		
Agoseris grandiflora* var. *leptophylla	**giant mountain dandelion**						**x**			
Agrostis pallens	**thin grass**						**x**	**x**	**x**	
Aira caryophyllea	common silver-hair grass				x	x	x	x	x	
Allium hickmanii	**Hickman's onion**	**1B.2**					**x**			
Alopecurus saccatus	Pacific foxtail						**x**			
Amblyopappus pusillus	**amblyopappus**				**x**	**x**				
Amsinckia intermedia	**common fiddleneck**				**x**	**x**				
Amsinckia spectabilis* var. *microcarpa	**small fruited seaside fiddleneck**						**x**			
Anagallis arvensis	scarlet pimpernel				x	x	x	x	x	x
Antirrhinum kelloggii	**Kellogg's snapdragon**						**x**			
Antirrhinum majus	snapdragon					x				
Aphanes occidentalis	**western lady's mantle**				**x**					
Apiastrum angustifolium	**wild celery**				**x**	**x**	**x**	**x**		**x**
Armeria maritima* subsp. *californica	**California sea pink, sea thrift**				**x**					
Artemisia douglasiana	**mugwort**					**x**	**x**			
Artemisia dracunculus	**tarragon**								**x**	
Artemisia pycnocephala	**sandhill sagebrush, beach sagewort**								**x**	
Avena barbata	slender wild oat			mod	x	x	x	x	x	x
Avena fatua	wild oat			mod			x	x		
Briza maxima	rattlensnake grass			lim		x	x	x	x	x
Briza minor	little rattlesnake grass						x	x		
Brodiaea terrestris* subsp. *terrestris	**dwarf brodiaea**						**x**			
Bromus carinatus	**California brome**						**x**	**x**	**x**	
Bromus diandrus	ripgut brome			mod	x	x	x	x	x	x
Bromus hordeaceus	soft chess			lim	x	x	x	x	x	x
Bromus madritensis subsp. *rubens*	red brome			high	x	x	x	x	x	x
Calandrinia ciliata	**red maids**				**x**	**x**	**x**	**x**	**x**	
Callitriche	**water starwort**						**x**			
Calochortus albus* var. *albus	**fairy lanterns, globe lily**				**x**	**x**	**x**	**x**	**x**	
Calyptridium monandrum	**pussy paws**				**x**	**x**				
Calystegia subacaulis	**hill morning -glory**				**x**		**x**	**x**		
Camissonia contorta	**contorted suncups**				**x**	**x**	**x**	**x**	**x**	

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2018

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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)										
Camissonia strigulosa	**strigose suncups**				**x**		**x**			
Camissoniopsis cheiranthifolia* subsp. *cheiranthifolia	**beach evening- primrose**					**x**				
Camissoniopsis micrantha	**small suncups**				**x**	**x**	**x**	**x**	**x**	
Cardionema ramosissimum	**sand mat**				**x**	**x**	**x**	**x**	**x**	
Carduus pycnocephalus	Italian thistle			mod					x	
Carex brevicaulis	**short-stemmed sedge**						**x**			
Carex globosa	**round-fruited sedge**				**x**	**x**	**x**	**x**	**x**	
Carex subbracteata	**small bract sedge**						x			
Carpobrotus edulis	hottentot fig/ice plant			high	x	x	x	x	x	x
Castilleja affinis* subsp. *affinis	**coast Indian paint-brush**							**x**		
Castilleja attenuata	**valley tassels**						**x**			
Castilleja exserta* subsp. *latifolia	**wideleaf purple owl's clover**				**x**	**x**			**x**	
Castilleja foliolosa	**wooly paintbrush**								**x**	
Caulanthus lasiophyllus	**California mustard**				**x**	**x**				
Centaurea melitensis	tocalote			mod	x	x	x	x	x	x
Cerastium glomeratum	mouse-eared chickweed						x	x		
Chenopodium californicum	**California goosefoot**					**x**	**x**	**x**	**x**	
Chlorogalum pomeridianum* var. *divaricatum	**soap plant/amole**						**x**	**x**		
Chorizanthe diffusa	**diffuse chorizanthe**				**x**	**x**	**x**	**x**	**x**	
Chorizanthe douglasii	**Douglas' spineflower**						**x**			
Chorizanthe c.f. minutiflora	**small-flowered spineflower**							**x**		
Chorizanthe pungens* var. *pungens	**Monterey spine-flower**	**HMP**	**1B.1**		**x**	**x**	**x**	**x**	**x**	
Cicendia quadrangularis	**Oregon timwort**						**x**			
Cirsium brevifolium	**clustered thistle, Indian thistle**						**x**			
Cirsium occidentale* var. *occidentale	**cobweb thistle**				**x**	**x**	**x**			
Cirsium occidentale* var. *venustum	**Venus thistle**								**x**	
Cirsium vulgare	bull thistle			mod		x	x		x	
Clarkia lewisii	**Lewis' clarkia**		**4.3**					**x**		
Clarkia amoenea	**farewell-to-spring**					**x**				
Clarkia purpurea	**wine cup clarkia**							**x**		
Claytonia perfoliata	**miner's lettuce**				**x**	**x**				
Clinopodium douglasii	**yerba buena**				**x**		**x**	**x**		
Collinsia heterophylla	**Chinese houses**					**x**				

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2018

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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)										
Conium maculatum	poison-hemlock			mod			x			x
Cordylanthus rigidus* subsp. *littoralis	**seaside bird's-beak**	**HMP**	**1B.1**		**x**	**x**	**x**		**x**	
Corethrogyne filaginifolia	**California aster**				**x**	**x**	**x**	**x**	**x**	**x**
Cortaderia jubata	pampas grass, jubata grass			high	x	x	x	x	x	x
Cotula coronopifolia	brass buttons			lim			x			
Crassula aquatica	**water pygmyweed**						**x**			
Crassula connata	**pygmy weed**				**x**	**x**	**x**	**x**	**x**	
Croton californicus	**California croton**				**x**	**x**	**x**	**x**	**x**	**x**
Cryptantha clevelandii* var. *florosa	**coastal cryptantha**				**x**	**x**	**x**		**x**	
Cryptantha micromeres	**small-flowered cryptantha**				**x**	**x**	**x**	**x**		
Cryptantha microstachys	**Tejon cryptantha**				**x**	**x**		**x**		
Danthonia californica	**California oat grass**						**x**			
Cyperus eragrostis	**tall flatsedge**						**x**			
Danthonia californica	**California oat grass**						**x**	**x**		
Daucus pusillus	**rattlesnake weed**				**x**	**x**	**x**	**x**		
Deinandra [Hemizonia] corymbosa subsp. corymbosa	**tarplant**						**x**			
Deinandra increscens* subsp. *increscens	**coast tarplant**				**x**	**x**	**x**	**x**	**x**	**x**
Delphinium parryi* subsp. *maritimum	**seaside larkspur**							**x**		
Deschampsia danthonioides	**annual hairgrass**						**x**		**x**	
Dichelostemma capitatum	**blue dicks, wild hyacinth**				**x**	**x**	**x**	**x**		
Distichlis spicata	**saltgrass**						**x**			
Dodecatheon clevelandii* var. *sanctarum	**padre's shooting stars**						**x**			
Drymocallis glandulosa* var. *glandulosa	**sticky cinquefoil**				**x**	**x**	**x**	**x**	**x**	
Dudleya lanceolata	**lance-leaved live-forever**						**x**	**x**	**x**	
Eleocharis acicularis var. acicularis	**slender spikerush**						**x**			
Eleocharis macrostachya	**common spikerush**						**x**	**x**		
Elymus glaucus	**western ryegrass**				**x**	**x**	**x**	**x**	**x**	**x**
Elymus triticoides	**alkali rye**							**x**		
Epilobium brachycarpus	**tall annual willowherb**					**x**			**x**	
Epilobium canum	**California-fuchsia**					**x**	**x**			
Epilobium ciliatum* var. *ciliatum	**northern willowherb**					**x**				
Eriastrum virgatum	**wand woollystar**		**4.3**		**x**	**x**	**x**			

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2018

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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)										
Erigeron canadensis	**horseweed**				**x**	**x**	**x**	**x**	**x**	**x**
Erigeron foliosus **var. *foliosus***	**leafy daisy**				**x**					
Erigeron sumatrensis	tropical horseweed					x				
Eriogonum latifolium	**coast buckwheat**							**x**		
Eriogonum nudum **var. *auriculatum***	**nude buckwheat**						**x**			
Erodium botrys	long-beaked filaree				x	x	x	x	x	x
Erodium cicutarium	red-stemmed filaree			lim	x	x		x		
Eryngium armatum	**coyote thistle**						**x**			
Erysimum ammophilum	**coast wallflower**	**HMP**	**1B.2**		**x**				**x**	
Eschscholzia californica	**California poppy**				**x**	**x**	**x**	**x**	**x**	
Euphorbia peplus	petty spurge					x				
Euthamia occidentalis	**western goldenrod**						**x**	**x**		
Festuca bromoides	brome fescue						x			
Festuca microstachya	**small fescue**				**x**	**x**	**x**			
Festuca myuros	rattail fescue			mod	x	x	x	x	x	
Festuca octoflora	**six-weeks fescue**				**x**	**x**	**x**	**x**	**x**	
Festuca perennis	Italian rye grass			mod			x			
Fritillaria affinis	**checker lily, Mission bells**				**x**		**x**		**x**	
Galium aparine	**bedstraw**							**x**		
Galium californicum **subsp. *californicum***	**California bedstraw**				**x**	**x**	**x**	**x**	**x**	
Galium porrigens **var. *porrigens***	**climbing bedstraw**				**x**	**x**	**x**	**x**	**x**	**x**
Gamochaeta ustulata	**purple cudweed**				**x**	**x**	**x**	**x**		
Gastridium phleoides	nit grass						x			
Geranium dissectum	cut-leaved geranium			lim			x	x		
Gilia achilleafolia var. *achilleafolia*	California gilia						x			
Gilia capitata **subsp. *abrotanifolia***	**ball gilia**					**x**	**x**			
Gilia capitata **subsp. *capitata***	**ball gilia**					**x**				
Gilia tenuiflora **subsp. *arenaria***	**sand [Monterey] gilia**	**HMP**	**1B.2**		**x**	**x**	**x**		**x**	
Gilia tricolor	**bird's eyes gilia**					**x**				
Helminthotheca echioides	bristly ox-tongue			lim		x				
Heliotropium curassivicum	**wild heliotrope**							**x**	**x**	
Herniaria hirsuta subsp. *cinerea*	hairy rupturewort					x	x	x		

Table 3-1
Observed Plant Species in Munitions Response Areas 2008-2018

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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)										
Hesperevax acaulis var. ambusticola	**fire evax, stemless dwarf cudweed**							**x**		
Heterotheca grandifolia	**telegraph weed**				**x**	**x**	**x**	**x**	**x**	**x**
Holcus lanatus	velvet grass			mod				x		
Hordeum brachyantherum* subsp. *brachyantherum	**meadow barley**					**x**				
Hordeum marinum subsp. *gussoneanum*	Mediterranean barley			mod			x			
Hordeum murinum	foxtail barley			mod						
Horkelia californica* var. *frondosa	**Californica horkelia**					**x**				
Horkelia cuneata* var. *cuneata	**coast horkelia, wedge-leaved horkelia**				**x**	**x**	**x**	**x**	**x**	**x**
Hypochaeris glabra	smooth cat's ears			lim	x	x	x	x		
Hypochaeris radicata	cat's ears			mod	x	x	x			
Juncus bufonius* var. *occidentalis	**toad rush**						**x**			
Juncus capitatus	**leafy-bract dwarf rush**						**x**			
Juncus effusus* var. *pacificus	**bog rush**					**x**				
Juncus mexicanus	**Mexican rush**						**x**	**x**		
Juncus occidentalis	**western rush**						**x**			
Juncus patens	**common rush**							**x**		
Juncus phaeocephalus* var. *phaeocephalus	**brown-headed rush**						**x**	**x**		
Koeleria macrantha	**June grass**				**x**		**x**	**x**	**x**	
Lagurus ovatus	hare's tail grass						x	x		
Lasthenia glaberrima	**smooth goldfields**						**x**			
Lasthenia gracilis	**slender goldfields**						**x**			
Lathyrus vestitus* var. *vestitus	**wild sweet pea, Pacific pea**							**x**		**x**
Layia hieracioides	**tall layia**						**x**			
Layia platyglossa	**tidy tips**				**x**	**x**				
Lamarckia aurea	goldentop grass						x			
Lastarriaea coriacea	**leather spineflower**							**x**		
Lemna minor	**least duckweed**						**x**			
Leontodon saxatilis	hawkbit								x	
Lepidium nitidum	**common peppergrass**				**x**	**x**				
Leptochloa fusca* subsp. *fascicularis	**bearded sprangletop**					**x**				
Leptosiphon parviflorus	**common linanthus**					**x**				
Leptosiphon pygmaeus* subsp. *continentalis	**pygmy linanthus**						**x**			

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

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

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Observed Plant Species in Munitions Response Areas 2008-2018

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

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

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Ferns and Fern-relatives										
Dryopteris arguta	**coastal wood fern**						**x**	**x**		
Pellea mucronata **var. *mucronata***	**bird's nest fern**						**x**			
Pentagramma triangularis **subsp. *triangularis***	**goldenback fern**						**x**	**x**		
Pteridium aquilinum **var. *pubescens***	**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 - 2018

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

Table 3-2
Observed Wildlife Species in Munitions Response Areas 2008 - 2018

ESCA RP 2018 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									
Accipiter cooperii	Cooper's hawk					x		x	
Amphispiza belli	Bell's sage sparrow			x				x	
Anas platyrhynchos	Mallard duck					*x*			
Aphelocoma californica	Western scrub jay		x	x	x	x	x	x	
Asio otus	Long-eared owl			x					
Baeolophus inornatus	Oak titmouse					x		x	
Buteo lineatus	Red-shouldered hawk					x			
Buteo jamaicensis	Red-tailed hawk		x	x	x	x	x	x	
Callipepla californica	California quail		x	x	x	x	x	x	
Calypte anna	Anna's hummingbird		x	x	x	x	x	x	
Carduelis psaltria	Lesser goldfinch		x	x	x	x	x		
Carpodacus mexicanus	House finch					x		x	
Carpodacus purpureus	Purple finch					x			
Cathartes aura	Turkey vulture		x	x	x	x			
Chamaea fasciata	Wrentit		x	x	x	x	x	x	
Charadrius alexandrinus nivosus	Western snowy plover	x							
Charadrius vociferus	Killdeer		x	x	x	x	x		
Circus cyaneus	Northern harrier		x	x	x				
Colaptes auratus	Northern flicker		x		x	x		x	
Corvus brachyrhynchos	American crow		x	x	x	x	x	x	x
Dendroica coronata	Yellow-rumped warbler							x	
Dendroica occidentalis	Hermit warbler							x	
Dendroica townsendi	Townsend's warbler							x	
Empidonax difficilis	Pacific-slope flycatcher					x			
Falco sparverius	American kestrel		x	x	x	x	x		
Gallinago gallinago	Common snipe					x			
Geococcyx californianus	Greater roadrunner		x	x	x				
Hirundo rustica	Barn swallow		x	x	x	x			
Junco hyemalis	Dark-eyed junco					x		x	
Lanius ludovicianus	Loggerhead shrike							x	
Meleagris gallapavo	Wild turkey					x	x		

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Observed Wildlife Species in Munitions Response Areas 2008 - 2018

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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									
Mimus polyglottos	**Northern mockingbird**							x	
Myiarchus cinerascens	**Ash-throated flycatcher**					x			
Petrochelidon pyrrhonota	**Cliff swallow**					x			
Phalacrocorax auritus	**Double-crested cormorant**								
Phalaenoptilus nuttallii	**Common poorwill**					x			
Phalaropus lobatus	**Red-necked phalarope**					x			
Picoides nuttallii	**Nuttall's woodpecker**							x	
Pipilo crissalis	**California towhee**		x	x	x	x		x	
Pipilo maculatus	**Spotted towhee**		x		x	x		x	
Poecile rufescens	**Chestnut-backed chickadee**							x	
Psaltriparus minimus	**Bushtit**					x		x	
Sayornis saya	**Say's phoebe**							x	
Sturnella neglecta	**Western meadowlark**							x	
Tachycineta bicolor	**Tree swallow**							x	
Thryomanes bewickii	**Bewick's wren**					x		x	
Toxostoma redivivum	**California thrasher**		x	x	x			x	
Vireo huttoni	**Hutton's vireo**					x		x	
Vermivora ruficapilla	**Nashville warbler**								
Zenaida macroura	**Mourning dove**		x	x	x	x	x	x	
Zonotrichia atricapilla	**Golden-crowned sparrow**							x	
INVERTEBRATES									
Linderiella occidentalis	**California linderiella**	x				x			

Table 3-3
Future East Garrison MRA Grenade Range
Observed Plant Species in or Around Aquatic Features
2011-2018

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

Table 3-3
Future East Garrison MRA Grenade Range
Observed Plant Species in or Around Aquatic Features
2011-2018

ESCA RP 2018 Annual Natural Resource Report

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

Table 3-3
Future East Garrison MRA Grenade Range
Observed Plant Species in or Around Aquatic Features
2011-2018

ESCA RP 2018 Annual Natural Resource Report

Scientific Name	Common Name	Wetland Indicator Status[1]	Aquatic Features		
			AF09-1	AF09-1B	AF09-2
Rubus ursinus	**California blackberry**	**FACU**	**x**		
Salix lasiolepis	**arroyo willow**	**FACW**	**x**		
Soliva sessilis	South American soliva	FACU	x		
Sonchus asper subsp. *asper*	prickly sow-thistle	FACU	x		
Spiranthes romanzoffiana	**hooded ladies tresses**	**FACW**			**x**
Triglochin scillioides	**flowering quillwort**	**OBL**	**x**	**x**	
Tribolium obliterum	cape grass	NL	x	x	
Typha latifolia	**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 Conducted in 2010

ESCA RP 2018 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						
Quercus agrifolia	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						
Arctostaphylos crustacea subsp. *crustacea*	brittleleaf manzanita	45.8%	32.3%	8.7%	41.8%	89.7%
Adenostoma fasciculatum	chamise	27.4%	22.4%	6.0%	25.0%	100%
Arctostaphylos montereyensis	**Toro manzanita**	**14.4%**	**19.8%**	5.3%	13.1%	**64.1%**
Salvia mellifera	black sage	7.2%	15.5%	4.2%	6.6%	56.4%
Baccharis pilularis subsp. *consanguinea*	coyote brush	2.2%	4.1%	1.1%	2.0%	48.7%
Mimulus aurantiacus	sticky monkeyflower	2.1%	4.1%	1.1%	1.9%	59.0%
Garrya elliptica	coast silk tassel	1.5%	3.9%	1.0%	1.4%	28.2%
Ceanothus rigidus	**Monterey ceanothus**	**1.5%**	**2.2%**	0.6%	1.4%	**48.7%**
Frangula californica subsp. *californica*	California coffeeberry	1.3%	3.5%	0.9%	1.2%	20.5%
Heteromeles arbutifolia	toyon	1.0%	2.7%	0.7%	1.0%	17.9%
Ericameria ericoides	dune-heather, mock-heather	0.7%	3.9%	1.1%	0.6%	5.1%
Toxicodendron diversilobum	poison-oak	0.4%	1.4%	0.4%	0.4%	10.3%
Ceanothus thyrsiflorus	blue blossom	0.3%	1.8%	0.5%	0.3%	5.1%
Ribes malvaceum	chaparral currant	0.1%	0.6%	0.2%	0.1%	5.1%
Acmispon glaber	deerweed	0.1%	0.4%	0.1%	0.1%	2.6%
Lepechinia calycina	pitcher sage	0.0%	0.3%	0.1%	0.0%	2.6%
Ericameria fasciculata	**Eastwood's ericameria**	**0.0%**	**0.2%**	0.0%	0.0%	**2.6%**
Eriophyllum confertiflorum	golden yarrow	0.0%	0.1%	0.0%	0.0%	5.1%
Ceanothus dentatus	dwarf ceanothus	0.0%	0.1%	0.0%	0.0%	2.6%
Crocanthemum scoparium	rush-rose	0.0%	0.0%	0.0%	0.0%	5.1%
Rubus ursinus	California blackberry	0.0%	--	--	0.0%	0.0%
Symphoricarpos mollis	creeping snowberry	0.0%	--	--	0.0%	0.0%
Rosa gymnocarpa var. *gymnocarpa*	wood rose	0.0%	--	--	0.0%	0.0%
Ribes speciosum	fuchsia-flowered gooseberry	0.0%	0.0%	0.0%	0.0%	0.0%
Quercus wislizenii var. *wislizenii*	interior live oak	0.0%	0.0%	0.0%	0.0%	0.0%
Arctostaphylos hookeri	**Hooker's manzanita**	**0.0%**	**--**	--	0.0%	**0.0%**
Total Mean Percent Native Shrub and Subshrub Cover		***106.0%***			***97.5%***	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		***2.0%***	***4.4%***	***1.2%***	***--***	***51.3%***
Total Mean Cover of Target Weed Species (*Carpobrotus edulis*)		***0.4%***	***2.7%***	***0.7%***	***0.4%***	***2.6%***
Total Mean Non-native Herbaceous Species Cover		***na***				
Total Mean Percent Native Vegetative Cover		***108.7%***				
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

Table 6-1
Future East Garrison
MRA Vegetation Cover in Areas Subject to Vegetation Cutting Conducted in 2010

ESCA RP 2018 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2013 (Year 3)				
		Six Transects (in Grid Cells Veg Cut in 2010)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
Quercus agrifolia	coast live oak	0.7%	1.5%	1.3%	0.9%	33.3%
Total Mean Percent Native Tree Cover		***0.7%***			***0.9%***	
Shrub and Sub-shrub Species						
Arctostaphylos crustacea subsp. *crustacea*	brittleleaf manzanita	15.2%	10.4%	8.6%	21.3%	83.3%
Adenostoma fasciculatum	chamise	8.6%	6.2%	5.1%	12.0%	100.0%
Arctostaphylos montereyensis	**Toro manzanita**	**0.1%**	**0.3%**	**0.2%**	**0.2%**	**33.3%**
Salvia mellifera	black sage	1.8%	3.5%	2.9%	2.5%	33.3%
Baccharis pilularis subsp. *consanguinea*	coyote brush	9.1%	9.7%	7.9%	12.8%	33.3%
Mimulus aurantiacus	sticky monkeyflower	4.5%	4.4%	3.6%	6.3%	100.0%
Garrya elliptica	coast silk tassel	0.1%	0.2%	0.2%	0.1%	16.7%
Ceanothus rigidus	**Monterey ceanothus**	**0.7%**	**1.2%**	**1.0%**	**0.9%**	**66.7%**
Frangula californica subsp. *californica*	California coffeeberry	1.0%	2.3%	1.9%	1.3%	16.7%
Heteromeles arbutifolia	toyon	0.6%	1.0%	0.8%	0.9%	33.3%
Ericameria ericoides	dune-heather, mock-heather	0.0%	--	--	0.0%	0.0%
Toxicodendron diversilobum	poison-oak	0.0%	--	--	0.0%	0.0%
Ceanothus thyrsiflorus	blue blossom	0.2%	0.4%	0.3%	0.3%	33.3%
Ribes malvaceum	chaparral currant	0.5%	1.1%	0.9%	0.7%	16.7%
Acmispon glaber	deerweed	7.6%	17.2%	14.1%	10.7%	50.0%
Lepechinia calycina	pitcher sage	0.0%	--	--	0.0%	0.0%
Ericameria fasciculata	**Eastwood's ericameria**	**0.0%**	**--**	**--**	**0.0%**	**0.0%**
Eriophyllum confertiflorum	golden yarrow	1.4%	3.4%	2.8%	2.0%	33.3%
Ceanothus dentatus	dwarf ceanothus	0.0%	--	--	0.0%	0.0%
Crocanthemum scoparium	rush-rose	2.3%	2.2%	1.8%	3.2%	83.3%
Rubus ursinus	California blackberry	0.0%	--	--	0.0%	0.0%
Symphoricarpos mollis	creeping snowberry	0.0%	--	--	0.0%	0.0%
Rosa gymnocarpa var. *gymnocarpa*	wood rose	0.0%	--	--	0.0%	0.0%
Ribes speciosum	fuchsia-flowered gooseberry	0.0%	--	--	0.0%	0.0%
Quercus wislizenii var. *wislizenii*	interior live oak	0.0%	--	--	0.0%	0.0%
Arctostaphylos hookeri	**Hooker's manzanita**	**0.1%**	**0.2%**	**0.2%**	**0.1%**	**16.7%**
Total Mean Percent Native Shrub and Subshrub Cover		***53.8%***			***75.4%***	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		***16.8%***	***18.2%***	***15.0%***	**--**	***100.0%***
Total Mean Cover of Target Weed Species (*Carpobrotus edulis*)		***0.0%***				
Total Mean Non-native Herbaceous Species Cover		***na***				
Total Mean Percent Native Vegetative Cover		***71.3%***				
Total Bare Ground (Including Masticated Vegetation)		***34.8%***				
Total Mean Percent Masticated Vegetation		***na***				
Total Mean Percent Bare Ground		***35%***	***10%***	**--**	**--**	***100%***

HMP Species in Bold

Table 6-1
Future East Garrison
MRA Vegetation Cover in Areas Subject to Vegetation Cutting Conducted in 2010

ESCA RP 2018 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2015 (Year 5)				
		Six Transects (in Grid Cells Veg Cut in 2010)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
Quercus agrifolia	coast live oak	0.8%	1.5%	0.5%	1.1%	33.3%
Total Mean Percent Native Tree Cover		***0.8%***			***1.2%***	
Shrub and Sub-shrub Species						
Arctostaphylos crustacea subsp. *crustacea*	brittleleaf manzanita	18.5%	13.6%	4.2%	25.8%	100.0%
Adenostoma fasciculatum	chamise	12.8%	7.2%	2.2%	17.8%	100.0%
Arctostaphylos montereyensis	**Toro manzanita**	**0.5%**	**1.3%**	0.4%	0.7%	**16.7%**
Salvia mellifera	black sage	3.5%	6.6%	2.1%	4.9%	50.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	8.0%	7.7%	2.4%	11.2%	100.0%
Mimulus aurantiacus	sticky monkeyflower	4.3%	5.3%	1.7%	6.0%	83.3%
Garrya elliptica	coast silk tassel	0.3%	0.6%	0.2%	0.4%	16.7%
Ceanothus rigidus	**Monterey ceanothus**	**0.8%**	**1.7%**	0.5%	1.1%	**33.3%**
Frangula californica subsp. *californica*	California coffeeberry	0.7%	1.7%	0.5%	0.9%	16.7%
Heteromeles arbutifolia	toyon	0.4%	1.0%	0.3%	0.6%	33.3%
Ericameria ericoides	dune-heather, mock-heather	0.3%	0.8%	0.2%	0.4%	16.7%
Toxicodendron diversilobum	poison-oak	0.1%	0.2%	0.1%	0.2%	33.3%
Ceanothus thyrsiflorus	blue blossom	0.7%	0.8%	0.3%	1.0%	50.0%
Ribes malvaceum	chaparral currant	0.1%	0.3%	0.1%	0.1%	16.7%
Acmispon glaber	deerweed	4.8%	10.5%	3.3%	6.7%	66.7%
Lepechinia calycina	pitcher sage	0.0%	0.0%	0.0%	0.0%	0.0%
Ericameria fasciculata	**Eastwood's ericameria**	**0.0%**	**0.0%**	0.0%	0.0%	**0.0%**
Eriophyllum confertiflorum	golden yarrow	0.4%	0.4%	0.1%	0.5%	66.7%
Ceanothus dentatus	dwarf ceanothus	0.0%	0.0%	0.0%	0.0%	0.0%
Crocanthemum scoparium	rush-rose	2.0%	3.2%	1.0%	2.8%	66.7%
Rubus ursinus	California blackberry	0.0%	0.1%	0.0%	0.1%	16.7%
Symphoricarpos mollis	creeping snowberry	0.0%	0.0%	0.0%	0.0%	0.0%
Rosa gymnocarpa var. *gymnocarpa*	wood rose	0.0%	0.0%	0.0%	0.0%	0.0%
Ribes speciosum	fuchsia-flowered gooseberry	0.0%	0.0%	0.0%	0.0%	0.0%
Quercus wislizenii var. *wislizenii*	interior live oak	0.0%	0.0%	0.0%	0.0%	0.0%
Arctostaphylos hookeri	**Hooker's manzanita**	**0.2%**	**0.5%**	0.1%	0.3%	**16.7%**
Total Mean Percent Native Shrub and Subshrub Cover		***58.4%***			***94.9%***	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		***2.4%***	***3.3%***	***1.0%***	***3.9%***	***100.0%***
Total Mean Cover of Target Weed Species (*Carpobrotus edulis*)		***0.0%***				
Total Mean Non-native Herbaceous Species Cover		***9.9%***	***3.3%***	***1.0%***	*--*	*--*
Total Mean Percent Native Vegetative Cover		***61.6%***				
Total Bare Ground (Including Masticated Vegetation)		***28.7%***				
Total Mean Percent Masticated Vegetation		***14.1%***	***9.0%***	***2.8%***	*--*	***20.0%***
Total Mean Percent Bare Ground		***14.6%***	***10.2%***	***3.2%***	*--*	***17%***

HMP Species in Bold

Table 6-1
Future East Garrison
MRA Vegetation Cover in Areas Subject to Vegetation Cutting Conducted in 2010

ESCA RP 2018 Annual Natural Resource Report

Scientific Name	Common Name	Post-activity Data 2018 (Year 8)				
		Six Transects (in Grid Cells Veg Cut in 2010)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Frequency
Tree Species						
Quercus agrifolia	coast live oak	1.4%	2.5%	2.0%	1.7%	50.0%
Total Mean Percent Native Tree Cover		***1.4%***			***1.9%***	
Shrub and Sub-shrub Species						
Arctostaphylos crustacea subsp. *crustacea*	brittleleaf manzanita	24.8%	14.8%	12.2%	29.4%	83.3%
Adenostoma fasciculatum	chamise	18.8%	9.0%	7.4%	22.2%	100.0%
Arctostaphylos montereyensis	**Toro manzanita**	**1.9%**	**2.5%**	2.1%	2.2%	**50.0%**
Salvia mellifera	black sage	3.2%	6.3%	5.2%	3.8%	66.7%
Baccharis pilularis subsp. *consanguinea*	coyote brush	9.2%	8.3%	6.9%	11.0%	83.3%
Mimulus aurantiacus	sticky monkeyflower	4.6%	3.6%	2.9%	5.5%	83.3%
Garrya elliptica	coast silk tassel	0.2%	--	--	0.2%	16.7%
Ceanothus rigidus	**Monterey ceanothus**	**1.7%**	**4.1%**	3.4%	2.1%	**50.0%**
Frangula californica subsp. *californica*	California coffeeberry	0.8%	--	--	0.9%	16.7%
Heteromeles arbutifolia	toyon	0.9%	0.2%	0.1%	1.1%	33.3%
Ericameria ericoides	dune-heather, mock-heather	0.1%	--	--	0.1%	16.7%
Toxicodendron diversilobum	poison-oak	0.2%	0.5%	0.4%	0.2%	33.3%
Ceanothus thyrsiflorus	blue blossom	3.4%	4.2%	3.5%	4.0%	50.0%
Ribes malvaceum	chaparral currant	0.2%	--	--	0.2%	16.7%
Acmispon glaber	deerweed	0.2%	0.6%	0.5%	0.2%	33.3%
Lepechinia calycina	pitcher sage	0.1%	--	--	0.1%	16.7%
Ericameria fasciculata	**Eastwood's ericameria**	**0.0%**	**--**	**--**	**0.0%**	**0.0%**
Eriophyllum confertiflorum	golden yarrow	0.3%	0.2%	0.1%	0.4%	50.0%
Ceanothus dentatus	dwarf ceanothus	0.0%	--	--	0.0%	0.0%
Crocanthemum scoparium	rush-rose	1.9%	1.8%	1.5%	2.2%	100.0%
Rubus ursinus	California blackberry	0.1%	--	--	0.1%	16.7%
Symphoricarpos mollis	creeping snowberry	0.0%	--	--	0.0%	0.0%
Rosa gymnocarpa var. *gymnocarpa*	wood rose	0.0%	--	--	0.0%	0.0%
Ribes speciosum	fuchsia-flowered gooseberry	0.1%	--	--	0.1%	16.7%
Quercus wislizenii var. *wislizenii*	interior live oak	0.0%	--	--	0.0%	0.0%
Arctostaphylos hookeri	**Hooker's manzanita**	**0.3%**	--	--	0.4%	**16.7%**
Total Mean Percent Native Shrub and Subshrub Cover		***72.9%***			***94.5%***	
Total Combined Mean Native Herbaceous Cover Between Shrubs and Subshrubs		***2.8%***	***2.3%***	***1.9%***	***3.2%***	***83.3%***
Total Mean Cover of Target Weed Species (*Carpobrotus edulis*)		***0.0%***				
Total Mean Non-native Herbaceous Species Cover		***7.2%***	***10.0%***	***8.2%***	***8.6%***	***100.0%***
Total Mean Percent Native Vegetative Cover		***77.2%***				
Total Bare Ground (Including Masticated Vegetation)		***24.2%***				
Total Mean Percent Masticated Vegetation		***0.8%***				
Total Mean Percent Bare Ground		***23.4%***				

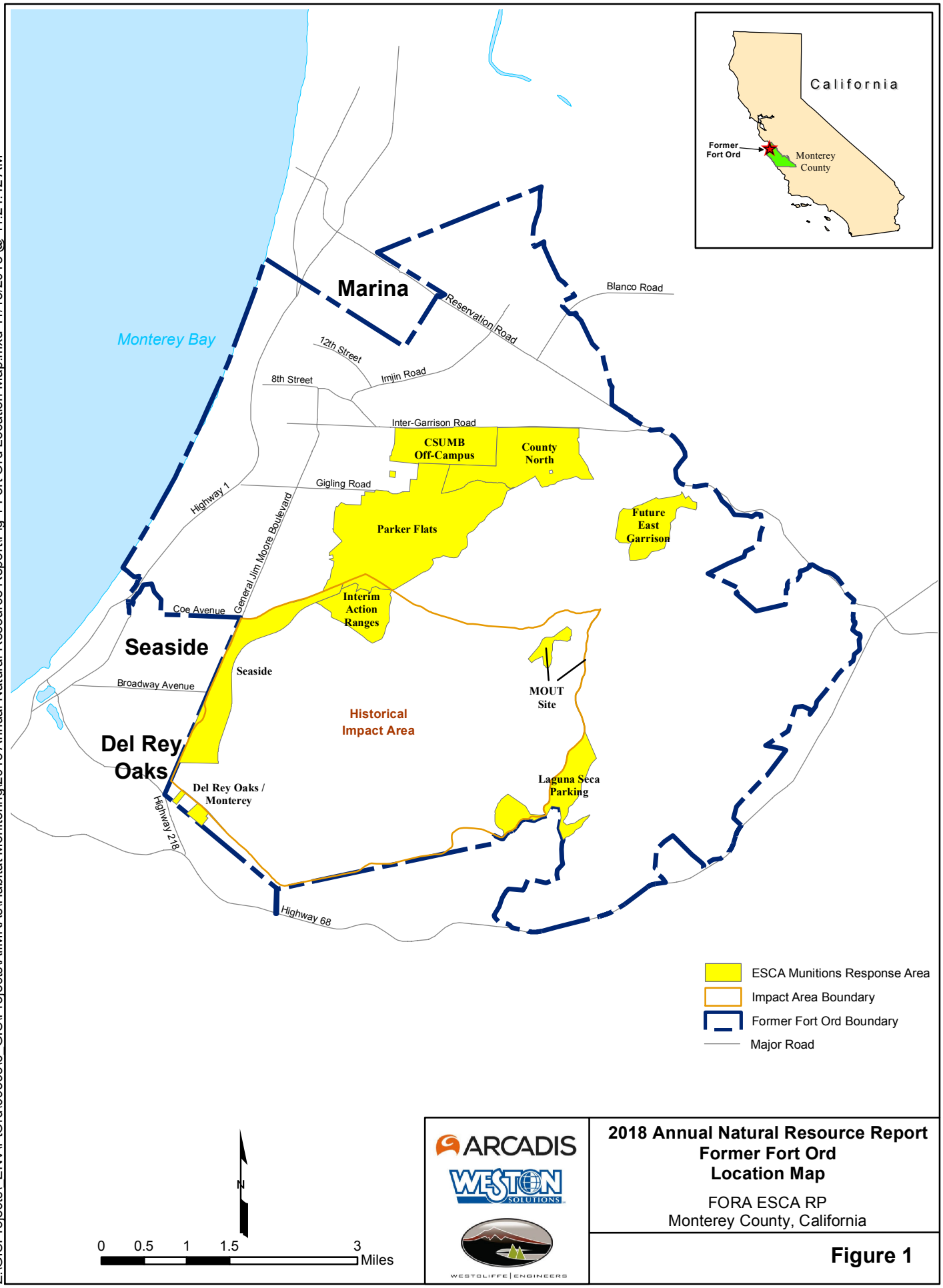
HMP Species in Bold

Table 6-2
Future East Garrison MRA
2018 Species Richness and Diversity

ESCA RP 2018 Annual Natural Resource Report

Future East Garrison MRA						
Vegetation Cutting in Central Maritime Chaparral						
Activity Year	**Baseline (2011)**	**Year 3 (2013)**	**Year 5 (2015)**	**Year 5 with surrounding species included (2015)**	**Year 8 (2018)**	**Year 8 with surrounding species included (2018)**
Number of Transects/Quadrats	39 Transects	6 transects				
Total Number of Native Species	25	17	30	71	45	75
Total Number of HMP Species Present	3	3	3	3	4	4
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	22	16	18	21	22	26
Total Native Herbaceous Species in All Transects or Related Herbaceous Plots	1	15	11	48	21	30
Total Native Ferns and Fern Allies in All Transects or Related Herbaceous Plots	1	0	0	2	1	1
Mean Number Tree Species per Transect	0.1	0.3	0.3	0.8	0.2	1.0
Mean Number Shrub Species per Transect	5.7	8.7	8.8	12.5	9.7	11.7
Mean Number of Native Herbaceous Species in All Transects or Related Herbaceous Plots	0.05	4.8	3.7	12.7	5.5	8.0
Mean number of Native Ferns and Fern Allies per Transect	0.1	0.0	0.0	0.2	0.2	0.2
Diversity - Shannon Index	1.1	1.5	1.5	--	1.5	--
Evenness	0.2	0.2	0.2	--	0.2	--
Total Percent Mean Native Cover (Transects)	109.0%	71.3%	61.6%	--	77.2%	--
Total Percent Mean Native Shrub Cover (Transects)	106.3%	54.4%	58.5%	--	72.9%	--
Total Percent Mean Native Herbaceous Species Cover (Transects)	2.0%	16.8%	2.4%	--	2.8%	--
Total Percent Mean Native Cover (Herbaceous Quadrats)	0%[1]	--	0%[1]	--	--	--

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



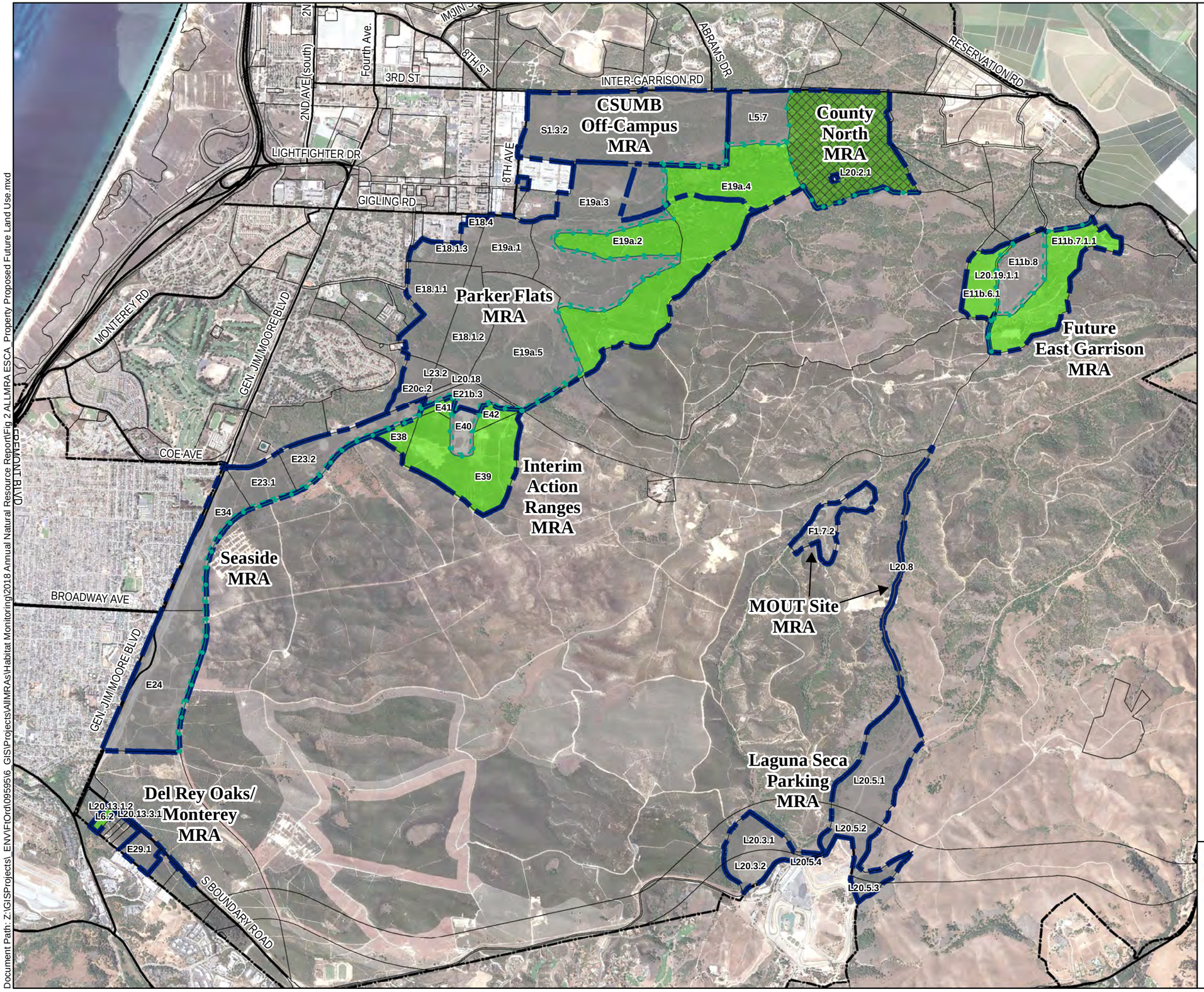
ARCADIS
WESTON SOLUTIONS
WESTCLIFFE | ENGINEERS

2018 Annual Natural Resource Report
Former Fort Ord
Location Map

FORA ESCA RP
Monterey County, California

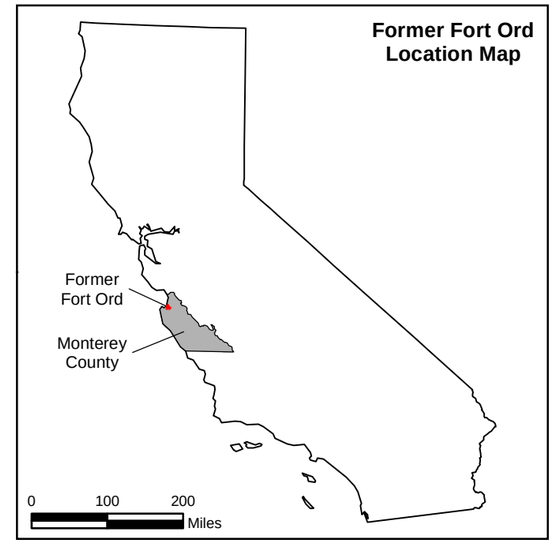
Figure 1

Z:\GIS\Projects_ENV\FtOrd\09595\6_GIS\Projects\AIIMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig 1 Fort Ord Location Map.mxd 11/13/2018 @ 11:24:42 AM



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



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

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2018 Annual Natural Resource Report

ESCA RP
2018 Designated Future Land Use

FORA ESCA RP
Monterey County, California

Figure 2

Reservation Road

5

L20.19.1.1
(Roadway Parcel)

68 North
68 South
AF69
67
AF68AB
AF68C
66
70 (995)
AF 10-1
TANK WASH
996 (Chaparral Pond)

E11b.6.1

E11b.8

E11b.7.1.1

65

Barloy Canyon Road

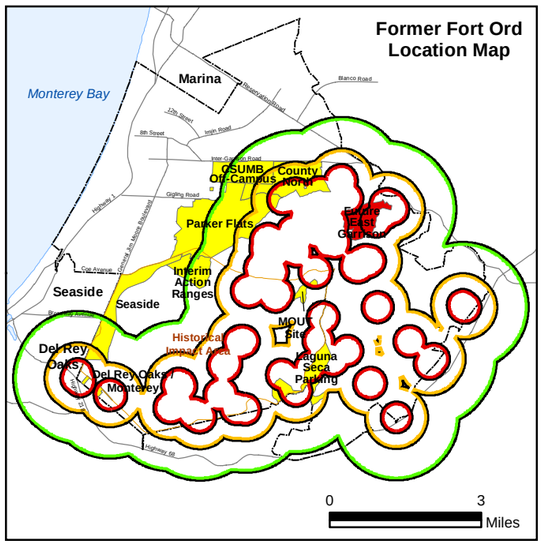
AF09-1B
AF09-2
AF09-1

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



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Accessed 11/21/2014 - Image Date: 8/25/2013

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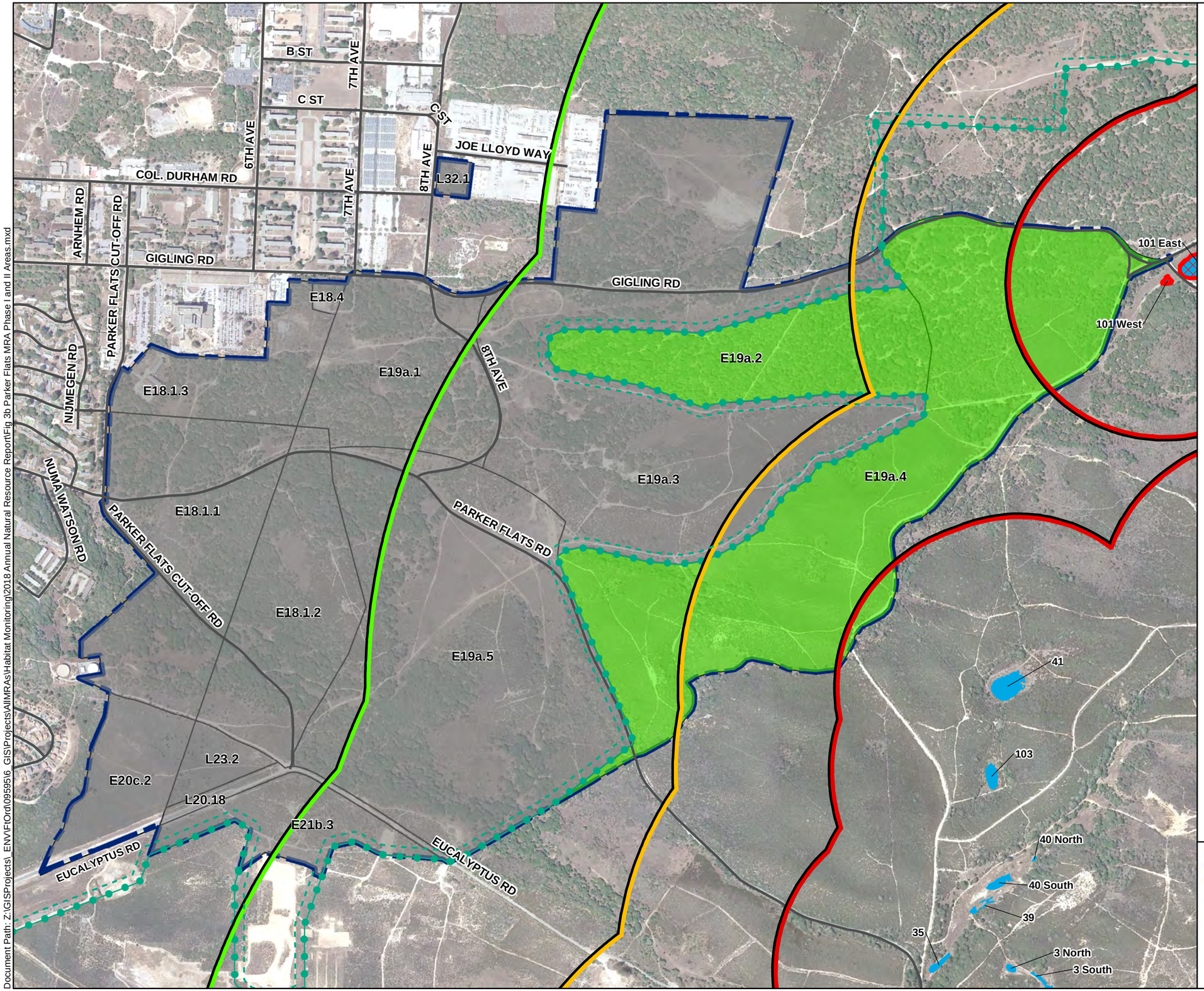
2018 Annual Natural Resource Report

Munitions Response Areas with Habitat Parcels Overview Future East Garrison MRA

FORA ESCA RP
Monterey County, California

Figure 3a

Document Path: Z:\GIS\Projects_ENVFtOrd\0959516_GIS\Projects\AllMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig 3a Future East Garrison MRA.mxd



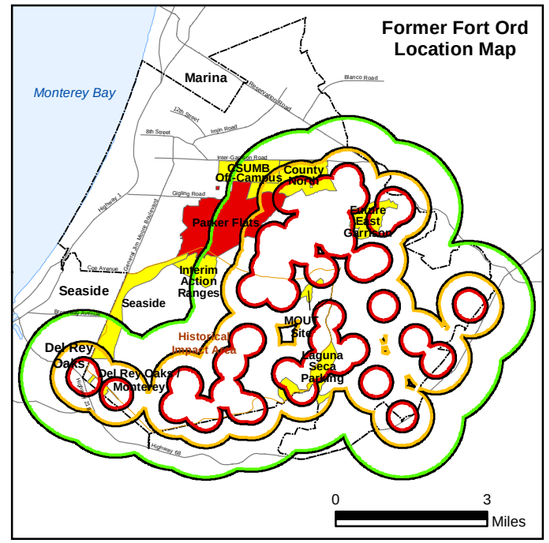
Document Path: Z:\GISProjects_ENV\FtOrd\09595\6_GIS\Projects\AllMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig 3b Parker Flats MRA Phase I and II Areas.mxd

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



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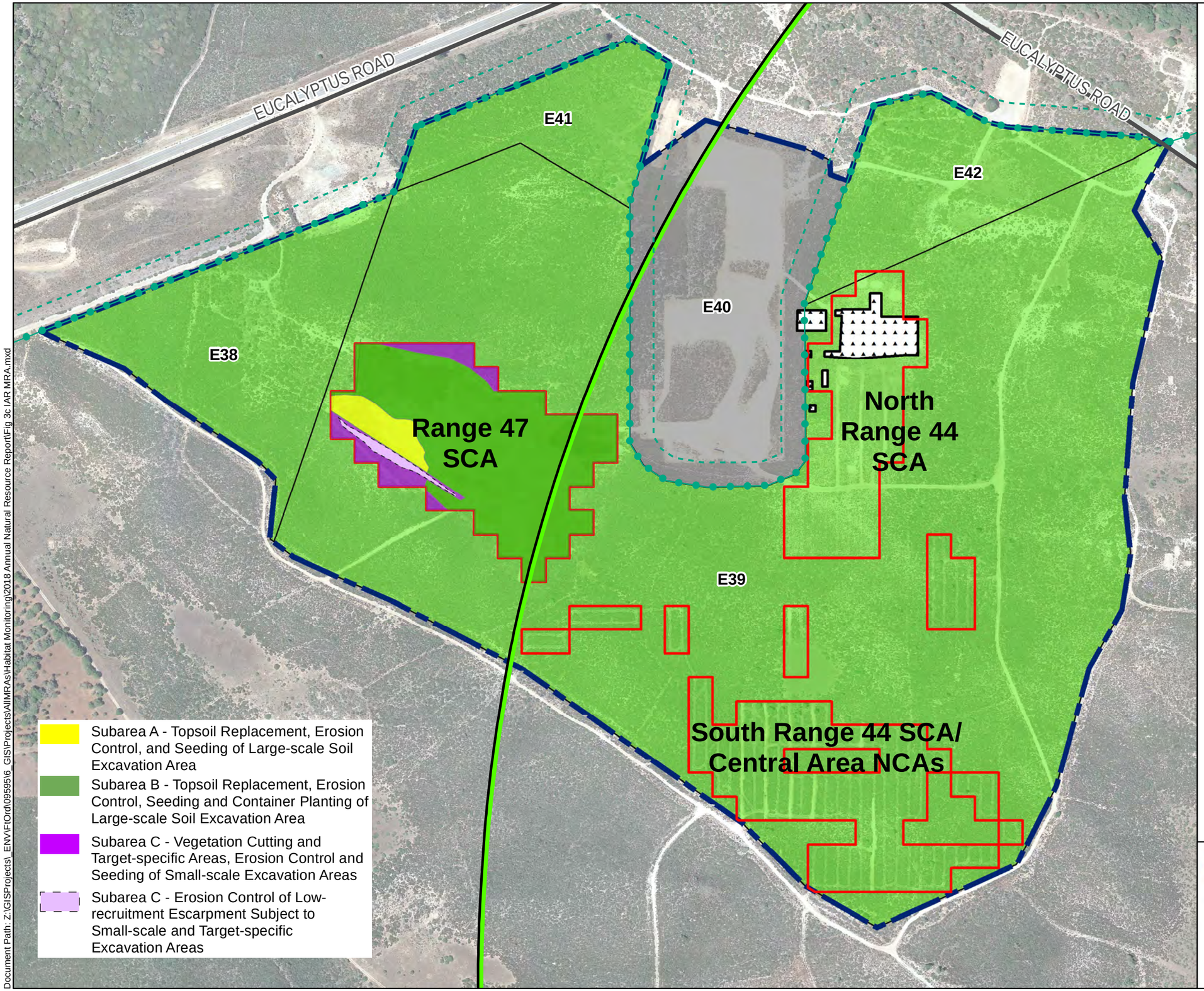
2018 Annual Natural Resource Report

Munitions Response Areas with Habitat Parcels Overview Parker Flats MRA

FORA ESCA RP
Monterey County, California

Figure 3b



Subarea A - Topsoil Replacement, Erosion Control, and Seeding of Large-scale Soil Excavation Area

Subarea B - Topsoil Replacement, Erosion Control, Seeding and Container Planting of Large-scale Soil Excavation Area

Subarea C - Vegetation Cutting and Target-specific Areas, Erosion Control and Seeding of Small-scale Excavation Areas

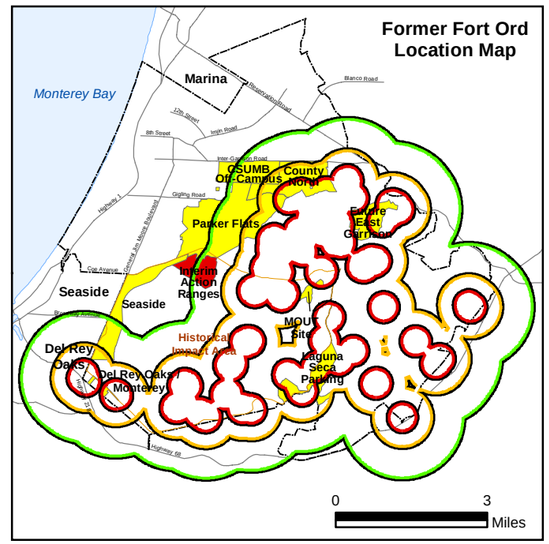
Subarea C - Erosion Control of Low-recruitment Escarpment Subject to Small-scale and Target-specific Excavation Areas

Legend

- Munitions Response Area
- Major Road
- E23.1 — USACE Parcel
- Site 39 (HA44) US Army Action
- Special Case and Non-Completed Areas (Work Areas)
- Habitat Reserve
- Development Parcels
- Borderland Interface
- 100-Foot Buffer from Borderland Interface

California Tiger Salamander Buffer

- 500 m
- 1 km
- 2 km



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Accessed 4/17/2014 - Image Date: 8/25/2013

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2018 Annual Natural Resource Report

Munitions Response Areas with Habitat Parcels Overview
Interim Action Ranges MRA

FORA ESCA RP
Monterey County, California

Figure 3c

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Monterey Bay

CSUMB Off-Campus

County North

Parker Flats

Future East Garrison

Interim Action Ranges

Seaside

MOUT Site

Del Rey Oaks/ Monterey

Laguna Seca Parking

1

218

68

BLANCO ROAD

RESERVATION ROAD

12TH STREET

IMJIN ROAD

8TH STREET

3RD AVENUE

ABRAMS ROAD

INTER-GARRISON ROAD

GIGLING ROAD

PARKER FLATS CUT OFF ROAD

PARKER FLAT ROAD

MONTEREY ROAD

COE AVENUE

EUCALYPTUS ROAD

EUCALYPTUS ROAD

BARLOW CANYON ROAD

DEL MONTE BOULEVARD

FREMONT STREET

BROADWAY ROAD

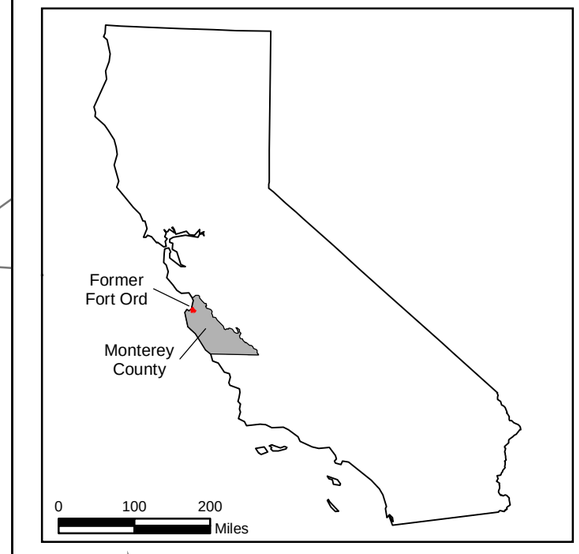
GENERAL JIM MOORE BOULEVARD

WATKINS GATE ROAD

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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2018 Annual Natural Resource Report

Former Fort Ord Monterey Spineflower Critical Habitat Locations

FORA ESCA RP
Monterey County, California

Figure 4

Document Path: Z:\GISProjects_ENV\FtOrd\09595\6_GIS\Projects\AllMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig 4 Monterey Spineflower Critical Habitat Location.mxd

Monterey Bay

BLANCO ROAD

RESERVATION ROAD

12TH STREET

IMJIN ROAD

8TH STREET

ABRAMS ROAD

3RD AVENUE

INTER-GARRISON ROAD

CSUMB Off-Campus

County North

GIGLING ROAD

PARKER FLATS CUT OFF ROAD

Parker Flats

PARKER FLAT ROAD

Future East Garrison

MONTEREY ROAD

COE AVENUE

EUCALYPTUS ROAD

Interim Action Ranges

EUCALYPTUS ROAD

BARLOW CANYON ROAD

DEL MONTE BOULEVARD

FREMONT STREET

BROADWAY ROAD

GENERAL JIM MOORE BOULEVARD

Seaside

MOUT Site

218

WATKINS GATE ROAD

Laguna Seca Parking

Del Rey Oaks/ Monterey

68

68

1

Document Path: Z:\GISProjects_ENV\FtOrd\095595\6_GIS\Projects\AIIMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig 5 CTS Potential Habitat Zones.mxd

Legend

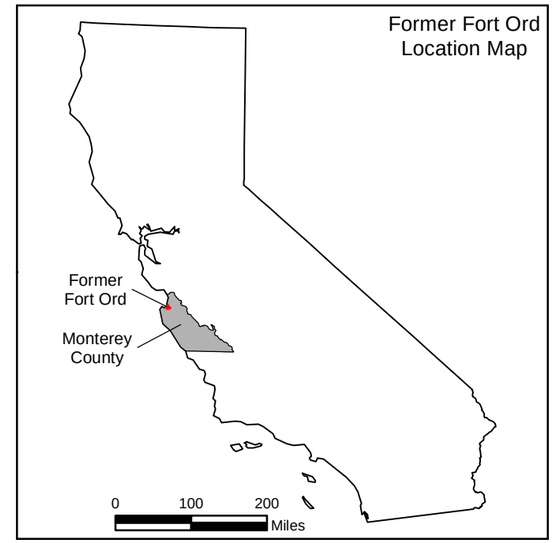
- Major Roads
- Former Fort Ord Boundary
- ESCA Munitions Response Areas
- Historical Impact Area Boundary

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)

Former Fort Ord Location Map



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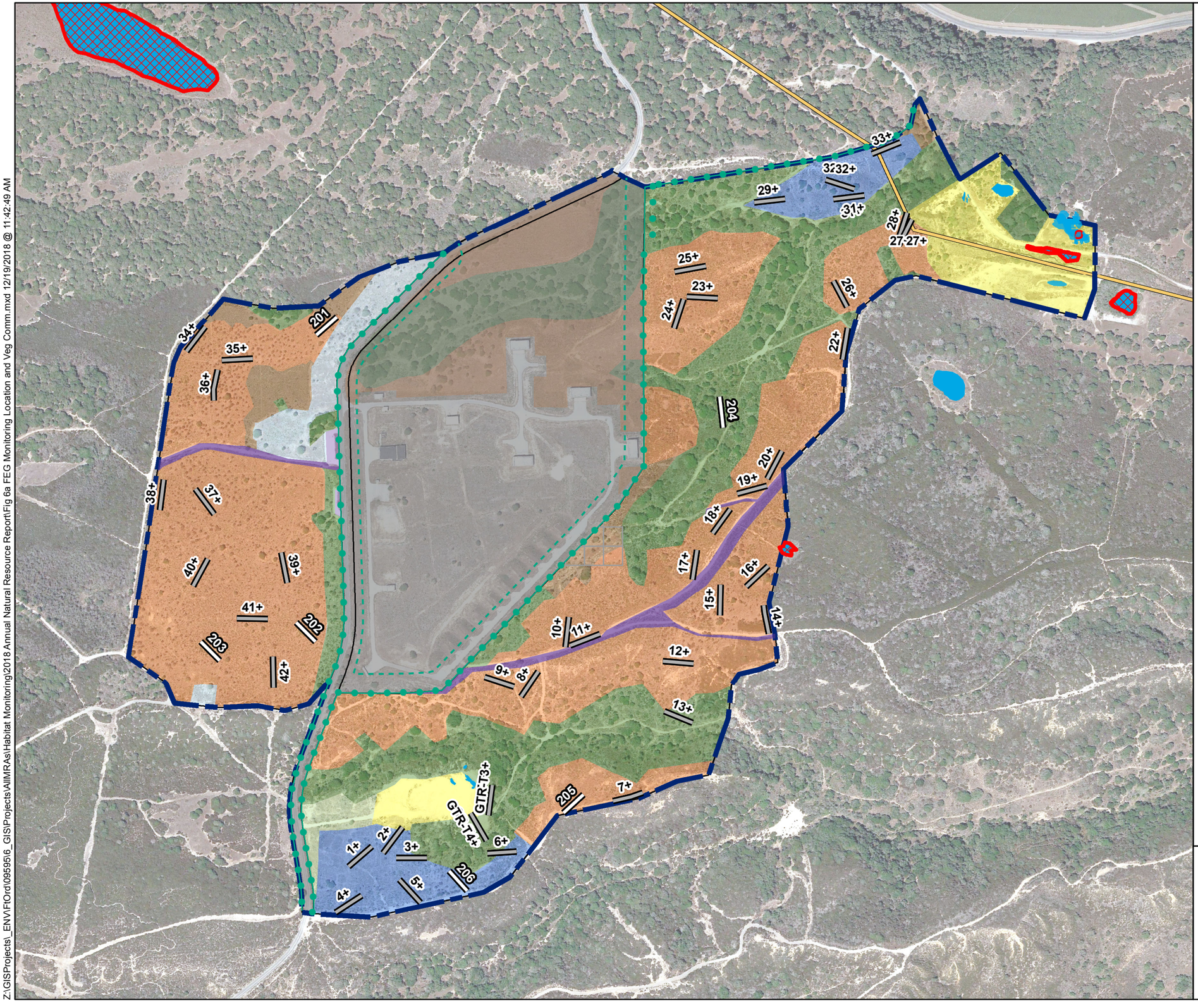
2018 Annual Natural Resource Report

California Tiger Salamander Habitat Buffer Zones

FORA ESCA RP
Monterey County, California

Figure 5



Z:\GISProjects_ENV\FtOrd\095956\6_GIS\Projects\AllMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig 6a FEG Monitoring Location and Veg Comm.mxd 12/19/2018 @ 11:42:49 AM

Legend

- Munitions Response Area
- Natural Gas Pipeline
- Development Parcel
- 2018 Vegetation Transects
- Previously Monitored Transects

Note: + = baseline transect

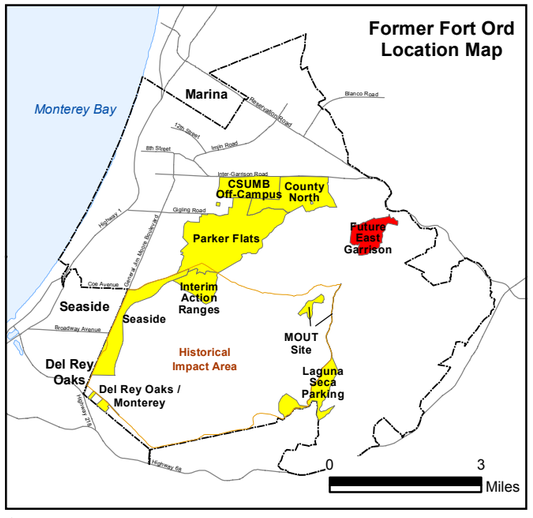
- Borderland Interface
- 100-Foot Buffer from Borderland Interface
- 2018 HMP Herbaceous Species Survey Areas (Survey areas shown outside of MRA habitat boundaries serve as reference locations)
- Aquatic Features
- Aquatic Feature with Documented CTS Presence

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.

Former Fort Ord Location Map



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

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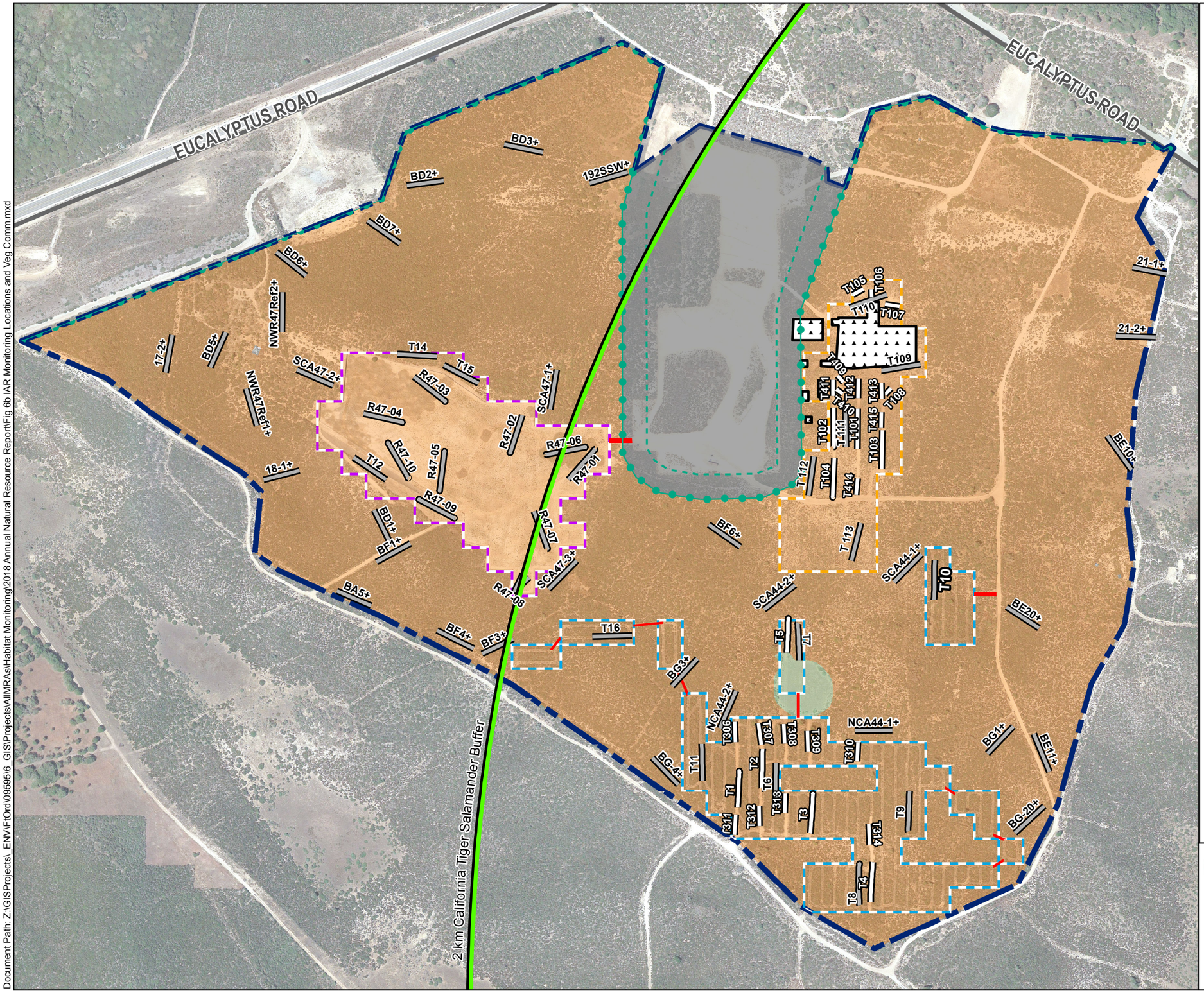
2018 Annual Natural Resource Report

Vegetation Monitoring and HMP Herbaceous Survey Locations Future East Garrison MRA

FORA ESCA RP
Monterey County, California

Figure 6a



Document Path: Z:\GISProjects_ENV\FtOrd\0959516_GIS\Projects\AIMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig 6b IAR Monitoring Locations and Veg Comm.mxd

Legend

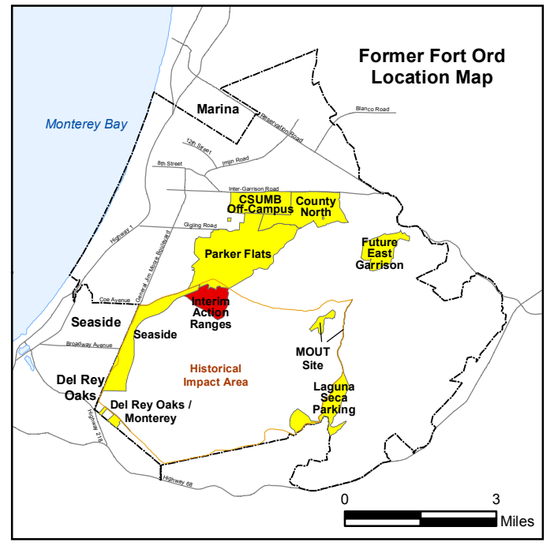
- Munitions Response Area
- Major Road
- Development Parcel
- Improved Ingress/Egress Established by ESCA RP Team
- Site 39 (HA44) US Army Action
- North Range 44 SCA
- South Range 44 SCA/Central Area NCA
- Range 47 SCA
- 2018 Vegetation Transects (Monitored Annually per HRP)
- Baseline Transects
- Borderland Interface
- 100-Foot Buffer from Borderland Interface

Note: + = baseline transect

Vegetation Types*

- Grassland
- Central Maritime Chaparral

*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

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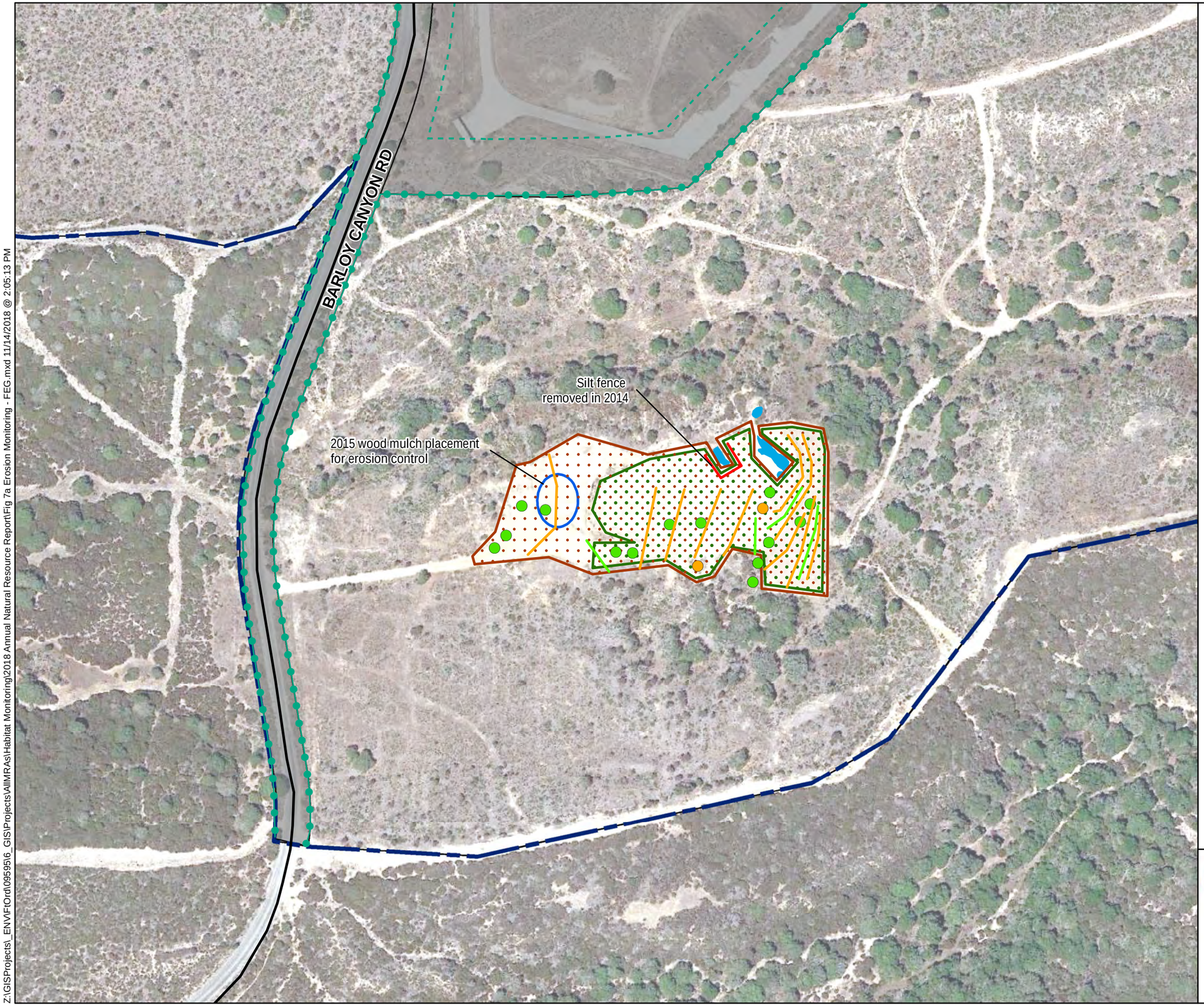
2018 Annual Natural Resource Report
Vegetation Monitoring and HMP Herbaceous Survey Locations
Interim Action Ranges MRA
FORA ESCA RP
Monterey County, California

Figure 6b

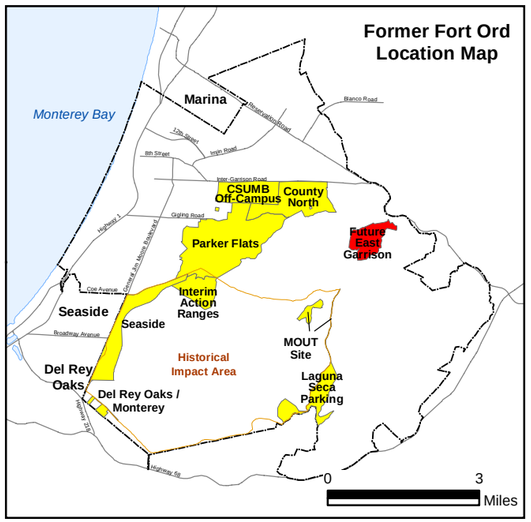


Legend

- 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



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Feet

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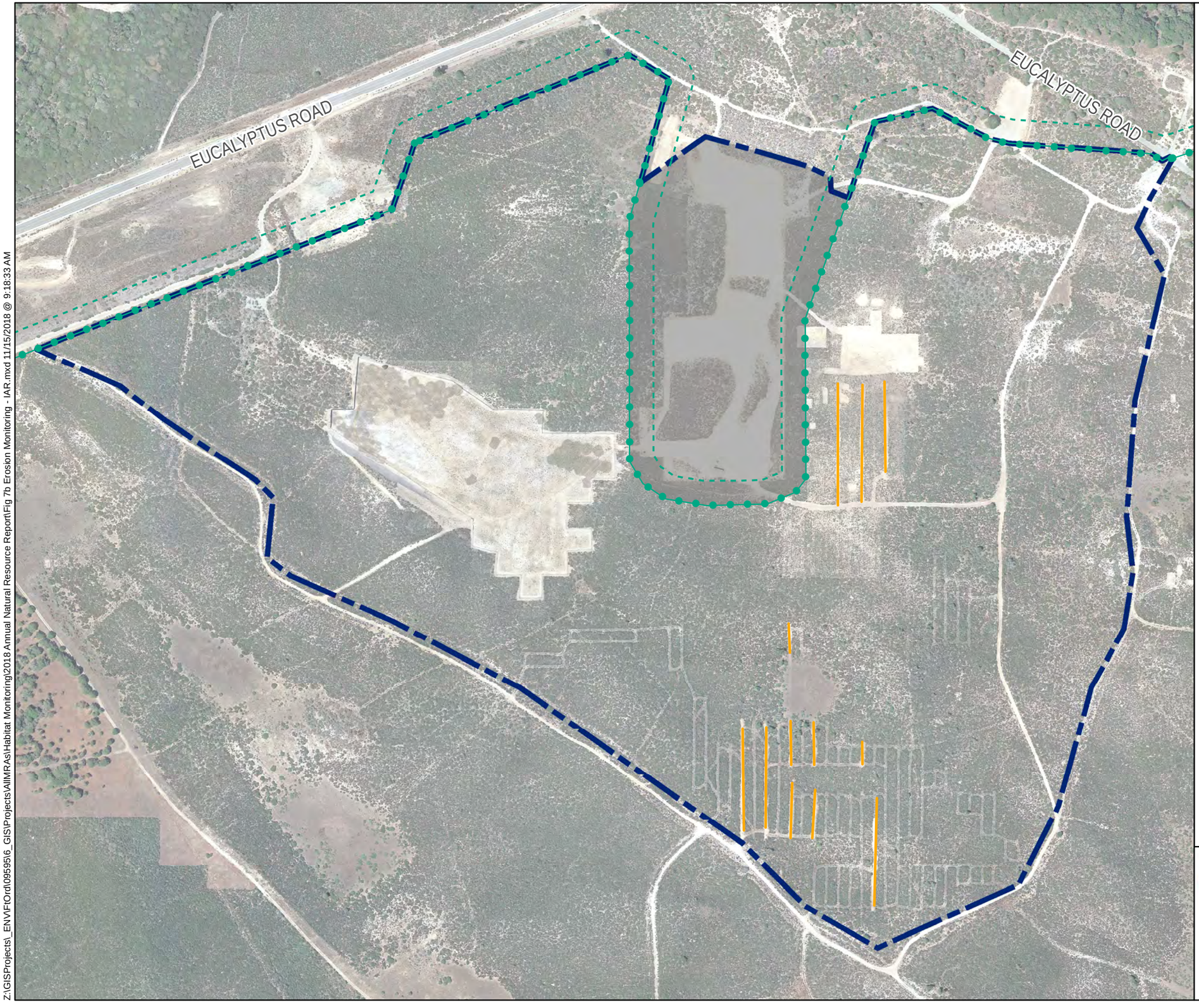
2018 Annual Natural Resource Report

Erosion Control BMPs in Future East Garrison MRA 2013-2015

FORA ESCA RP
Monterey County, California

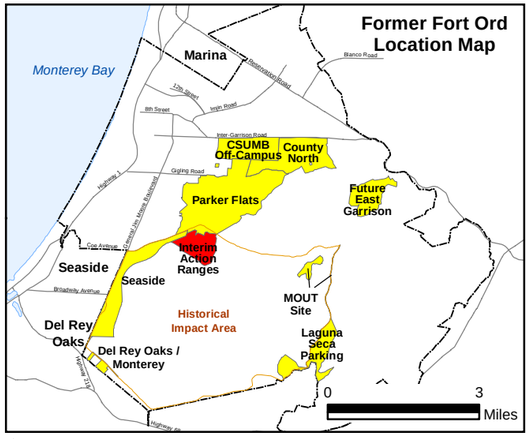
Figure 9a

Z:\GISProjects_ENVFtOrd\0959516_GIS\Projects\AllMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig 7a Erosion Monitoring - FEG.mxd 11/14/2018 @ 2:05:13 PM



Legend

- Major Road
- Munitions Response Area
- Development Parcel
- Borderland Interface
- 100-Foot Buffer from Borderland Interface
- Mulch, Straw Wattles and Water Bars



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2018 Annual Natural Resource Report

Erosion Control BMPs in Interim Action Ranges MRA 2018

FORA ESCA RP
Monterey County, California

Figure 7b

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Figure 8.
Future East Garrison MRA – Mean Shrub Cover of Shrub Species after Vegetation Cutting 2013 - 2018

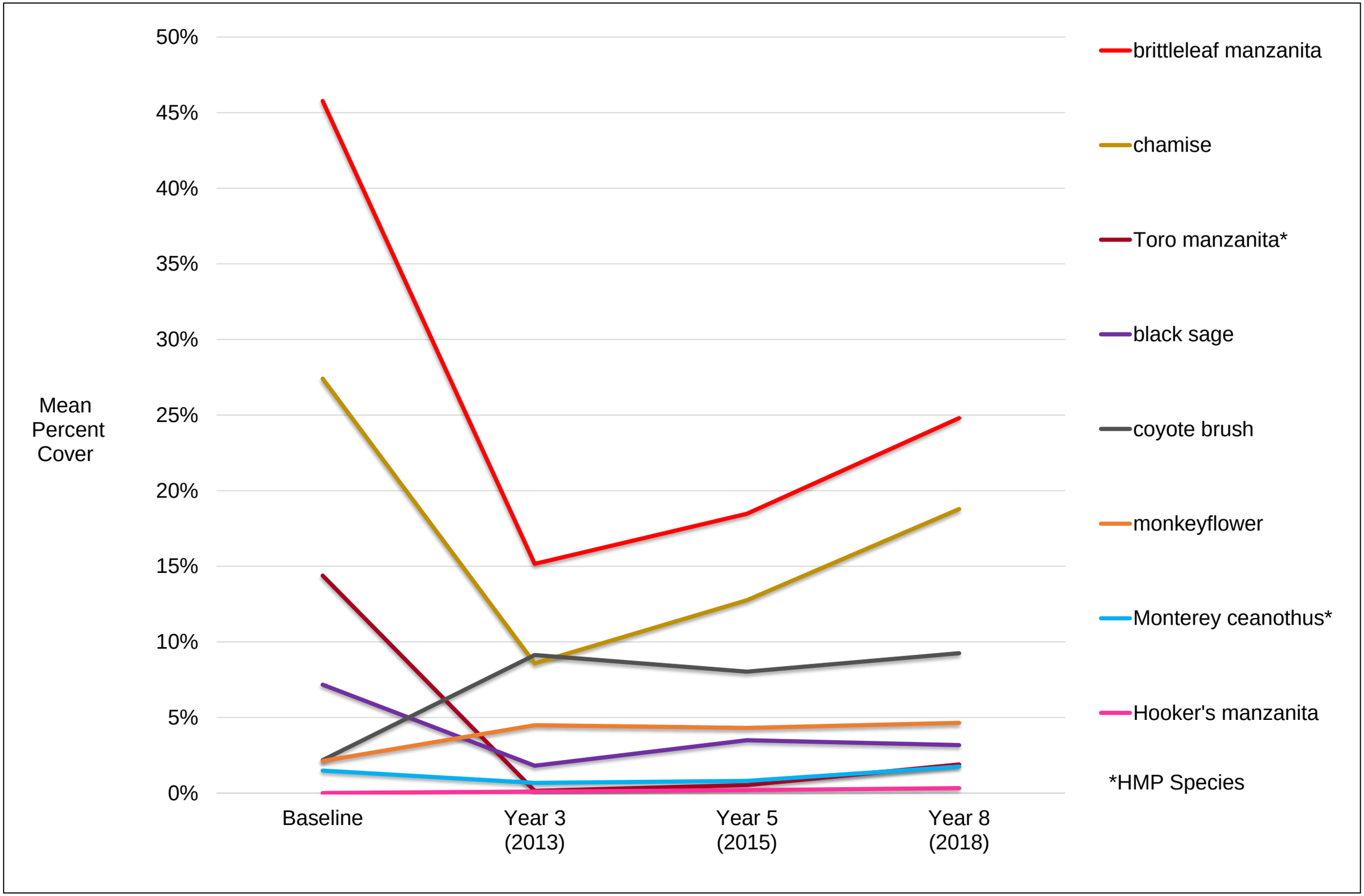


Figure 9.
Future East Garrison MRA – Mean Frequency of Shrub Species after Vegetation Cutting 2013 - 2018

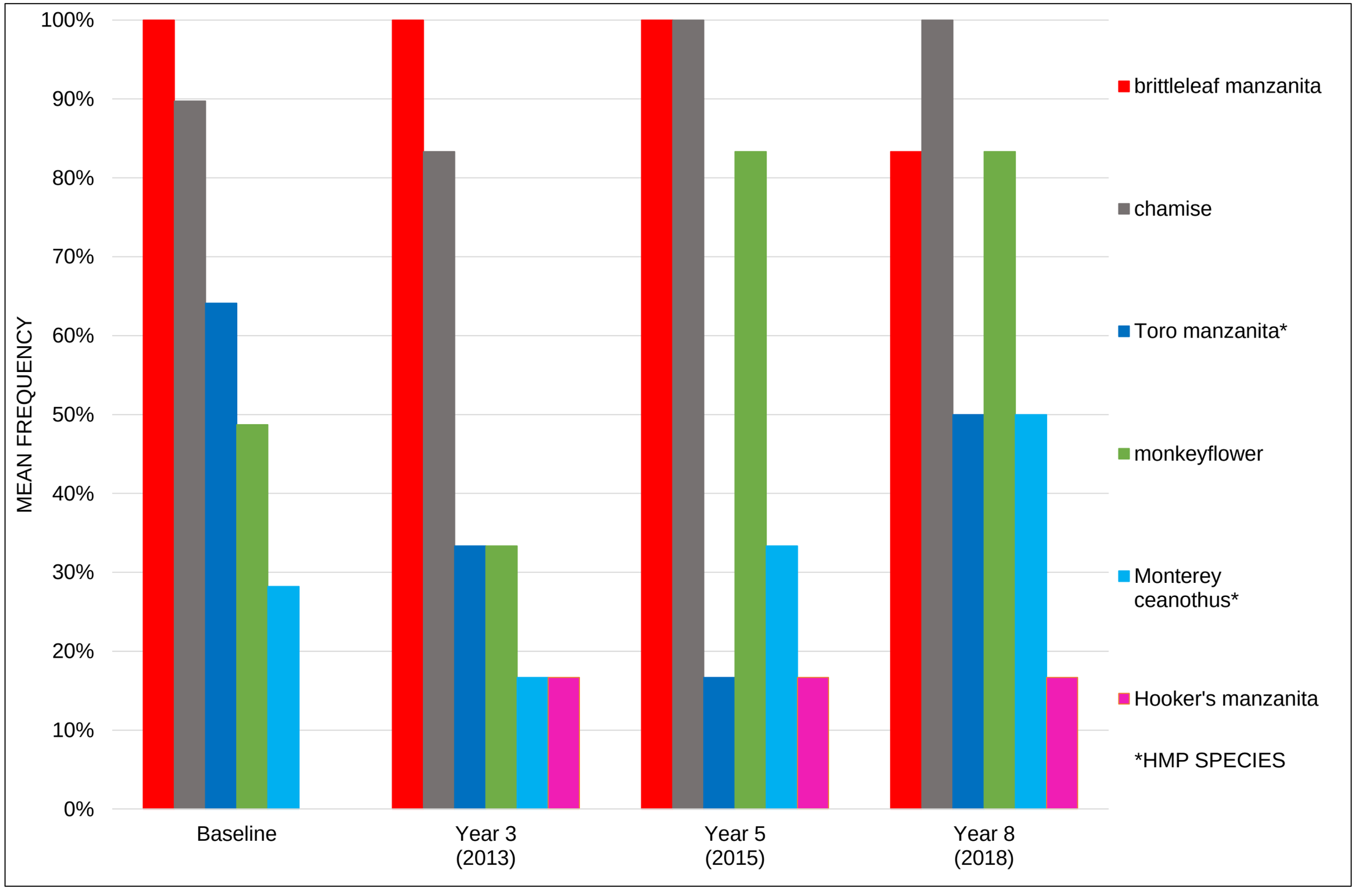
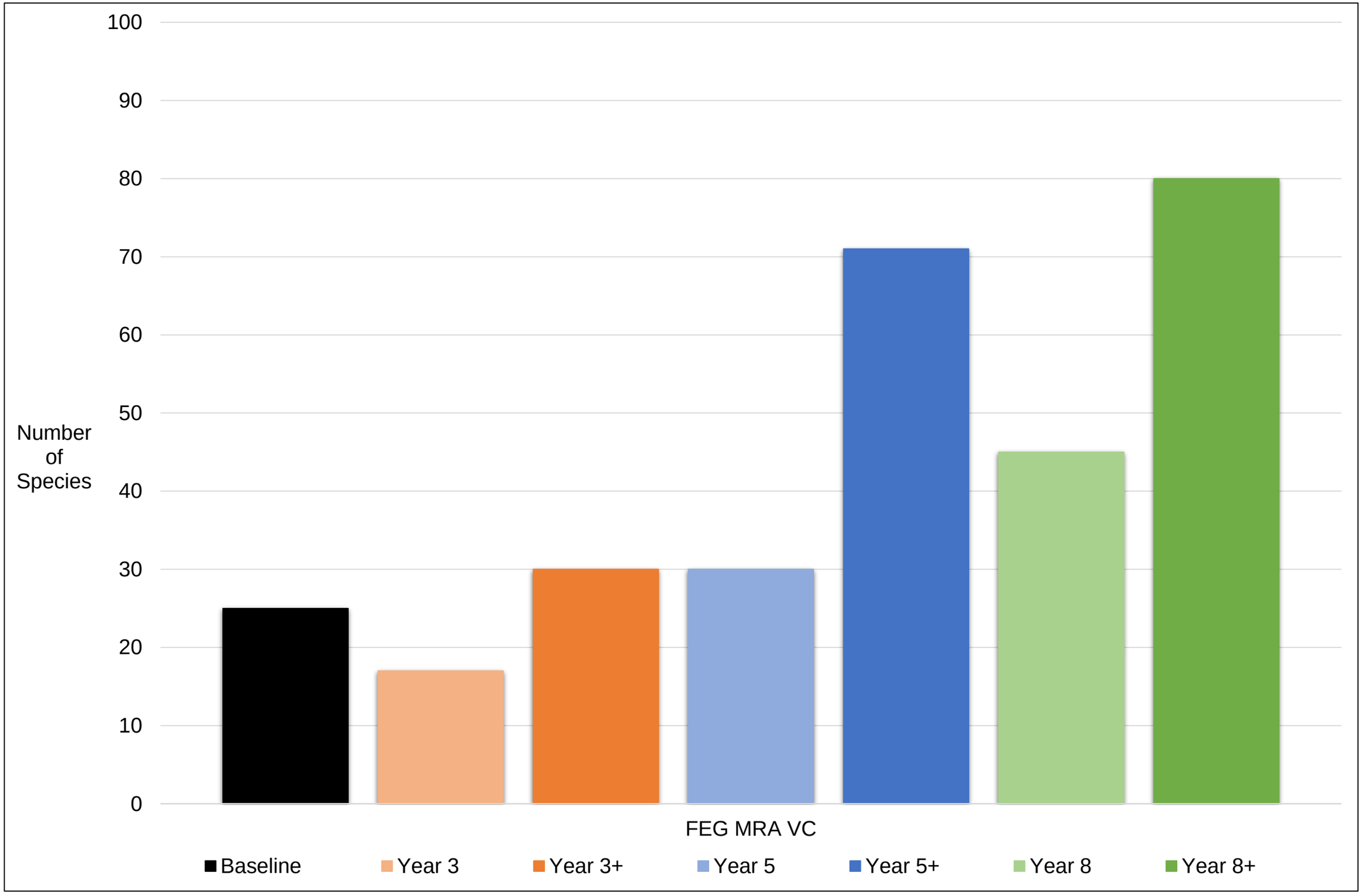
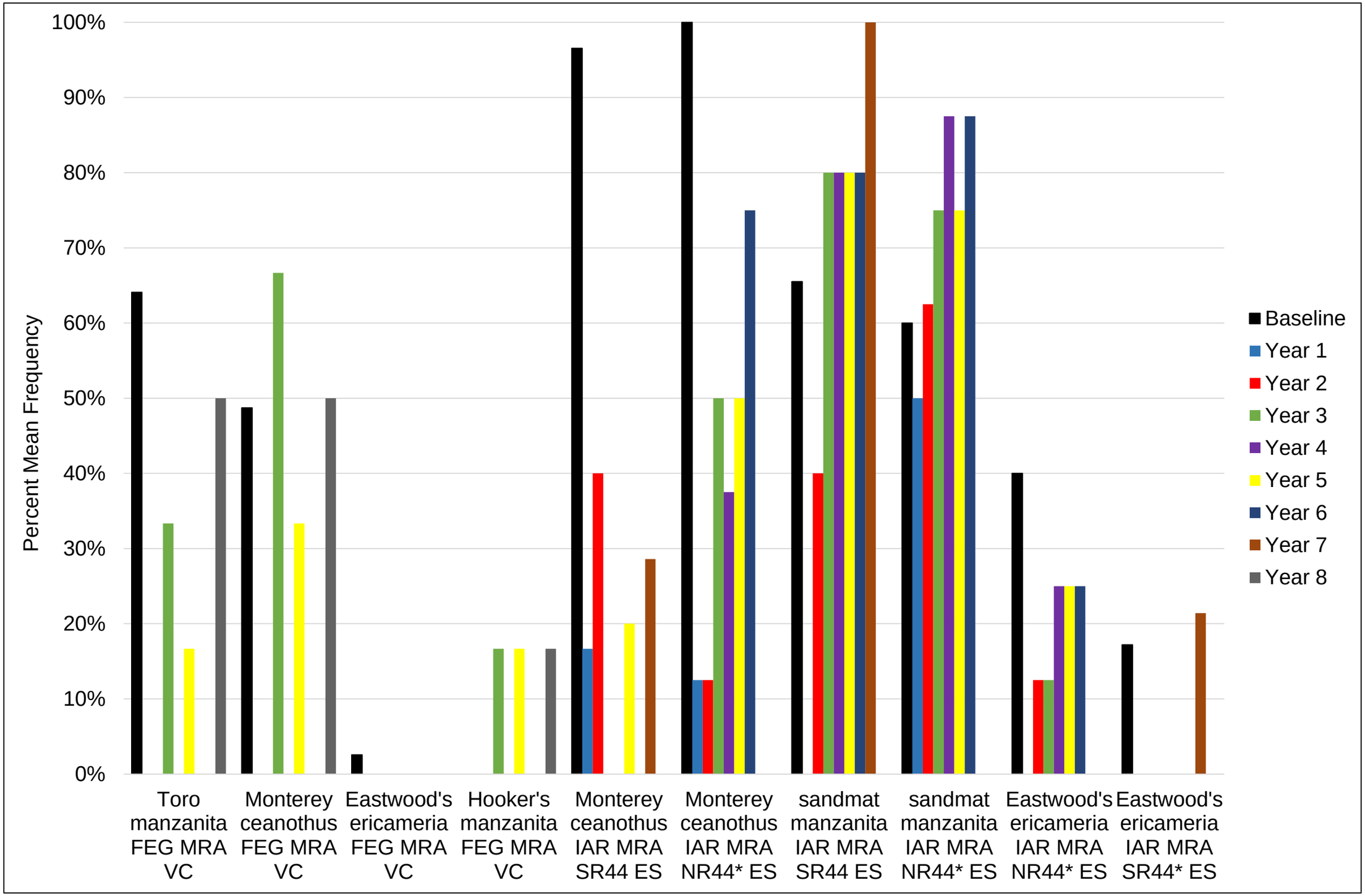


Figure 10.
Future East Garrison MRA - Native Species Richness for Baseline Grids and in 2010 Post-Activity Grids Subject to Vegetation Cutting 2013 - 2018



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

Figure 11.
Future East Garrison MRA and IAR MRA - HMP Shrub Species Frequency from 2010 – 2018



VC = Vegetation Cutting, ES = small-scale excavation

FORA ESCA REMEDIATION PROGRAM

Draft Final

Appendix A.

2018 Habitat Restoration Monitoring Report
Interim Action Ranges Munitions Response Area

Former Fort Ord
Monterey County, California

April 9, 2019

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: 09595-18-057-003

Prepared by:

ARCADIS Design & Consultancy for natural and built assets
WESTON SOLUTIONS
WESTCLIFFE | ENGINEERS

CONTENTS

TABLES

FIGURES

ATTACHMENTS

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)
LUCs	Land Use Controls
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 6 Habitat Restoration Monitoring Report summarizes the activities conducted by the Fort Ord Reuse Authority (FORA) during the sixth 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 2018 and 31 December 2018; it represents the sixth 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, 2016, and 2017 reporting periods (ESCA RP Team 2014, 2015b, 2016, 2017, and 2018).

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, 2016, and 2017 Annual Natural Resource Reports (ESCA RP Team 2016, 2017, and 2018) indicated that most areas in the IAR 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, the areas in South Range 44 SCA and Central Area NCAs and North Range 44 SCA subject to vegetation cutting, and the grassland area in South Range 44 SCA. 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 (LUCs) 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. The LUCs for the Interim Action Ranges MRA are described in the Final Land Use Controls Implementation Plan / Operation and Maintenance Plan, Interim Action Ranges MRA (ESCA RP Team 2018b). The LUCs include but are not limited to: (1) restrictions prohibiting residential use; and (2) restrictions against uses inconsistent with the HMP (USACE 1997). Uses that are inconsistent with the HMP include, but are not limited to, residential, school and commercial /industrial development.

This report summarizes the monitoring activities performed by the ESCA RP Team in 2018, 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 LUCs 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. The LUCs for the Interim Action Ranges MRA are described in the Land Use Controls Implementation Plan / Operation and Maintenance Plan, Interim Action Ranges MRA (ESCA RP Team 2018b). The LUCs include but are not limited to: (1) restrictions prohibiting residential use; and (2) restrictions against uses inconsistent with the HMP

(USACE 1997). Uses that are inconsistent with the HMP include, but are not limited to, residential, school and commercial /industrial development.

1.3 Report Organization

This Year 6 Habitat Restoration Monitoring Report is presented in numbered sections, tables, figures, and an attachment with photographs. 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, 2015, and 2017) 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 alexandrines 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 (ESCA RP Team 2015b). 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 2015b) 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 A6-6)

- 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 A6-7 to A6-8)

- 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 A6-7 to A6-8, 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, 2016, and 2017 Annual Natural Resource Reports (ESCA RP Team 2016, 2017, and 2018) 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, the areas in North Range 44 SCA and South Range 44 SCA and Central Area NCAs subject to vegetation cutting, and the grassland area in South Range 44 SCA. 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, B, and D, container plantings, and HMP herbaceous species were met in 2015, 2016, or 2017 (ESCA RP Team 2016, 2017, and 2018) so their methods are no longer described in this section.

Areas requiring vegetation monitoring in 2018 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 2017. 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 and A6-6. 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 (2009); 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 2018, 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 2009). 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.

Performance targets have been met in several categories to date (Table A6-9). 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 or 2018.

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.

2018 - Twenty-nine transects were monitored on 26 April and 7, 8, 9, and 10 May 2018. In the North Range 44 SCA, eight transects were installed in 2013 and were located mostly at the top of slopes in small-scale excavation areas. In 2018, seven additional transects were installed in North Range 44 small-scale excavation areas near the middle and bottom of slopes to provide more even sampling coverage to gather representative data for the length of the small-scale excavation areas. In South Range 44 small-scale excavation areas, five transects were installed in 2013. In 2018, nine additional transects were placed near the middle and bottom of slopes to provide more even sampling coverage in the small-scale excavation areas.

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. The grassland area met Year 7 performance targets in 2017 and monitoring in for these grassland quadrats is complete.

4.4 Target Weed Cover Methods (Activity C)

Several weedy species found at the site are listed by the California Invasive Plant Council as invasive weeds (Cal-IPC 2018). 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, target weed monitoring was conducted using CNPS releve vegetation monitoring protocol on *CDFW-CNPS Protocol for the Combined Vegetation Rapid Assessment and Relevé Field Form (April 28, 2016)*. Survey plot locations were identified using a random stratified approach. The survey area was divided into five spatially separate areas and then a plot center was randomly selected using a random number generator placing the plot in the middle of the preestablished 100x100 foot grid cells.

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 added in 2018 in the IAR MRA are summarized in Figure A6.

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 A6-8, and in Figures A7-A12. Attachment A provides selected photographs of areas surveyed in 2018.

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 A6-9). 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). In 2017, Year 7 performance targets were met in the grassland grid in South Range 44 SCE that had been previously subject to small-scale soil excavation (Activity C). Monitoring is complete in all of the areas listed above.

Monitoring efforts in 2018 focused on only those areas and activities that had not yet met Year 7 performance targets, which included the Range 44 SCAs and NCAs Activity C 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 and A6-6. 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 year for Activity C between 2010 and 2018, and Figure A8 presents the number of HMP species present for Activity C by year between 2010 and 2018. Cover and frequency data in sampled locations are summarized in Tables A6-7 and A6-8. Status of areas and activity types relative to performance targets are summarized in Table A6-9.

6.1 Native Plant Species Richness Results

The performance category for total native species richness applies to **Activity C** in 2018, 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). 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 2018, 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 2018, a total of 84 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 6 after small-scale excavation activities was 52; there were 15 tree and shrub species and 37 herbaceous species.

A total of 65 species occurred within the one-meter belt along the transect in 2018, including one tree species, 18 shrub species, 45 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 41 in Year 7 after small-scale excavation activities. The number of shrub species was 12 and herbaceous species richness increased from 1 to 29 between baseline and Year 7 (Table A6-5). A total of 60 species were observed within the one-meter belt along the transects, including 16 shrub species, and 44 herbaceous species.

Performance summary: The total native species richness of 60 to 65 species present after small-scale excavation activities in 2018, including 25 shrub and subshrub species, meets 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 (*Arctostaphylos pumila*), Eastwood's ericameria (*Ericameria fasciculata*), Monterey ceanothus (*Ceanothus rigidus*), Monterey spineflower, sand (Monterey) gilia, and seaside bird's-beak. In 2013, coast wallflower (*Erysimum ammophilum*) appeared in small-scale excavation areas, in addition to areas subject to vegetation cutting. All seven of these species were observed in 2018 (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 2018 (3 out of 3 or 100%) meets the Year 7 performance target for HMP shrub species richness (66%) for areas subject to small-scale excavation (Tables A3-3, A6-4, and A6-9).

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 2018. 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 2018 post-activity sampling data are summarized in this section based on small-scale excavations. During 2018, a total of 29 transects were monitored in the IAR MRA in areas that had been subject to small-scale excavation during munitions investigation activities (Figure A2). Thirteen transects were added in 2018 to provide a more comprehensive overview of native cover in small-scale excavation areas, as shown in Tables 6-7 and 6-8; these tables show 2010-2011 baseline results and post-activity data for the past four years.

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 SCA: Table A6-7 shows 2018 cover data from the eight transects installed in 2013 as well as data from 15 transects that combine 2013 transects and the seven new 2018 transects.

Total 2018 native cover in North Range SCA small-scale excavation areas averaged 30%, an eighty-one percent increase over the previous year. Mean native woody species cover in these small-scale excavation areas was 22.9% in Year 6 (Table A6-7, Figure A9). The greatest shrub and subshrub mean cover in 2018 North Range 44 SCA transects in small-scale excavation areas was provided by rush-rose (*Crocanthemum scoparium*, 6.5%), sandmat manzanita (3.7%), and deerweed (*Acmispon glaber,* 3.2%).

Shrubs that occurred in more than 50% of small-scale excavation transects include rush-rose (86.7% frequency), deerweed 86.7% frequency), dwarf ceanothus (*Ceanothus dentatus*; 80% frequency), sandmat manzanita (73.3% frequency), Monterey ceanothus (73.3% mean frequency), golden yarrow (*Eriophyllum confertiflorum*; 73.3% frequency), and shaggy-barked manzanita (*Arctostaphylos tomentosa*; 60% frequency). In baseline transects, the greatest cover was exhibited by shaggy-barked manzanita and dwarf ceanothus. Although cover by these species was low in 2018, shaggy-barked manzanita had 60% frequency and dwarf ceanothus had 80% frequency, suggesting widespread presence of species that will increase in size and cover in time (Figure A10).

Sandmat manzanita exhibited higher frequency in 2018 (73.3%) than in baseline transects (65.5%). Monterey ceanothus was present in 96.6% of baseline transects and 73.3% of 2018 Year 8 transects, or 76% relative frequency in 2018 compared with the baseline.

Mean non-native species cover was 0.5%, comprised of annual non-native species such as tocalote (*Centaurea melitensis*), narrow-leaved filago (*Logfia gallica*), and red-stemmed filaree (*Erodium cicutarium*); none of these non-native annual species had greater than 0.1% cover. No target weeds were present in these transects.

Performance summary: Year 6 mean native vegetative cover in North Range 44 small-scale excavation areas was 30%, meeting the Year 6 native cover performance target of 30% and suggesting that these areas are on a positive trajectory towards forming self-sustaining natural central maritime chaparral communities.

South Range 44: Table A6-8 shows 2018 cover data from the five transects installed in 2013 as well as data from 14 transects that combine 2013 transects and the nine new 2018 transects. The same baseline data are used for both North and South Range 44, although conditions are generally somewhat drier and native cover is slightly lower in South Range 44.

Native cover in Year 7 (2018) transects in South Range 44 small-scale excavation areas averaged 23.0%, a 117% increase over Year 6 data. Mean native shrub and subshrub cover was 20.6% and mean native herbaceous cover was 2.4% (Table A6-8, Figure A11). The greatest shrub and sub-shrub cover was provided by rush-rose (6.3%) and sandmat manzanita (4.3%), with four species providing 1.8 to 2.3% cover: shaggy-barked manzanita, golden yarrow, deerweed, and poison-oak (*Toxicodendron diversilobum*).

Shrubs that occurred in more than 50% of small-scale excavation transects include sandmat manzanita (100% frequency), rush-rose (100% frequency), golden yarrow (92.9% frequency), shaggy-barked manzanita (78.6% frequency), deerweed (78.6% frequency), and black sage

(*Salvia mellifera*), with 64.3% mean frequency (Figure A12). In baseline transects, the greatest cover was exhibited by shaggy-barked manzanita and dwarf ceanothus. Although cover by these species was low in 2018, shaggy-barked manzanita had 78.6% frequency and dwarf ceanothus had 28.6% frequency.

Sandmat manzanita exhibited higher frequency in 2018 (100%) than in baseline transects (65.5%). Monterey ceanothus was present in 96.6% of baseline transects and 28.6% of 2018 Year 8 transects. Eastwood's ericameria exhibited higher frequency in 2018 (21.4%) than in baseline transects (17.2%).

Mean native herbaceous cover was similar to Year 6 data, ranging between 2.4% and 2.9%.

Mean non-native species cover was 0.4%, comprised annual non-native species such as tocalote, narrow-leaved filago, and red-stemmed filaree. Iceplant (*Carpobrotus edulis*) had 0.1% mean cover in these transects; of the 12 transects sampled in small-scaled excavation areas in 2018, two supported iceplant, which has been recently removed.

Performance summary: Year 7 mean native vegetative cover in South Range 44 small-scale excavation areas was 23.0%, not quite meeting the Year 5 native cover performance target of 25% and a little less than half of the Year 7 native cover performance target of 50%. Nonetheless, the high frequency values (>60%) of sandmat manzanita, rush-rose, golden yarrow, shaggy-barked manzanita, deerweed, and black sage suggest that these areas are on a positive trajectory towards forming self-sustaining natural central maritime chaparral communities.

6.5.2 Grassland

All monitoring areas in the grassland area of South Range 44 SCA met Year 7 performance targets for native vegetation cover in 2017 and are no longer subject to ongoing monitoring (ESCA RP Team 2018a).

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 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 (ESCA RP Team 2016); the remaining vegetation-cut monitoring area in South Range 44 met the Year 7 performance target in 2016 (ESCA RP Team 2017).

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 now covers at least 25% of these areas and is expected to continue to increase over time and shrub frequency data suggest the site is on a trajectory of full recovery.

It should be noted that the baseline transects are the same for both North and South Range 44 (including selected Army and ESCA RP "proxy" transects), and were placed outside of the munitions investigation areas until after work was complete. Local variation in frequency of dominant and HMP shrubs was therefore not quantified in baseline transect data. As a result, comparisons of cover and frequency data between baseline and 2018 transects do not reflect location-based site recovery.

Adaptive management measures implemented in 2018 to improve site conditions and boost native vegetation cover include installation of one rolled coir wattle in North Range 44 and two water bars in South Range 44 to capture seeds and deter erosion in January, application of certified weed-free decontaminated mulch in rings around the base of young shrubs in early December, and sowing of western wild rye (*Elymus glaucus*) seed in small-scale excavation areas in early December.

6.6 Target Weed Cover Results

Iceplant is the primary target weed in the IAR MRA monitoring area. There were no iceplant individuals in transects in North Range 44, but two of fourteen transects in South Range 44 supported 0.1% cover by iceplant in small-scale excavation areas; these iceplant individuals were subsequently pulled (Tables A6-7 and A6-8). Average target weed cover for all areas continues to remain below 1%, and meets the Year 7 performance target of less than 5% mean cover (Table D-1; Appendix D). No target weeds were found in any of the 15 releves randomly sampled in North Range 44, South Range 44, and Range 47 SCAs and NCAs. These forms and all weed monitoring data are included 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 2018 included completion of 29 vegetation transects; these monitoring events and associated data provide the ESCA RP Team with valuable information to guide site management.

Vegetation cover and species diversity data indicate 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 (ESCA RP Team 2014).

Both large-scale excavation Subareas A and B in Range 47 achieved all performance targets required in the HRP in 2015 (ESCA RP Team 2016). Restoration plantings and natural recruits continue increasing in size while maintaining populations of HMP annuals. Irrigation infrastructure and fencing was removed in 2016 (ESCA RP Team 2017).

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 meet Year 5 native vegetation cover targets and native species recruitment continues to increase. Adaptive management strategies implemented in 2018 to improve native cover include installation of one rolled coir wattle in North Range 44 and two water bars in South Range 44 to capture seeds and deter erosion in January, application of certified weed-free decontaminated mulch in rings around the base of young shrubs in early

December, and sowing of western wild rye (*Elymus glaucus*) seed in small-scale excavation areas in early December.

Native vegetation in grassland areas has completely recovered to baseline conditions and met Year 7 performance targets in 2017.

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 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. However, habitat monitoring indicates that native vegetation cover recovery in the Range 44 small-scale excavation areas is on a trajectory for full recovery with natural recruitment; therefore, we recommend monitoring of these areas cease after 2019.

Year 7 and 8 quantitative surveys will begin in selected areas in spring 2019 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 2019 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
- Vegetation transects in South Range 44 small-scale excavation areas
- 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, 2017, and 2018 weed control in 2019 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 2019 annual monitoring report.

- Submit annual monitoring report

8.0 REFERENCES

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Table 3-1
Interim Action Ranges MRA Activity Types and Restoration Strategies

ESCA RP 2018 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 3-2
Soil and Topography Remediation Success Criteria

ESCA RP 2018 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 47and 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 2018 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 2018 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 2018 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]	After Activities 2018[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	84
	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

2018 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						
Arbutus menziesii	**Pacific madrone**					
Hesperocyparis macrocarpa	**Monterey cypress**		1B.2			
Pinus radiata	**Monterey pine**		1B.1			
Populus trichocarpa	**black cottonwood**					
Quercus agrifolia	**coast live oak**				x	
Salix lasiolepis	**arroyo willow**				x	
Shrubs and Subshrubs						
Acmispon glaber	**deerweed**				x	
Adenostoma fasciculatum	**chamise**				x	
Arctostaphylos pumila	**sandmat manzanita**	HMP	1B.2		x	
Arctostaphylos tomentosa* subsp. *tomentosa	**shaggy-barked manzanita**				x	
Artemisia californica	**California sagebrush**				x	
Baccharis pilularis* subsp. *consanguinea	**coyote bush, coyote brush**				x	
Ceanothus dentatus	**dwarf ceanothus**				x	
Ceanothus rigidus	**Monterey ceanothus**	HMP	4.2		x	
Crocanthemum scoparium	**rush-rose**				x	
Ericameria ericoides	**dune-heather, mock-heather**				x	
Ericameria fasciculata	**Eastwood's ericameria**	HMP	1B.1		x	x
Eriogonum fasciculatum var. foliolosum	**California buckwheat**				x	
Eriophyllum confertiflorum	**golden yarrow**				x	
Frangula californica* subsp. *californica	**California coffeeberry**				x	
Garrya elliptica	**coast silk-tassel**				x	
Heteromeles arbutifolia	**toyon**				x	
Lepechinia calycina	**pitcher sage**				x	
Lupinus arboreus	**coastal bush lupine**				x	
Lupinus chamissonis	**silver bush lupine**				x	x
Mimulus aurantiacus	**bush monkeyflower**				x	
Ribes malvaceum	**chaparral currant**				x	
Ribes speciosum	**fuchsia-flowered gooseberry**				x	
Salvia mellifera	**black sage**				x	
Solanum umbelliferum	**blue witch nightshade**				x	
Symphoricarpos mollis	**creeping snowberry**				x	
Toxicodendron diversilobum	***poison-oak***				x	

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2018 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)						
Achillea millefolium	**common yarrow**				x	
Acmispon heermannii* var. *orbicularis	**woolly lotus**				x	x
Acmispon strigosus	**Bishop's lotus**				x	
Aira caryophyllea	common silver-hair grass				x	x
Amblyopappus pusillus	**amblyopappus**				x	
Amsinckia intermedia	**common fiddleneck**				x	x
Anagallis arvensis	scarlet pimpernel				x	
Antirrhinum majus	snapdragon					
Apiastrum angustifolium	**wild celery**				x	
Armeria maritima* subsp. *californica	**California sea-pink, sea thrift**				x	
Artemisia douglasiana	**mugwort**					
Avena barbata	slender wild oat				x	x
Avena fatua	wild oat					
Briza maxima	rattlensnake grass					
Bromus diandrus	ripgut brome				x	x
Bromus hordeaceus	soft chess				x	x
Bromus madritensis subsp. *rubens*	red brome			high	x	
Calandrinia ciliata	**red maids**				x	x
Calochortus albus* var. *albus	**fairy lanterns, globe lily**				x	
Calyptridium monandrum	**pussy paws**				x	
Calystegia subacaulis	**hill morning-glory**				x	
Camissonia contorta	**contorted suncups**				x	x
Camissonia strigulosa	**strigose suncups**				x	x
Camissoniopsis cheiranthifolia* subsp. *cheiranthifolia	**beach primrose**					
Camissoniopsis micrantha	**small suncups**				x	
Cardionema ramosissimum	**sand mat**				x	
Carex globosa	**round-fruited sedge**				x	
Carpobrotus edulis	hottentot fig/ice plant			high	x	
Castilleja exserta* subsp. *latifolia	**wideleaf purple owl's clover**				x	x
Caulanthus lasiophyllus	**California mustard**				x	
Centaurea melitensis	tocalote			mod	x	x
Cerastium glomeratum	mouse-eared chickweed				x	x

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2018 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)						
Chenopodium californicum	**California goosefoot**					
Chorizanthe diffusa	**diffuse chorizanthe**				x	
Chorizanthe pungens **var. *pungens***	**Monterey spineflower**	HMP	1B.2		x	x
Cirsium occidentale **var. *occidentale***	**cobweb thistle**				x	x
Cirsium vulgare	bull thistle			mod		
Clarkia amoena	**farewell-to-spring**					
Claytonia perfoliata	**miner's lettuce**				x	
Collinsia heterophylla	**Chinese houses**					
Cordylanthus rigidus **subsp. *littoralis***	**seaside bird's beak**	HMP	1B.1		x	
Corethrogyne filaginifolia	**California aster**				x	
Cortaderia jubata	pampas grass, jubata grass			high	x	
Crassula connata	**pygmy weed**				x	x
Croton californicus	**California croton**				x	x
Cryptantha clevelandii **var. *florosa***	**coastal cryptantha**				x	x
Cryptantha micromeres	**small-flowered cryptantha**				x	x
Cryptantha microstachys	**Tejon cryptantha**				x	x
Daucus pusillus	**rattlesnake weed**				x	
Deinandra increscens **subsp. *increscens***	**coast tarplant**				x	x
Dichelostemma capitatum	**blue dicks, wild hyacinth**				x	x
Drymocallis glandulosa **var. *glandulosa***	**sticky cinquefoil**				x	
Elymus glaucus **subsp. *glaucus***	**western wild-rye**				x	
Epilobium brachycarpus	**tall annual willowherb**					
Epilobium canum	**California-fuchsia**					
Epilobium ciliatum **var. *ciliatum***	**northern willowherb**					
Eriastrum virgatum	**wand woollystar**		4.3		x	x
Erigeron bonariensis	flax-leaved fleabane					
Erigeron canadensis	**horseweed**				x	x
Erigeron foliosus **var. *foliosus***	**leafy daisy**				x	
Erigeron sumatrensis	tropical horseweed					

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2018 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)						
Erodium botrys	long-beaked filaree				x	x
Erodium cicutarium	red-stemmed filaree			lim	x	x
Erysimum ammophilum	**coast wallflower**	HMP	1B.2		x	
Eschscholzia californica	**California poppy**				x	x
Euphorbia peplus	petty spurge					
Festuca microstachya	**small fescue**				x	
Festuca myuros	rattail fescue			mod	x	x
Festuca octoflora	**six-weeks fescue**				x	x
Fritillaria affinis	**checker lily, Mission bells**				x	
Galium californicum	**California bedstraw**				x	
Galium porrigens **var. *porrigens***	**climbing bedstraw**				x	
Gamochaeta ustulata	**purple cudweed**				x	
Gilia capitata **subsp. *abrotanifolia***	**ball gilia**					
Gilia capitata **subsp. *capitata***	**ball gilia**					
Gilia tenuiflora **subsp. *arenaria***	**sand [Monterey] gilia**	HMP	1B.2		x	
Gilia tricolor	**bird's eyes gilia**					
Helminthotheca echioides	bristly ox-tongue			lim		
Herniaria hirsuta subsp. *cinerea*	hairy rupturewort					
Heterotheca grandifolia	**telegraph weed**				x	x
Hordeum brachyantherum **subsp. *brachyantherum***	**meadow barley**					
Horkelia cuneata **var. *cuneata***	**coast horkelia, wedge-leaved horkelia**				x	x
Hypochaeris glabra	smooth cat's ears			lim	x	x
Hypochaeris radicata	cat's ears			mod	x	
Juncus effusus **var. *pacificus***	**bog rush**					
Koeleria macrantha	**June grass**				x	
Layia platyglossa	**tidy tips**				x	x
Lepidium nitidum	**common peppergrass**				x	
Leptochloa fusca **subsp. *fascicularis***	**bearded sprangletop**					
Lessingia pectinata **var. *pectinata***	**common lessingia**				x	x
Leptosiphon parviflorus	**common linanthus**					
Logfia gallica	narrow-leaved filago				x	x
Logfia filaginoides	**California filago**				x	x
Lomatium parvifolium	**coastal biscuitroot**		4.2		x	

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2018 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)						
Lupinus bicolor	**miniature lupine**				x	x
Lupinus concinnus	**elegant lupine**					
Lupinus nanus	**sky lupine**				x	x
Lupinus truncatus	**blunt-leaved lupine**					
Madia exigua	**small tarplant**				x	
Madia sativa	**coast tarplant**				x	
Marah fabaceus	**wild cucumber**				x	
Melica imperfecta	**Coast Range melic**				x	
Melilotus indicus	yellow sweet-clover					
Micropus californicus* var. *californicus	**cottontop**				x	
Mimulus cardinalis	**scarlet monkeyflower**					
Monardella sinuata* subsp. *nigrescens	**northern curly-leaved monardella**		**4.2**		x	x
Navarretia hamata* subsp. *parviloba	**hooked navarretia**				x	
Navarretia intertexta	**needle-leaved navarretia**				x	x
Navarretia squarrosa	**skunkweed**				x	
Nemophila menziesii	**baby blue-eyes**					
Nuttallanthus texanus [Linaria canadensis]	**toad-flax**				x	x
Orobanche bulbosa	**chaparral broomrape**				x	
Orobanche californica	**California broomrape**				x	
Oxalis pilosa	**hairy wood sorrel**					
Parapholis incurva	sicklegrass					
Pectocarya penicillata	**winged combseed**				x	x
Petrorhagia dubia	hairypink				x	x
Phacelia campanularia	**desert bluebells**					
Phacelia distans	**wild heliotrope**				x	
Phacelia douglasii	**Douglas' phacelia**				x	
Piperia michaelii	**Michael's rein-orchid**		**4.2**		x	
Plagiobothrys collinus* var. *fulvescens	**rusty-haired popcorn flower**				x	
Plantago coronopus	cut-leaved plantain				x	

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2018 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)						
Plantago erecta	**California plantain**				x	x
Poa annua	annual bluegrass					
Poa secunda	**one-sided bluegrass, pine bluegrass**				x	
Pogogyne serpylloides	**thymeleaf mesamint**					
Polypogon interruptus	ditch beard grass					
Polypogon monspeliensis	rabbitsfoot grass			lim		
Polypogon viridis	water beard grass					
Pseudognaphalium beneolens	**fragrant everlasting**				x	
Pseudognaphalium californicum	**California everlasting**				x	x
Pseudognaphalium ramosissimum	**pink everlasting**				x	
Pseudognaphalium stramineum	**cottonbatting plant**				x	
Psilocarphus tenellus	**slender woolly marbles**					
Pterostegia drymarioides	**fairy mist**				x	
Rumex acetosella	sheep sorrel			mod	x	x
Sagina apetela	**sticky pearlwort**					
Senecio c.f. aphanactis	**chaparral ragwort**		2B.2		x	
Senecio glomeratus	cut-leaved fireweed			mod		
Senecio vulgare	common ragwort					
Silene gallica	windmill pink				x	x
Sisymbrium orientale	Indian hedgemustard					
Sisyrinchium bellum	**blue-eyed grass**					
Solanum americanum **(herbaceous)**	**American nightshade**					
Sonchus asper subsp. *asper*	prickly sow-thistle				x	
Sonchus oleraceus	common sow-thistle				x	
Spergula arvensis	corn spurrey					
Spergularia rubra	red sand-spurrey					
Stachys bullata	**wood mint**				x	
Stipa pulchra	**purple needlegrass**				x	
Stylocline gnaphaliodes	**everlasting neststraw**				x	x
Taraxia [Camissonia] ovata	**suncups**				x	
Toxicoscordion fremontii	**Fremont's star lily**				x	
Trifolium ciliolatum	**foothill clover**				x	x
Trifolium gracilentum	**pinpoint clover**				x	
Trifolium hirtum	rose clover			mod		
Trifolium microcephalum	**hairy clover, small-headed clover**				x	x
Uropappus lindleyi	**silver puffs**				x	
Viola cultivar	pansy					

Table A 6-2
Observed Plant Species in Interim Action Ranges MRA

2018 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						
Pteridium aquilinum* var. *pubescens	**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 2018 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]	After Activities 2018[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	6	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	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 2018 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						2018 Compared with Baseline (percent of presence)	
				2013	2014	2015	2016[3]	2017[3]	2018[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	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, 2016, and 2017 year were not sampled in 2016, 2017, or 2018

Table A 6-4
Interim Action Ranges MRA Native Shrub Species Richness by Activity Type

ESCA RP 2018 Annual Natural Resource Report – Appendix A

Activity Category	Location	Restoration Strategy	Presence of HMP Shrub Species							
			Prior to Activities [2]	After Activities						2018 Compared with Baseline Requirement of 3 HMP Shrubs (percent of presence)
				2013	2014	2015	2016[3]	2017[3]	2018[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	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
2018 Plant Species Richness and Diversity

ESCA RP 2018 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**	**Small-scale Excavation**											
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)**	**Year 6 (2017)**	**Year 6 with surrounding species included (2017)**	**Year 7 (2018)**	**Year 7 with surrounding species included (2018)**
Number of Transects/Quadrats	**Seven Transects**	**Five Transects and 30 Quadrats**				**Five Transects**						**Fourteen Transects**	
Total Number of Native Species	**15**	18	29	26	39	44	70	39	52	35	58	41	60
Total Number of HMP Species Present	**3**	1	3	5	5	3	5	3	5	3	5	5	5
Total Number of HMP Herbaceous Species Present	**0**	1	1	3	2	2	2	2	2	2	3	2	2
Total Tree Species in All Transects	**0**	0	0	0	0	1	1	0	0	0	1	0	0
Total Shrub Species in All Transects	**14**	7	12	11	14	17	20	8	14	10	14	12	16
Total Herbaceous Species in All Transects or Related Herbaceous Plots	**1**	11	17	15	25	26	49	31	38	25	43	29	44
Total Fern and Fern Allies Species in All Transects	**0**	0	0	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	0.0	0.2	0.0	0.0
Mean Number of Shrub Species per Transect	**9.6**	4.0	5.8	5.0	9.2	5.2	9.2	4.4	9.0	5.8	7.8	6.7	8.9
Mean Number of Herbaceous Species per Transect	**0.0**	4.6	6.6	3.0	11.2	7.0	14.0	14.8	23.4	13.8	22.3	6.1	17.1
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	0.0	0.0	0.0
Diversity - Shannon Index	**1.8**	0.7	0.6	0.8	--	1.0	--	1.2	--	1.3	--	1.5	--
Evenness	**0.2**	0.2	0.1	0.2	--	0.2	--	0.2	--	0.2	--	0.2	--
Total Percent Mean Native Cover (Transects)	**108.8%**	7.5%	14.4%	19.7%	--	14.8%	--	18.6%	--	10.6%	--	25.7%	--
Percent Mean Shrub Cover	**107.6%**	2.3%	7.6%	16.4%	--	11.3%	--	14.0%	--	7.7%	--	23.3%	--
Percent Mean Herbaceous Cover (Transects)	**1.2%**	5.1%	6.8%	3.3%	--	3.5%	--	--	--	2.9%	--	2.4%	--
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 - 2018 Plant Species Richness and Diversity

ESCA RP 2018 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA in Central Maritime Chaparral												
Location	**Interim Action Ranges MRA Range R44**											
Area	**All**											
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)**	**Year 6 (2018)**	**Year 6 with surrounding species included (2018)**
Number of Transects/Quadrats	**Five Transects**	**Eight Transects**									**Fifteen Transects**	
Total Number of Native Species	**15**	24	41	58	44	62	47	60	42	63	52	65
Total Number of HMP Species Present	**3**	3	6	7	6	7	6	7	6	7	7	7
Total Number of HMP Herbaceous Species Present	**0**	1	3	4	3	4	3	4	3	4	4	4
Total Tree Species in All Transects	**0**	1	1	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	14	18
Total Herbaceous Species in All Transects or Related Herbaceous Plots	**1**	12	24	38	30	43	35	43	29	47	36	45
Total Fern and Fern Allies Species in All Transects	**0**	1	1	1	0	1	0	1	0	1	1	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	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	7.1	9.5
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	8.8	16.9
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	0.1	0.2
Diversity - Shannon Index	**1.8**	0.8	0.9	--	1.1	--	1.2	--	1.3	--	1.4	--
Evenness	**0.2**	0.3	0.2	--	0.2	--	0.2	--	0.2	--	0.2	--

Table A 6-6
Interim Action Ranges MRA North Range 44 SCA and Central Area NCAs
2010 - 2018 Plant Species Richness and Diversity

ESCA RP 2018 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA in Central Maritime Chaparral												
Location	**Interim Action Ranges MRA Range R44**											
Area	**All**											
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)**	**Year 6 (2018)**	**Year 6 with surrounding species included (2018)**
Number of Transects/Quadrats	**Five Transects**	**Eight Transects**									**Fifteen Transects**	
Total Percent Mean Native Cover (Transects)	**99.6%**	2.8%	4.4%	--	10.9%	--	23.8%	--	16.5%	--	25.9%	--
Percent Mean Shrub Cover	**98.0%**	0.8%	1.9%	--	5.0%	--	11.5%	--	12.3%	--	20.3%	--
Percent Mean Herbaceous Cover (Transects)	**1.7%**	0.0%	2.4%	--	5.4%	--	11.3%	--	4.2%	--	6.5%	--
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 North Range 44 SCA
Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)

ESCA RP 2018 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						
Quercus agrifolia	coast live oak	0.0%	--	--	0.0%	0.0%
Total Cover by Native Tree Species		***0.0%***			***0%***	
Acmispon glaber	deerweed	2.6%	0.0%	--	1.5%	0.0%
Crocanthemum scoparium	rush-rose	8.1%	9.1%	2.9%	8.6%	86.2%
Arctostaphylos pumila	**sandmat manzanita**	**1.6%**	**2.0%**	**0.6%**	**1.7%**	**65.5%**
Ceanothus dentatus	dwarf ceanothus	20.2%	16.0%	5.0%	21.4%	89.7%
Eriophyllum confertiflorum	golden yarrow	1.5%	2.2%	0.7%	1.6%	65.5%
Lupinus chamissonis	silver bush lupine	0.4%	1.1%	0.4%	0.4%	13.8%
Toxicodendron diversilobum	poison-oak	0.0%	--	--	0.0%	0.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	29.3%	15.6%	4.9%	31.0%	100%
Ceanothus rigidus	**Monterey ceanothus**	**13.5%**	**9.3%**	**2.9%**	**14.3%**	**96.6%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.2%**	**0.5%**	**0.2%**	**0.2%**	**17.2%**
Salvia mellifera	black sage	5.3%	7.2%	2.3%	5.6%	69.0%
Adenostoma fasciculatum	chamise	9.0%	6.9%	2.2%	9.5%	89.7%
Ericameria ericoides	dune-heather, mock-heather	1.5%	5.6%	1.8%	1.6%	24.1%
Frangula californica subsp. *californica*	California coffeeberry	0.9%	1.9%	0.6%	1.0%	31.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.7%	1.8%	0.6%	0.7%	24.1%
Mimulus aurantiacus	bush monkeyflower	0.5%	0.9%	0.3%	0.5%	27.6%
Lepechinia calycina	pitcher sage	0.4%	1.4%	0.5%	0.4%	20.7%
Total Mean Percent Shrub and Subshrub Cover		***95.6%***			***100.0%***	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		***0.0%***	***--***	***--***	***0.0%***	***--***
Target Weed Total *(Carpobrotus edulis)*		***0.0%***				
Total Mean Non-native Herbaceous Species Cover		***na***				
Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)		***95.6%***				
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

1. These data are reported from the same eight transects sampled in years 1- 5

2. These data are reported from the same eight transects sampled in years 1- 5, plus seven transects added in 2018

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

Mean percent cover and relative cover values for 2018 represent averages weighted by transect length

Table A 6-7
Interim Action Ranges MRA North Range 44 SCA
Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)

ESCA RP 2018 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						
Quercus agrifolia	coast live oak	0.0%	0.0%	--	0.0%	0.0%
Total Cover by Native Tree Species		***0%***			***0%***	
Acmispon glaber	deerweed	0.8%	0.9%	0.8%	0.8%	80.0%
Crocanthemum scoparium	rush-rose	11.6%	11.0%	10.5%	11.6%	100.0%
Arctostaphylos pumila	**sandmat manzanita**	**2.4%**	**3.3%**	**3.1%**	**2.4%**	**60.0%**
Ceanothus dentatus	dwarf ceanothus	23.4%	19.3%	18.4%	23.5%	100.0%
Eriophyllum confertiflorum	golden yarrow	2.8%	3.2%	3.0%	2.8%	100.0%
Lupinus chamissonis	silver bush lupine	0.3%	0.7%	0.7%	0.3%	20.0%
Toxicodendron diversilobum	poison-oak	0.0%	0.0%	--	0.0%	0.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	22%	6%	6%	22%	100%
Ceanothus rigidus	**Monterey ceanothus**	**9.4%**	**10.3%**	**9.9%**	**9.4%**	**100.0%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.6%**	**0.9%**	**0.8%**	**0.6%**	**40.0%**
Salvia mellifera	black sage	6.1%	5.8%	5.6%	6.1%	60.0%
Adenostoma fasciculatum	chamise	16.1%	6.1%	5.8%	16.2%	100.0%
Ericameria ericoides	dune-heather, mock-heather	0.8%	1.2%	1.1%	0.8%	40.0%
Frangula californica subsp. *californica*	California coffeeberry	1.8%	2.2%	2.1%	1.8%	60.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	0.0%	--	0.0%	0.0%
Mimulus aurantiacus	bush monkeyflower	0.0%	0.1%	0.1%	0.1%	20.0%
Lepechinia calycina	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 *(Carpobrotus edulis)*		***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

1. These data are reported from the same eight transects sampled in years 1- 5

2. These data are reported from the same eight transects sampled in years 1- 5, plus seven transects added in 2018

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

Mean percent cover and relative cover values for 2018 represent averages weighted by transect length

Scientific Name	Common Name	Eight Transects in Small Scale Excavations in North Range 44[1]				
		Post-Activity Data 2015* (Year 3)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
Tree Species						
Quercus agrifolia	coast live oak	0.5%	1.5%	1.0%	4.2%	12.5%
Total Cover by Native Tree Species		***1%***			***5%***	
Acmispon glaber	deerweed	1.1%	2.3%	1.6%	8.4%	62.5%
Crocanthemum scoparium	rush-rose	1.0%	1.1%	0.7%	7.6%	75.0%
Arctostaphylos pumila	**sandmat manzanita**	**0.9%**	**0.9%**	**0.6%**	**7.5%**	**75.0%**
Ceanothus dentatus	dwarf ceanothus	0.4%	0.6%	0.4%	3.1%	50.0%
Eriophyllum confertiflorum	golden yarrow	0.3%	0.3%	0.2%	2.2%	62.5%
Lupinus chamissonis	silver bush lupine	0.1%	0.4%	0.2%	1.1%	25.0%
Toxicodendron diversilobum	poison-oak	0.5%	0.9%	0.6%	3.7%	25.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	0%	1%	0%	3%	38%
Ceanothus rigidus	**Monterey ceanothus**	**0.2%**	**0.4%**	**0.2%**	**1.4%**	**50.0%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.1%**	**0.4%**	**0.3%**	**1.1%**	**12.5%**
Salvia mellifera	black sage	0.0%	0.1%	0.1%	0.3%	25.0%
Adenostoma fasciculatum	chamise	0.0%	0.0%	0.0%	0.1%	12.5%
Ericameria ericoides	dune-heather, mock-heather	0.0%	0.0%	0.0%	0.1%	12.5%
Frangula californica subsp. *californica*	California coffeeberry	0.0%	--	--	--	0.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	--	--	--	0.0%
Mimulus aurantiacus	bush monkeyflower	0.0%	--	--	--	0.0%
Lepechinia calycina	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 *(Carpobrotus edulis)*		***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%***	***14%***	***10%***	*--*	***100%***

HMP Species in Bold

1. These data are reported from the same eight transects sampled in years 1- 5

2. These data are reported from the same eight transects sampled in years 1- 5, plus seven transects added in 2018

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

Mean percent cover and relative cover values for 2018 represent averages weighted by transect length

Table A 6-7
Interim Action Ranges MRA North Range 44 SCA
Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)

ESCA RP 2018 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Eight Transects in Small Scale Excavations in North Range 44[1]				
		Post-Activity Data 2016 (Year 4)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
Tree Species						
Quercus agrifolia	coast live oak	1.0%	2.9%	1.9%	3.9%	12.5%
Total Cover by Native Tree Species		***1%***			***5%***	
Acmispon glaber	deerweed	4.4%	10.9%	7.3%	17.1%	75.0%
Crocanthemum scoparium	rush-rose	2.7%	2.6%	1.8%	10.4%	75.0%
Arctostaphylos pumila	**sandmat manzanita**	**2.0%**	**1.1%**	**0.7%**	**7.9%**	**87.5%**
Ceanothus dentatus	dwarf ceanothus	0.4%	0.6%	0.4%	1.5%	62.5%
Eriophyllum confertiflorum	golden yarrow	0.8%	1.1%	0.7%	3.1%	75.0%
Lupinus chamissonis	silver bush lupine	0.3%	0.7%	0.5%	1.0%	25.0%
Toxicodendron diversilobum	poison-oak	0.1%	0.3%	0.2%	0.4%	12.5%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	0%	1%	1%	2%	50%
Ceanothus rigidus	**Monterey ceanothus**	**0.1%**	**0.3%**	**0.2%**	**0.6%**	**37.5%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.2%**	**0.4%**	**0.3%**	**0.6%**	**25.0%**
Salvia mellifera	black sage	0.1%	0.2%	0.1%	0.3%	25.0%
Adenostoma fasciculatum	chamise	0.1%	0.2%	0.1%	0.3%	25.0%
Ericameria ericoides	dune-heather, mock-heather	0.0%	--	--	0.0%	0.0%
Frangula californica subsp. *californica*	California coffeeberry	0.0%	--	--	0.0%	0.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	--	--	0.0%	0.0%
Mimulus aurantiacus	bush monkeyflower	0.0%	--	--	0.0%	0.0%
Lepechinia calycina	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 *(Carpobrotus edulis)*		***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%***	***--***	***--***		***0.0%***
Total Mean Percent Bare Ground		***82%***	***14%***	***10%***		***62%***

HMP Species in Bold

1. These data are reported from the same eight transects sampled in years 1- 5

2. These data are reported from the same eight transects sampled in years 1- 5, plus seven transects added in 2018

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

Mean percent cover and relative cover values for 2018 represent averages weighted by transect length

Scientific Name	Common Name	Eight Transects in Small Scale Excavations in North Range 44[1]				
		Post-Activity Data 2017 (Year 5)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
Tree Species						
Quercus agrifolia	coast live oak	0.6%	1.6%	1.1%	3.2%	12.5%
Total Cover by Native Tree Species		***1%***			***3%***	
Acmispon glaber	deerweed	3.2%	7.7%	5.1%	17.7%	75.0%
Crocanthemum scoparium	rush-rose	2.7%	2.7%	1.8%	15.4%	100.0%
Arctostaphylos pumila	**sandmat manzanita**	**1.9%**	**1.3%**	**0.8%**	**10.4%**	**75.0%**
Ceanothus dentatus	dwarf ceanothus	1.0%	1.5%	1.0%	5.4%	75.0%
Eriophyllum confertiflorum	golden yarrow	0.8%	0.6%	0.4%	4.6%	87.5%
Lupinus chamissonis	silver bush lupine	0.6%	1.6%	1.1%	3.2%	25.0%
Toxicodendron diversilobum	poison-oak	0.5%	0.9%	0.6%	2.7%	25.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	0%	1%	1%	3%	38%
Ceanothus rigidus	**Monterey ceanothus**	**0.4%**	**0.6%**	**0.4%**	**2.2%**	**50.0%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.2%**	**0.4%**	**0.3%**	**1.1%**	**25.0%**
Salvia mellifera	black sage	0.1%	0.2%	0.1%	0.5%	25.0%
Adenostoma fasciculatum	chamise	0.1%	0.2%	0.1%	0.4%	12.5%
Ericameria ericoides	dune-heather, mock-heather	0.0%	0.0%	--	0.0%	0.0%
Frangula californica subsp. *californica*	California coffeeberry	0.0%	0.0%	--	0.0%	0.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	0.0%	--	0.0%	0.0%
Mimulus aurantiacus	bush monkeyflower	0.0%	0.0%	--	0.0%	0.0%
Lepechinia calycina	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 *(Carpobrotus edulis)*		***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		***83%***	***15%***	***10%***		***100%***

HMP Species in Bold

1. These data are reported from the same eight transects sampled in years 1- 5

2. These data are reported from the same eight transects sampled in years 1- 5, plus seven transects added in 2018

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

Mean percent cover and relative cover values for 2018 represent averages weighted by transect length

Table A 6-7
Interim Action Ranges MRA North Range 44 SCA
Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)

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Scientific Name	Common Name	Eight Transects in Small Scale Excavations in North Range 44[1]				
		Post-Activity Data 2018 (Year 6)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
Tree Species						
Quercus agrifolia	coast live oak	0.4%	0.0%	--	1.5%	12.5%
Total Cover by Native Tree Species		***0%***			***2%***	
Acmispon glaber	deerweed	2.0%	10.7%	7.2%	8.0%	87.5%
Crocanthemum scoparium	rush-rose	7.7%	4.9%	3.3%	30.3%	87.5%
Arctostaphylos pumila	**sandmat manzanita**	**4.5%**	**1.8%**	**1.2%**	**17.8%**	**87.5%**
Ceanothus dentatus	dwarf ceanothus	1.5%	3.2%	2.1%	6.1%	75.0%
Eriophyllum confertiflorum	golden yarrow	2.2%	1.5%	1.0%	8.7%	62.5%
Lupinus chamissonis	silver bush lupine	0.0%	--	--	0.0%	0.0%
Toxicodendron diversilobum	poison-oak	0.4%	0.7%	0.5%	1.4%	25.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	1%	1%	1%	4%	50%
Ceanothus rigidus	**Monterey ceanothus**	**0.6%**	**1.8%**	**1.2%**	**2.3%**	**75.0%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.2%**	**0.0%**	**0.0%**	**0.9%**	**25.0%**
Salvia mellifera	black sage	0.2%	0.1%	0.1%	0.6%	25.0%
Adenostoma fasciculatum	chamise	0.2%	0.0%	--	0.8%	12.5%
Ericameria ericoides	dune-heather, mock-heather	0.1%	0.0%	--	0.5%	12.5%
Frangula californica subsp. *californica*	California coffeeberry	0.0%	0.0%	--	0.0%	0.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	0.0%	--	0.0%	0.0%
Mimulus aurantiacus	bush monkeyflower	0.0%	0.0%	--	0.0%	12.5%
Lepechinia calycina	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
Total Mean Percent Shrub and Subshrub Cover		***20.6%***			***82.5%***	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		***4.0%***	***19.6%***	***6.2%***	***15.8%***	***75.9%***
Target Weed Total *(Carpobrotus edulis)*		***0.0%***	***0.0%***	***--***	***0.0%***	***0.0%***
Total Mean Non-native Herbaceous Species Cover		***0.3%***	***18.6%***	***5.9%***	***1.2%***	***62.5%***
Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)		***25.0%***				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		***75.4%***				
Total Mean Percent Masticated Vegetation (only calculated in 2014)		***0.0%***	***0.0%***	***--***		***0.0%***
Total Mean Percent Bare Ground		***75.4%***	***21.0%***	***14.0%***		***75.9%***

HMP Species in Bold

1. These data are reported from the same eight transects sampled in years 1- 5

2. These data are reported from the same eight transects sampled in years 1- 5, plus seven transects added in 2018

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

Mean percent cover and relative cover values for 2018 represent averages weighted by transect length

Table A 6-7
Interim Action Ranges MRA North Range 44 SCA
Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)

ESCA RP 2018 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Fifteen Transects in Small Scale Excavations in North Range 44[2]				
		Post-Activity Data 2018 (Year 6)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
Tree Species						
Quercus agrifolia	coast live oak	0.2%	--	--	0.8%	6.7%
Total Cover by Native Tree Species		***0%***			***1%***	
Acmispon glaber	deerweed	3.2%	8.0%	3.6%	10.5%	86.7%
Crocanthemum scoparium	rush-rose	6.5%	4.0%	1.8%	21.3%	86.7%
Arctostaphylos pumila	**sandmat manzanita**	**3.7%**	**1.8%**	**0.8%**	**12.2%**	**73.3%**
Ceanothus dentatus	dwarf ceanothus	2.6%	4.5%	2.1%	8.6%	80.0%
Eriophyllum confertiflorum	golden yarrow	1.7%	1.3%	0.6%	5.7%	73.3%
Lupinus chamissonis	silver bush lupine	0.0%	--	--	0.0%	0.0%
Toxicodendron diversilobum	poison-oak	0.8%	2.1%	0.9%	2.5%	40.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	1%	4%	2%	4%	60%
Ceanothus rigidus	**Monterey ceanothus**	**1.2%**	**1.8%**	**0.8%**	**4.0%**	**73.3%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.1%**	**0.0%**	**0.0%**	**0.5%**	**13.3%**
Salvia mellifera	black sage	0.8%	4.5%	2.0%	2.5%	46.7%
Adenostoma fasciculatum	chamise	0.4%	3.0%	1.4%	1.5%	13.3%
Ericameria ericoides	dune-heather, mock-heather	0.4%	1.3%	0.6%	1.3%	26.7%
Frangula californica subsp. *californica*	California coffeeberry	0.0%	0.0%	--	0.0%	0.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	0.0%	--	0.0%	0.0%
Mimulus aurantiacus	bush monkeyflower	0.0%	0.0%	--	0.0%	12.5%
Lepechinia calycina	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
Total Mean Percent Shrub and Subshrub Cover		***22.9%***			***76.1%***	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		***7.0%***	***19.6%***	***6.2%***	***22.8%***	***75.9%***
Target Weed Total *(Carpobrotus edulis)*		***0.0%***	***1.8%***	***0.6%***	***0.0%***	***13.8%***
Total Mean Non-native Herbaceous Species Cover		***0.5%***	***13.2%***	***4.2%***	***1.5%***	***60.0%***
Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)		***30.1%***				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		***70.5%***				
Total Mean Percent Masticated Vegetation (only calculated in 2014)		***0.0%***	***0.0%***	*--*		***0.0%***
Total Mean Percent Bare Ground		***70.5%***	***17.0%***	***8.0%***		***100%***

HMP Species in Bold

1. These data are reported from the same eight transects sampled in years 1- 5

2. These data are reported from the same eight transects sampled in years 1- 5, plus seven transects added in 2018

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

Mean percent cover and relative cover values for 2018 represent averages weighted by transect length

Table A 6-8
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2018 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
Eriophyllum confertiflorum	golden yarrow	1.5%	2.2%	0.7%	1.6%	65.5%
Arctostaphylos pumila	**sandmat manzanita**	**1.6%**	**2.0%**	**0.6%**	**1.7%**	**65.5%**
Crocanthemum scoparium	rush-rose	8.1%	9.1%	2.9%	8.6%	86.2%
Acmispon glaber	deerweed	1.4%	0.0%	--	1.5%	0.0%
Adenostoma fasciculatum	chamise	9.0%	6.9%	2.2%	9.5%	89.7%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	29.3%	15.6%	4.9%	31.0%	100%
Toxicodendron diversilobum	poison-oak	0.0%	--	--	--	0.0%
Ericameria ericoides	dune-heather, mock-heather	1.5%	5.6%	1.8%	1.6%	24.1%
Salvia mellifera	black sage	5.3%	7.2%	2.3%	5.6%	69.0%
Ceanothus dentatus	dwarf ceanothus	20.2%	16.0%	5.0%	21.4%	89.7%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.7%	1.8%	0.6%	0.7%	24.1%
Ceanothus rigidus	**Monterey ceanothus**	**13.5%**	**9.3%**	**2.9%**	**14.3%**	**96.6%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.2%**	**0.5%**	**0.2%**	**0.2%**	**17.2%**
Frangula californica subsp. californica	California coffeeberry	0.9%	1.9%	0.6%	1.0%	31.0%
Lepechinia calycina	pitcher sage	0.4%	1.4%	0.5%	0.4%	20.7%
Lupinus chamissonis	silver bush lupine	0.4%	1.1%	0.4%	0.4%	13.8%
Mimulus aurantiacus	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 (*Carpobrotus edulis*)		***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

1. These data are reported from the same five transects sampled in years 1- 6

2. These data are reported from the same five transects sampled in years 1- 6, plus nine transects added in 2018

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

Mean percent cover values for 2018 represent averages weighted by transect length

Table A 6-8
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2018 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
Eriophyllum confertiflorum	golden yarrow	3.0%	2.7%	2.0%	2.8%	85.7%
Arctostaphylos pumila	**sandmat manzanita**	**0.7%**	**0.6%**	**0.4%**	**0.7%**	**71.4%**
Crocanthemum scoparium	rush-rose	10.0%	8.5%	6.2%	9.2%	100%
Acmispon glaber	deerweed	1.2%	1.1%	0.8%	1.1%	85.7%
Adenostoma fasciculatum	chamise	9.9%	7.1%	5.2%	9.1%	100%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	25.8%	9.5%	6.9%	23.7%	100%
Toxicodendron diversilobum	poison-oak	0.0%	0.0%	--	0.0%	0.0%
Ericameria ericoides	dune-heather, mock-heather	0.0%	0.0%	--	0.0%	0.0%
Salvia mellifera	black sage	8.7%	9.7%	7.1%	8.0%	100%
Ceanothus dentatus	dwarf ceanothus	30.4%	14.9%	10.9%	27.9%	100%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.2%	0.4%	0.3%	0.2%	28.6%
Ceanothus rigidus	**Monterey ceanothus**	**16.3%**	**5.0%**	**3.7%**	**14.9%**	**100%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.1%**	**0.2%**	**0.2%**	**0.1%**	**14.3%**
Frangula californica subsp. californica	California coffeeberry	0.1%	0.2%	0.2%	0.1%	14.3%
Lepechinia calycina	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
Lupinus chamissonis	silver bush lupine	1.2%	2.1%	1.5%	1.1%	28.6%
Mimulus aurantiacus	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 (*Carpobrotus edulis*)		***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

1. These data are reported from the same five transects sampled in years 1- 6

2. These data are reported from the same five transects sampled in years 1- 6, plus nine transects added in 2018

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

Mean percent cover values for 2018 represent averages weighted by transect length

Table A 6-8
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2018 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Five Transects in Small-scale Excavations in South Range 44 Conducted in 2011[1]				
		Post-activity Data 2015* (Year 4)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Cover	Mean Frequency
Eriophyllum confertiflorum	golden yarrow	1.2%	1.2%	1.2%	7.7%	100.0%
Arctostaphylos pumila	**sandmat manzanita**	**0.9%**	**1.2%**	**1.2%**	**6.2%**	**80.0%**
Crocanthemum scoparium	rush-rose	1.4%	1.6%	1.5%	9.4%	100%
Acmispon glaber	deerweed	7.0%	7.4%	7.1%	46.1%	80%
Adenostoma fasciculatum	chamise	0.4%	0.9%	0.9%	2.6%	20.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	0.1%	0.1%	0.1%	0.6%	40.0%
Toxicodendron diversilobum	poison-oak	0.2%	0.3%	0.3%	1.0%	20.0%
Ericameria ericoides	dune-heather, mock-heather	0.1%	0.3%	0.3%	0.8%	20.0%
Salvia mellifera	black sage	0.0%	0.1%	0.1%	0.3%	40.0%
Ceanothus dentatus	dwarf ceanothus	0.0%	0.0%	0.0%	0.1%	20.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	--	--	--	0.0%
Ceanothus rigidus	**Monterey ceanothus**	**0.0%**	**--**	**--**	**--**	**0.0%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.0%**	**--**	**--**	**0.0%**	**0.0%**
Frangula californica subsp. californica	California coffeeberry	0.0%	--	--	0.0%	0.0%
Lepechinia calycina	pitcher sage	0.0%	--	--	0.0%	0.0%
Lupinus chamissonis	silver bush lupine	0.0%	--	--	0.0%	0.0%
Mimulus aurantiacus	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 (*Carpobrotus edulis*)		***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

1. These data are reported from the same five transects sampled in years 1- 6

2. These data are reported from the same five transects sampled in years 1- 6, plus nine transects added in 2018

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

Mean percent cover values for 2018 represent averages weighted by transect length

Table A 6-8
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2018 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Five Transects in Small-scale Excavations in South Range 44 Conducted in 2011[1]				
		Post-activity Data 2016 (Year 5)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Cover	Mean Frequency
Eriophyllum confertiflorum	golden yarrow	2.3%	2.1%	2.0%	9.2%	100.0%
Arctostaphylos pumila	**sandmat manzanita**	**1.9%**	**1.4%**	**1.4%**	**7.7%**	**80.0%**
Crocanthemum scoparium	rush-rose	2.4%	2.0%	1.9%	9.3%	100%
Acmispon glaber	deerweed	5.9%	5.2%	4.9%	29.7%	80%
Adenostoma fasciculatum	chamise	0.4%	0.8%	0.8%	1.8%	20.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	0.3%	0.5%	0.5%	1.3%	40.0%
Toxicodendron diversilobum	poison-oak	0.0%	--	--	0.0%	0.0%
Ericameria ericoides	dune-heather, mock-heather	0.1%	0.3%	0.3%	0.5%	20.0%
Salvia mellifera	black sage	0.4%	0.8%	0.8%	1.5%	60.0%
Ceanothus dentatus	dwarf ceanothus	0.1%	0.2%	0.1%	0.5%	60.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	--	--	0.0%	0.0%
Ceanothus rigidus	**Monterey ceanothus**	**0.1%**	**0.1%**	**0.1%**	**0.2%**	**20.0%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.0%**	**--**	**--**	**0.0%**	**0.0%**
Frangula californica subsp. californica	California coffeeberry	0.0%	--	--	0.0%	0.0%
Lepechinia calycina	pitcher sage	0.0%	--	--	0.0%	0.0%
Lupinus chamissonis	silver bush lupine	0.0%	--	--	0.0%	0.0%
Mimulus aurantiacus	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 (*Carpobrotus edulis*)		***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

1. These data are reported from the same five transects sampled in years 1- 6

2. These data are reported from the same five transects sampled in years 1- 6, plus nine transects added in 2018

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

Mean percent cover values for 2018 represent averages weighted by transect length

Table A 6-8
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2018 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Five Transects in Small-scale Excavations in South Range 44 Conducted in 2011[1]				
		Post-activity Data 2017 (Year 6)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Cover	Mean Frequency
Eriophyllum confertiflorum	golden yarrow	2.1%	1.7%	1.7%	18.4%	100.0%
Arctostaphylos pumila	**sandmat manzanita**	**2.0%**	**1.5%**	**1.4%**	**17.7%**	**80.0%**
Crocanthemum scoparium	rush-rose	1.6%	2.3%	2.2%	14.1%	100%
Acmispon glaber	deerweed	1.4%	0.9%	0.9%	12.3%	100%
Adenostoma fasciculatum	chamise	0.4%	0.9%	0.9%	3.6%	20.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	0.2%	0.3%	0.3%	1.8%	40.0%
Toxicodendron diversilobum	poison-oak	0.1%	0.2%	0.1%	0.6%	40.0%
Ericameria ericoides	dune-heather, mock-heather	0.0%	0.0%	0.0%	0.2%	20.0%
Salvia mellifera	black sage	0.0%	0.0%	0.0%	0.2%	60.0%
Ceanothus dentatus	dwarf ceanothus	0.0%	0.0%	0.0%	0.1%	20.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	0.0%	--	0.0%	0.0%
Ceanothus rigidus	**Monterey ceanothus**	**0.0%**	**0.0%**	**--**	**0.0%**	**0.0%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.0%**	**0.0%**	**--**	**0.0%**	**0.0%**
Frangula californica subsp. californica	California coffeeberry	0.0%	0.0%	--	0.0%	0.0%
Lepechinia calycina	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
Lupinus chamissonis	silver bush lupine	0.0%	0.0%	--	0.0%	0.0%
Mimulus aurantiacus	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 (*Carpobrotus edulis*)		***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

1. These data are reported from the same five transects sampled in years 1- 6

2. These data are reported from the same five transects sampled in years 1- 6, plus nine transects added in 2018

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

Mean percent cover values for 2018 represent averages weighted by transect length

Table A 6-8
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2018 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Five Transects in Small-scale Excavations in South Range 44 Conducted in 2011[1]				
		Post-activity Data 2018 (Year 7)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Cover	Mean Frequency
Eriophyllum confertiflorum	golden yarrow	2.1%	1.2%	1.1%	13.7%	100.0%
Arctostaphylos pumila	**sandmat manzanita**	**3.8%**	**2.3%**	**2.2%**	**24.1%**	**100%**
Crocanthemum scoparium	rush-rose	3.6%	1.7%	1.7%	22.8%	100%
Acmispon glaber	deerweed	1.1%	0.8%	0.8%	7.1%	80.0%
Adenostoma fasciculatum	chamise	0.0%	--	--	0.0%	0.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	0.9%	0.5%	0.5%	5.9%	80.0%
Toxicodendron diversilobum	poison-oak	0.1%	--	--	0.5%	20.0%
Ericameria ericoides	dune-heather, mock-heather	0.1%	--	--	0.7%	20.0%
Salvia mellifera	black sage	0.6%	0.8%	0.8%	4.1%	80.0%
Ceanothus dentatus	dwarf ceanothus	0.4%	1.1%	1.0%	2.5%	40.0%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	--	--	0.0%	0.0%
Ceanothus rigidus	**Monterey ceanothus**	**0.1%**	--	--	**0.7%**	**20.0%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.0%**	--	--	**0.1%**	**20.0%**
Frangula californica subsp. californica	California coffeeberry	0.0%	--	--	0.0%	0.0%
Lepechinia calycina	pitcher sage	0.0%	--	--	0.0%	0.0%
Lupinus chamissonis	silver bush lupine	0.0%	--	--	0.0%	0.0%
Mimulus aurantiacus	bush monkeyflower	0.0%	--	--	0.2%	20.0%
Total Mean Percent Shrub and Subshrub Cover		***12.9%***			***82.5%***	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		***2.5%***	***15.4%***	***4.9%***	***15.8%***	***76%***
Target Weed Total (*Carpobrotus edulis*)		***0.0%***	***0.9%***	***0.4%***	***0.0%***	***14.3%***
Total Mean Non-native Herbaceous Species Cover		***0.3%***	***10.2%***	***3.2%***	***1.7%***	***48.3%***
Total Mean Percent Native Vegetative Cover		***15.6%***				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		***84.8%***				
Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)		***0.0%***				
Total Mean Percent Bare Ground		***84.8%***	***9.0%***	***8.0%***	*--*	***100%***

HMP Species in Bold

1. These data are reported from the same five transects sampled in years 1- 6

2. These data are reported from the same five transects sampled in years 1- 6, plus nine transects added in 2018

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

Mean percent cover values for 2018 represent averages weighted by transect length

Table A 6-8
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs
Vegetation Cover in Areas Subject to Small-scale Excavation

ESCA RP 2018 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Fourteen Transects in Small-scale Excavations in South Range 44 Conducted in 2011[2]				
		Post-activity Data 2018 (Year 7)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Cover	Mean Frequency
Eriophyllum confertiflorum	golden yarrow	2.3%	2.1%	1.0%	1.2%	92.9%
Arctostaphylos pumila	**sandmat manzanita**	**4.3%**	**3.4%**	**1.6%**	**18.5%**	**100%**
Crocanthemum scoparium	rush-rose	6.3%	6.3%	3.0%	27.0%	100%
Acmispon glaber	deerweed	2.1%	2.5%	1.2%	8.8%	78.6%
Adenostoma fasciculatum	chamise	0.0%	--	--	0.0%	0.0%
Arctostaphylos tomentosa subsp. *tomentosa*	shaggy-barked manzanita	1.9%	2.5%	1.2%	8.0%	78.6%
Toxicodendron diversilobum	poison-oak	1.8%	7.6%	3.6%	7.5%	28.6%
Ericameria ericoides	dune-heather, mock-heather	0.3%	1.1%	0.5%	1.2%	21.4%
Salvia mellifera	black sage	1.0%	2.1%	1.0%	4.1%	64.3%
Ceanothus dentatus	dwarf ceanothus	0.3%	0.8%	0.4%	1.1%	28.6%
Baccharis pilularis subsp. *consanguinea*	coyote brush	0.0%	--	--	0.0%	0.0%
Ceanothus rigidus	**Monterey ceanothus**	**0.1%**	**0.4%**	**0.2%**	**0.5%**	**28.6%**
Ericameria fasciculata	**Eastwood's ericameria**	**0.0%**	**0.1%**	**0.0%**	**0.1%**	**21.4%**
Frangula californica subsp. californica	California coffeeberry	0.0%	--	--	0.0%	0.0%
Lepechinia calycina	pitcher sage	0.0%	--	--	0.0%	0.0%
Lupinus chamissonis	silver bush lupine	0.0%	--	--	0.0%	0.0%
Mimulus aurantiacus	bush monkeyflower	0.3%	2.4%	1.1%	1.3%	28.6%
Total Mean Percent Shrub and Subshrub Cover		***20.6%***			***89.5%***	
Total Combined Mean Native Cover Between Shrubs and Subshrubs		***2.4%***	***15.4%***	***4.9%***	***10.4%***	***76%***
Target Weed Total (*Carpobrotus edulis*)		***0.1%***	***0.9%***	***0.4%***	***0.6%***	***14.3%***
Total Mean Non-native Herbaceous Species Cover		***0.4%***	***10.2%***	***3.2%***	***1.7%***	***48.3%***
Total Mean Percent Native Vegetative Cover		***23.0%***				
Total Mean Percent Bare Ground (Including Masticated Vegetation)		***77.6%***				
Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)		***0.0%***				
Total Mean Percent Bare Ground		***77.6%***	***14.4%***	***6.8%***	*** -- ***	***100%***

HMP Species in Bold

1. These data are reported from the same five transects sampled in years 1- 6

2. These data are reported from the same five transects sampled in years 1- 6, plus nine transects added in 2018

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Table A 6-9
Interim Action Ranges MRA 2018 Performance Criteria Status

ESCA RP 2018 Annual Natural Resource Report – Appendix A

Activity Category	Location	Performance Category	Performance Metric	Performance Target for Post-activity Area by Monitoring Year							2018 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%	<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 6-9
Interim Action Ranges MRA 2018 Performance Criteria Status

ESCA RP 2018 Annual Natural Resource Report – Appendix A

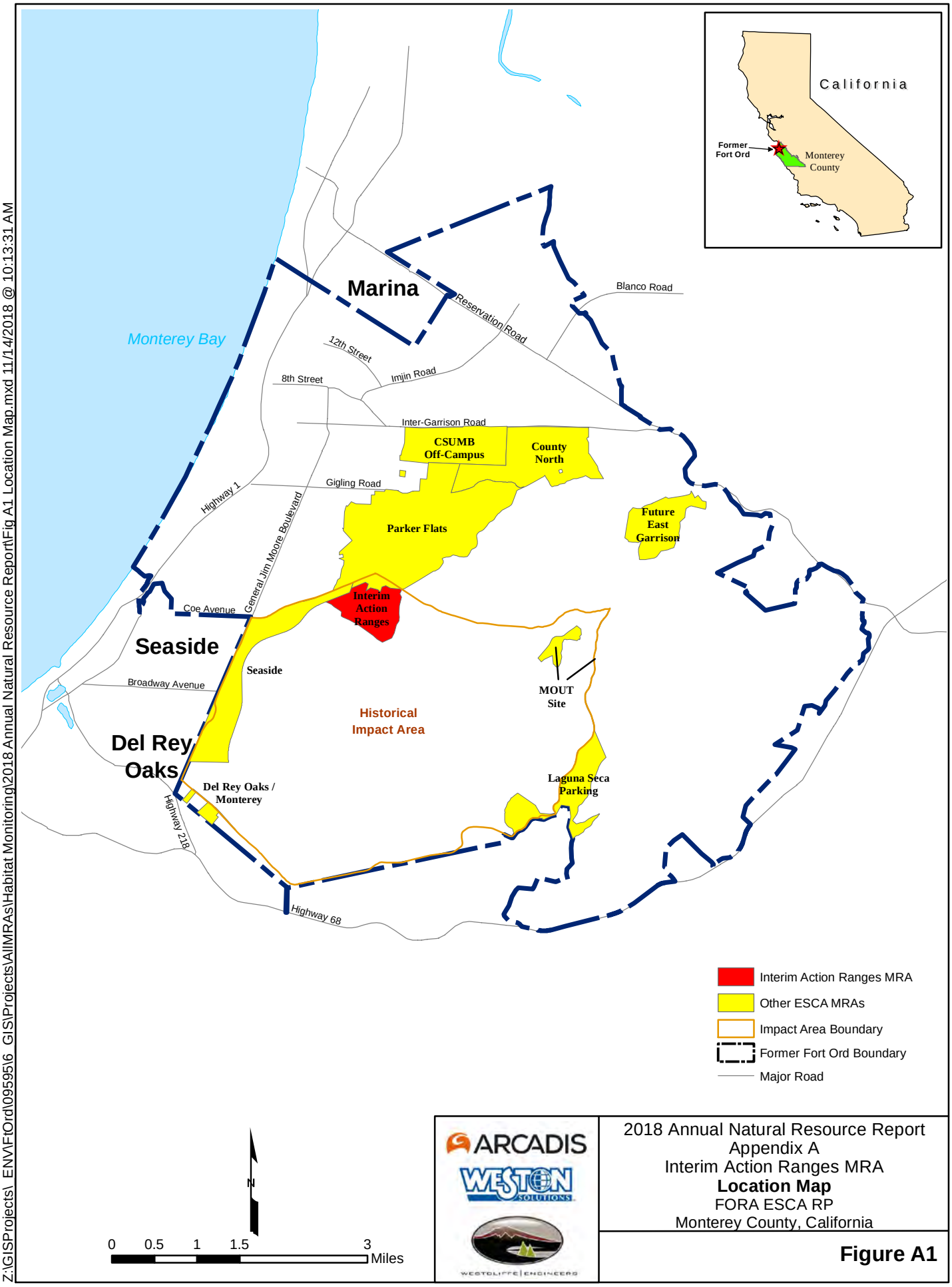
Activity Category	Location	Performance Category	Performance Metric	Performance Target for Post-activity Area by Monitoring Year							2018 Status	Monitoring Year Status
				Monitoring Years								
				1	2	3	4	5	6	7		
									North Range 44	South Range 44		
Small-scale soil excavation (Activity C)	North 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 6): 30.1% native cover; South Range 44 (Year 7): 23.0% native cover	North Range 44 meets Year 6 target; South Range 44 meets Year 4 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%	Year 7 Target met in 2017	--
		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 6-9
Interim Action Ranges MRA 2018 Performance Criteria Status

ESCA RP 2018 Annual Natural Resource Report – Appendix A

Activity Category	Location	Performance Category	Performance Metric	Performance Target for Post-activity Area by Monitoring Year							2018 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%	<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.



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WESTON SOLUTIONS
WESTCLIFFE ENGINEERS

2018 Annual Natural Resource Report
Appendix A
Interim Action Ranges MRA
Location Map
FORA ESCA RP
Monterey County, California

Figure A1

EUCALYPTUS ROAD

EUCALYPTUS ROAD

BD3+ BD2+ 192SSW+ BD7+ BD6+ NWR47Ref2+ 17-2+ BD5+ NWR47Ref1+ T14 T15 SCA47-2+ R47-03 SCA47-1+ R47-04 R47-02 R47-06 R47-01 R47-10 R47-05 T12 18-1+ R47-09 BD1+ BF1+ R47-07 SCA47-3+ R47-08 BA5+ BF4+ BF3+ T16 BG3+ NCA44-2+ T306 T307 T308 T309 NCA44-1+ T310 BG-4+ T11 T2 T6 T1 T313 T312 T311 T3 T9 T314 T8 T4 BG-20+ BG1+ BE11+ BE10+ BF6+ T 113 SCA44-2+ SCA44-1+ T10 BE20+ T5 T7 T105 T106 T110 T107 T109 T409 T411 T412 T410 T413 T108 T102 T111 T101 T415 T103 T112 T104 T414 21-1+ 21-2+ 2 km California Tiger Salamander Buffer

Document Path: Z:\GISProjects_ENV\FtOrd\0959516_GIS\Projects\AIMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig A2 IAR Monitoring Locations and Veg Comm.mxd

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
- 2018 Vegetation Transects (Monitored Annually per HRP)
- Baseline Transects

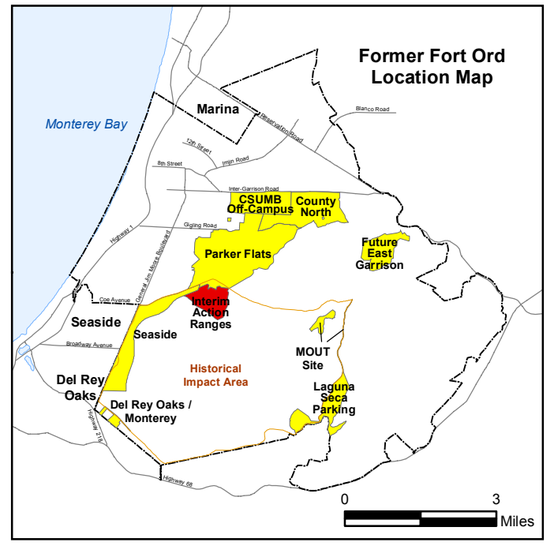
Note: + = baseline transect

- Borderland Interface
- 100-Foot Buffer from Borderland Interface

Vegetation Types*

- Grassland
- Central Maritime Chaparral

*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

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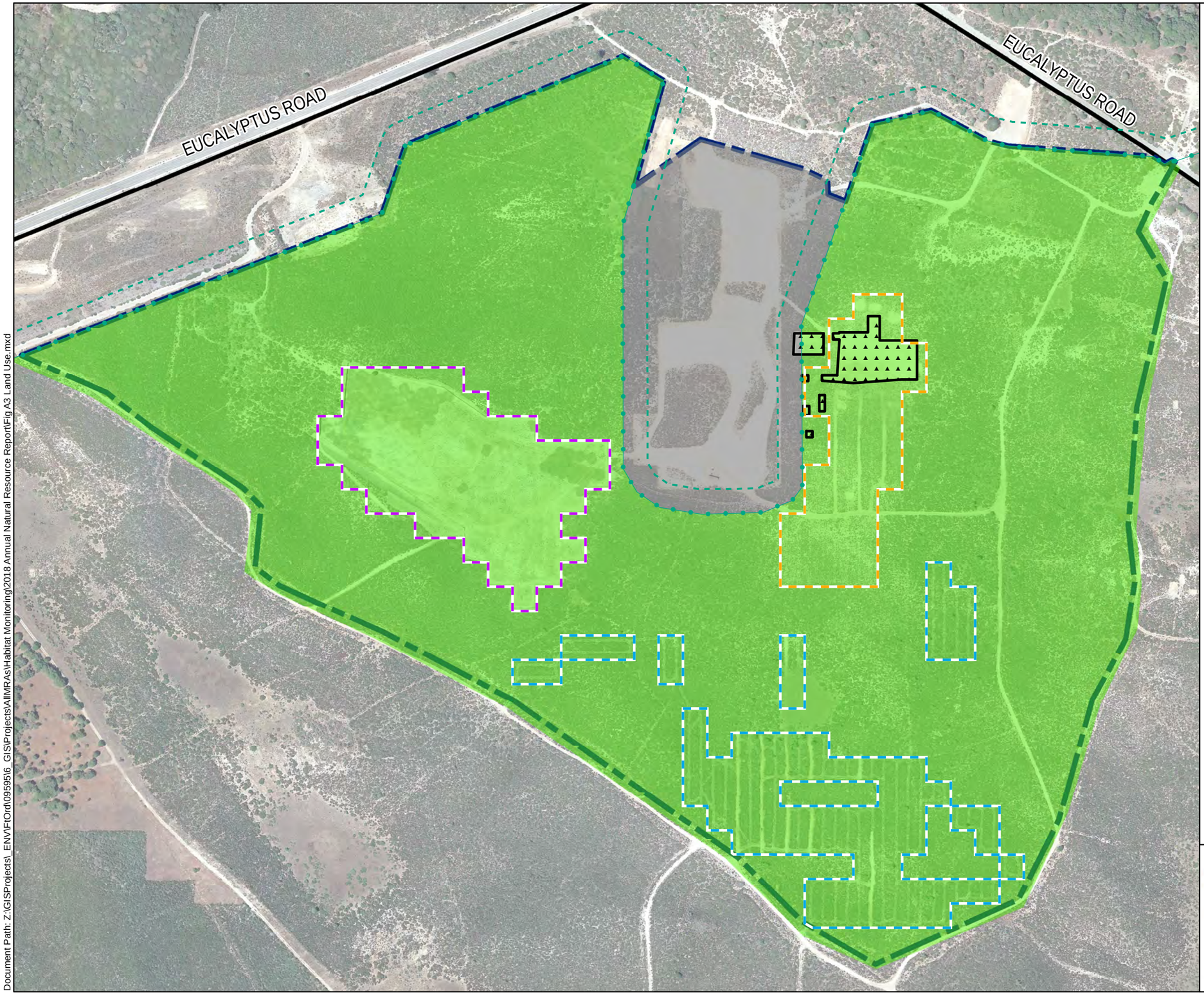
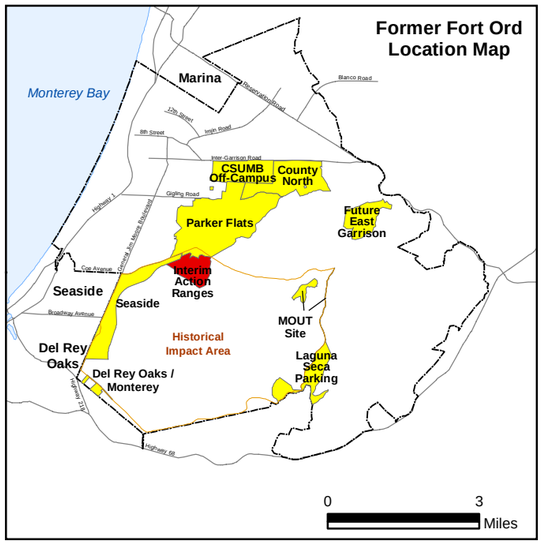
2018 Annual Natural Resource Report
Appendix A
Interim Action Ranges MRA
Vegetation Monitoring and HMP
Herbaceous Survey Locations
FORA ESCA RP
Monterey County, California

Figure A2



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



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Accessed 11/21/2014 - Image Date: 8/25/2013

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2018 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\FtOrd\0959516_GIS\Projects\AllMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig A3 Land Use.mxd

EUCALYPTUS ROAD

EUCALYPTUS ROAD

Escarpment

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

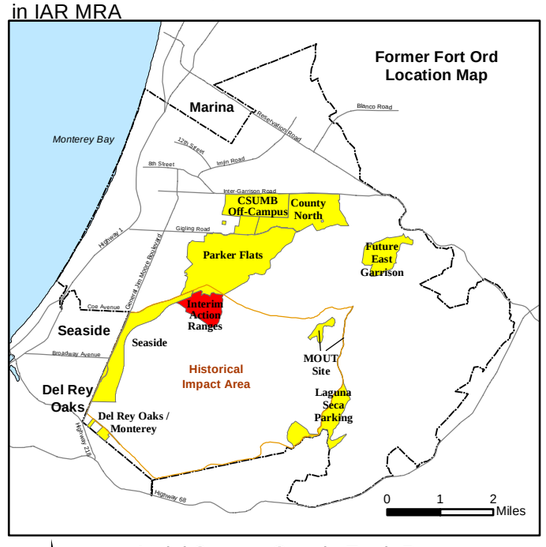
Active Restoration

- Topsoil Replacement, Seeding, and Container Planting of Large-scale Excavation Area

Vegetation Types

- Grassland

NOTE: Schematic representation of restoration activities in IAR MRA



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2018 Annual Natural Resource Report
Appendix A
Interim Action Ranges MRA

Restoration Activities

FORA ESCA RP
Monterey County, California

Figure A4

Document Path: Z:\GISProjects_ENV\FtOrd\0959516_GIS\Projects\AllMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig A4 IAR Restoration Strategies.mxd

Subarea C

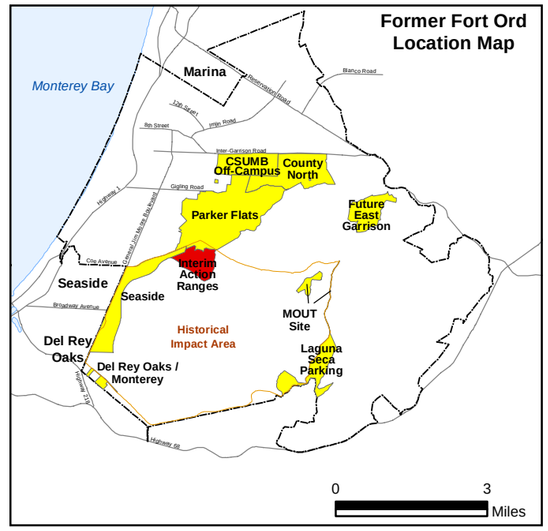
Subarea A

Subarea B

Escarpment

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



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2018 Annual Natural Resource Report
Appendix A
Interim Action Ranges MRA

Range 47 SCA Subareas

FORA ESCA RP
Monterey County, California

Figure A5

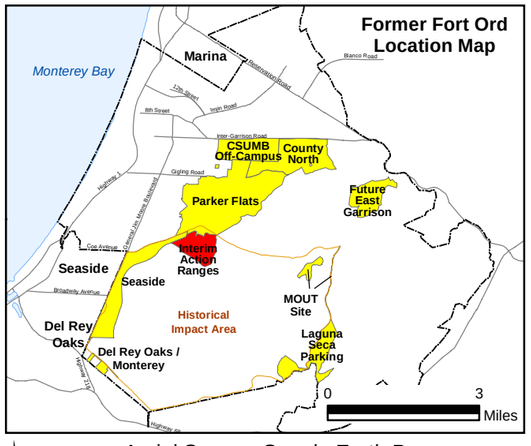
Document Path: Z:\GISProjects_ENV\FtOrd\0959516_GIS\Projects\AllMRAs\Habitat Monitoring\2018 Annual Natural Resource Report\Fig A5 IAR_R47_Detail_and_Subareas.mxd

EUCALYPTUS ROAD

EUCALYPTUS ROAD

Legend

- Major Road
- Munitions Response Area
- Development Parcel
- Borderland Interface
- 100-Foot Buffer from Borderland Interface
- Mulch, Straw Wattles and Water Bars



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2018 Annual Natural Resource Report
Appendix A
Interim Action Ranges MRA

Erosion Control BMPs in Interim Action Ranges MRA
2018

FORA ESCA RP
Monterey County, California

Figure A6

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Figure A7
Native Species Richness in Interim Action Ranges MRA in Areas Subject to Small-scale Excavation Year 2010 – 2018

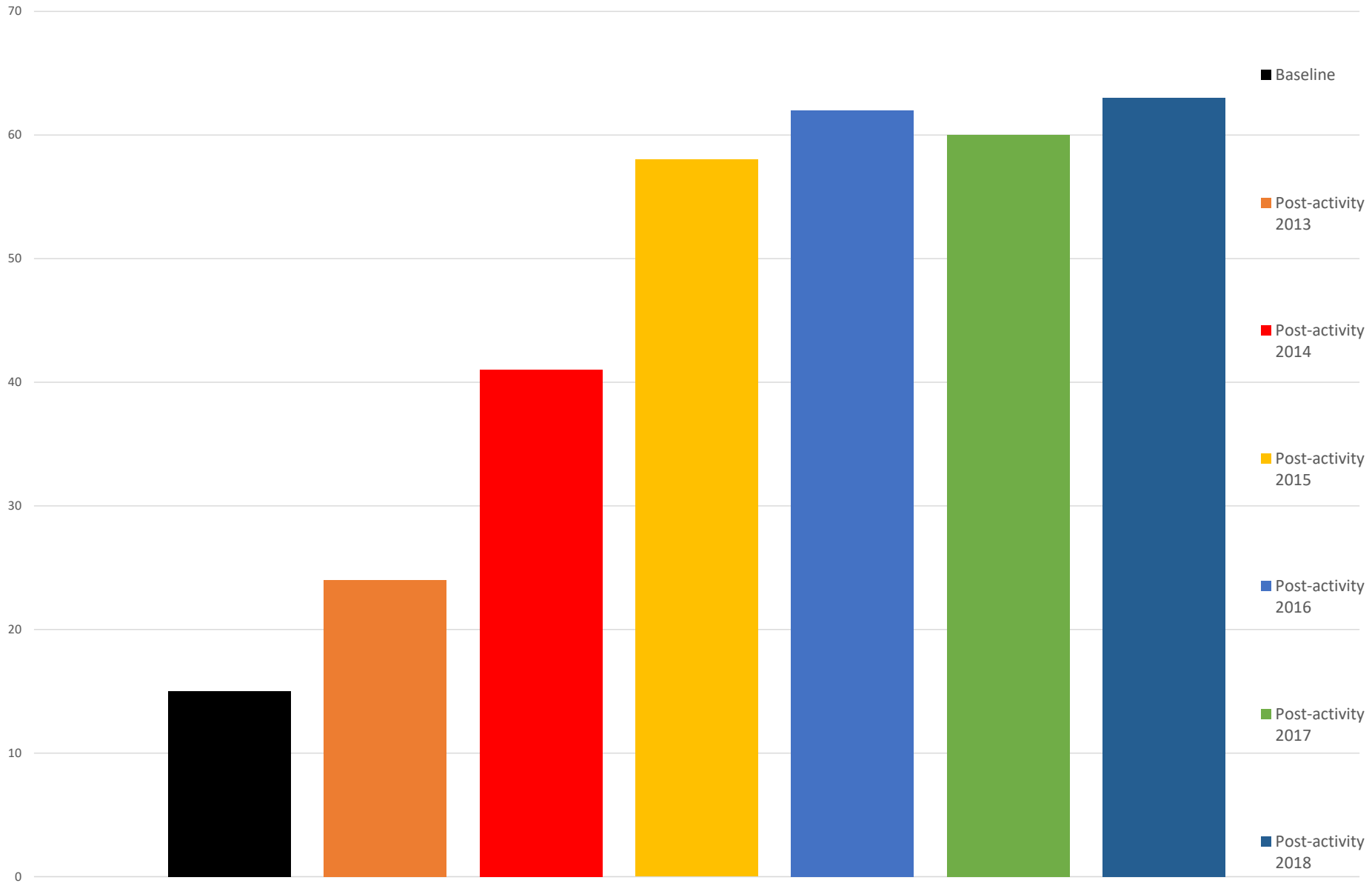
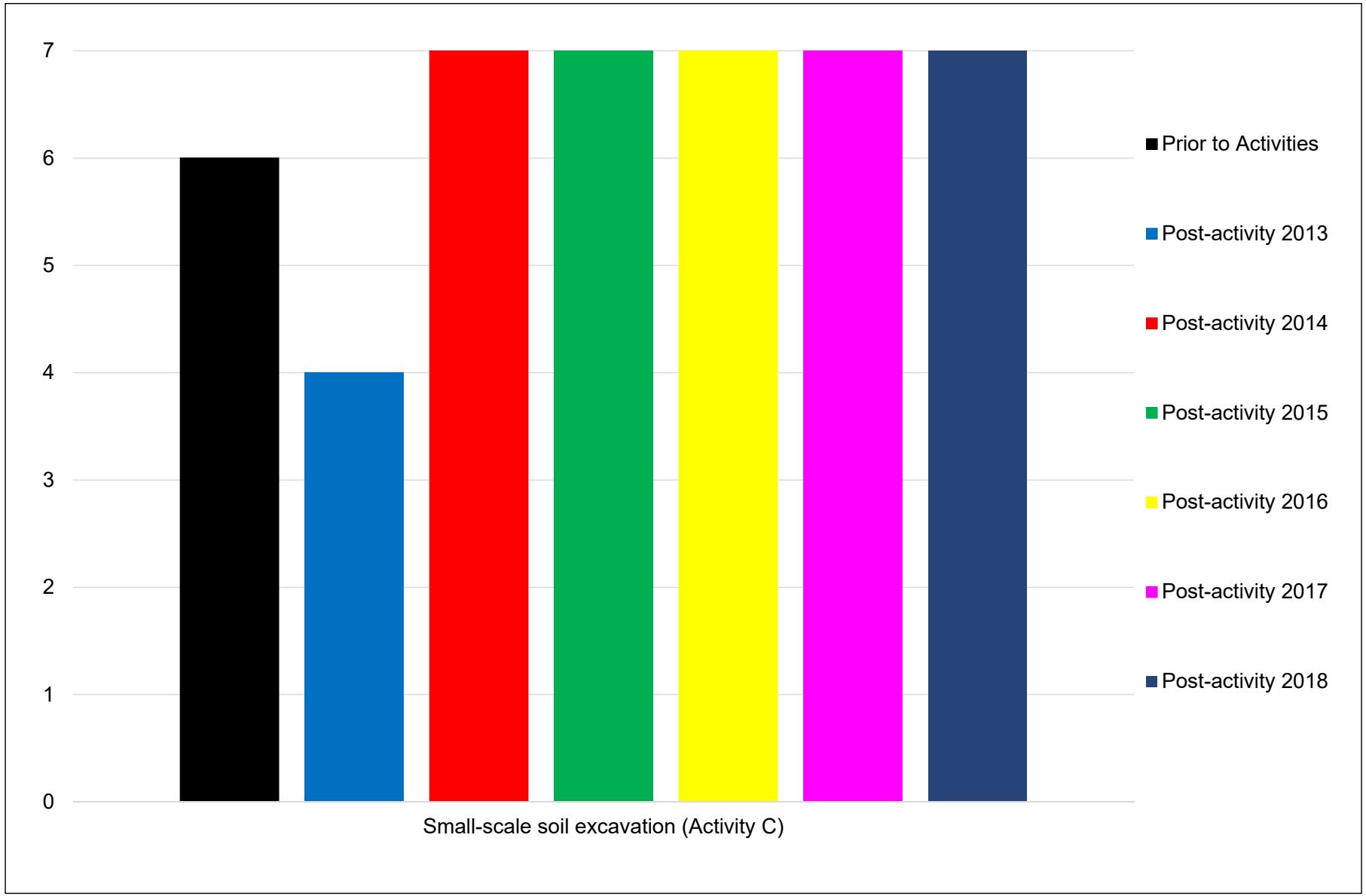


Figure A8
HMP Species Presence in Interim Action Ranges MRA in Areas Subject to Small-scale Excavation 2010 - 2018



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

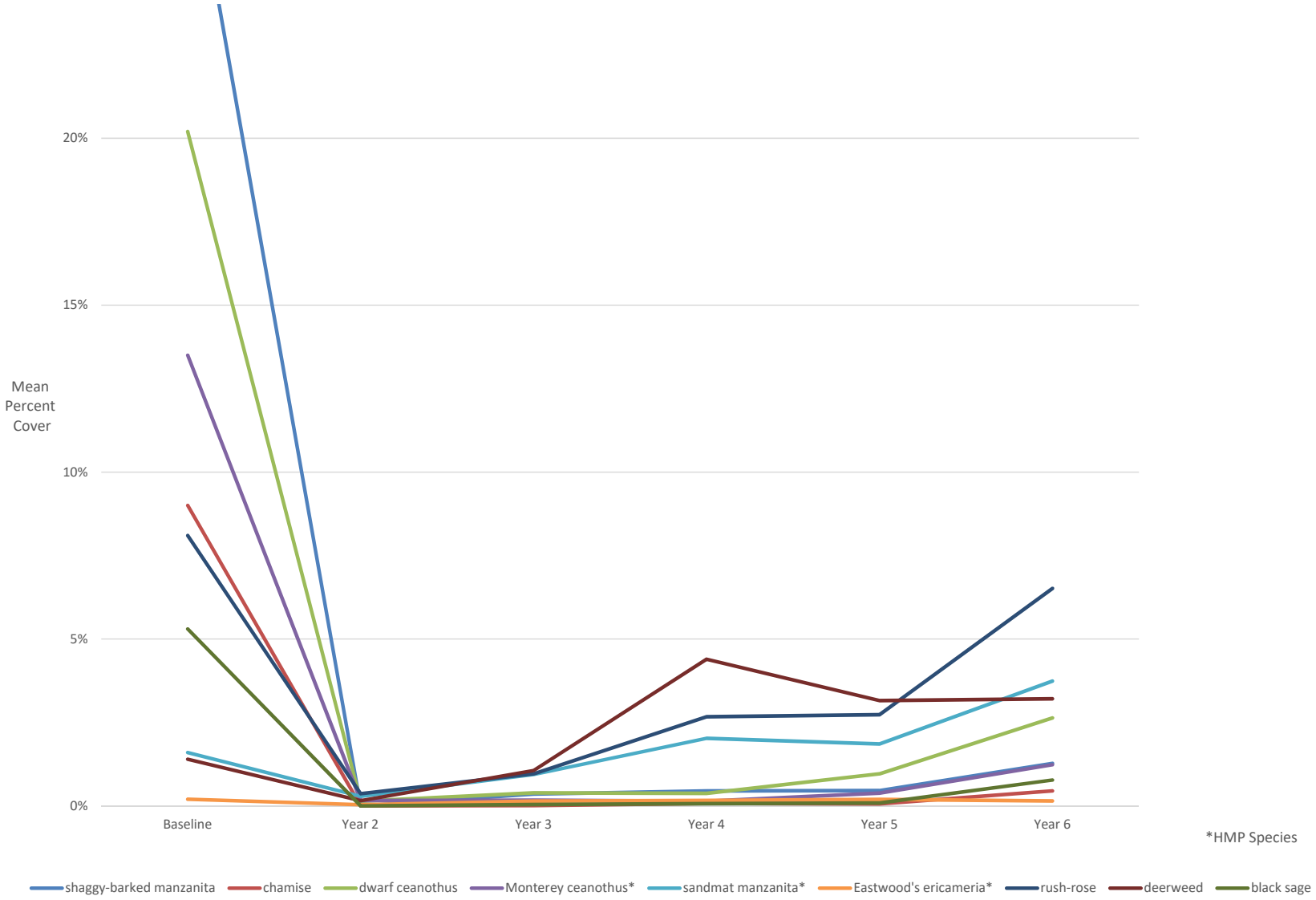


Figure A10
North Range 44 SCA – Mean Frequency of Shrub Species after Small-scale Excavation

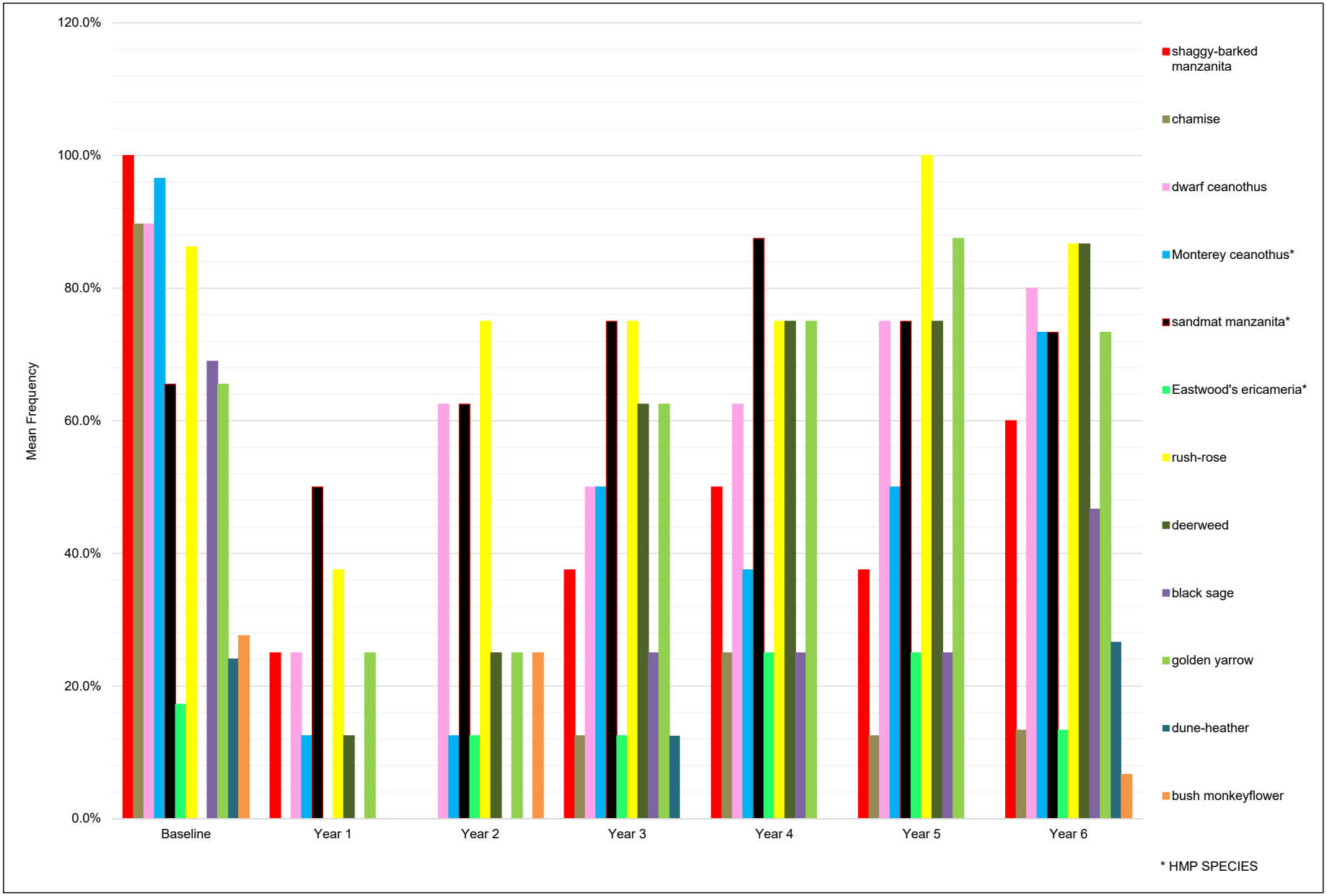
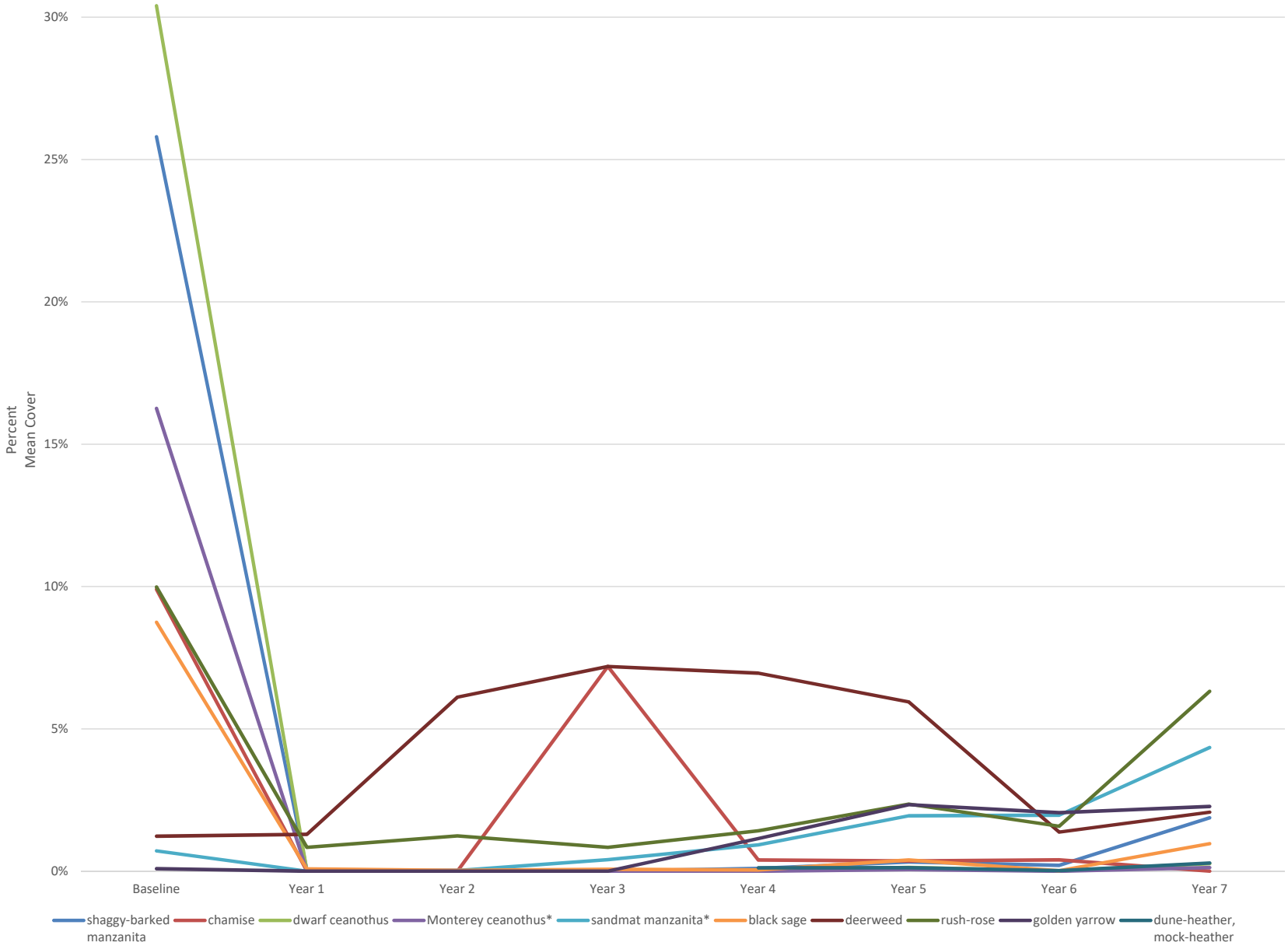
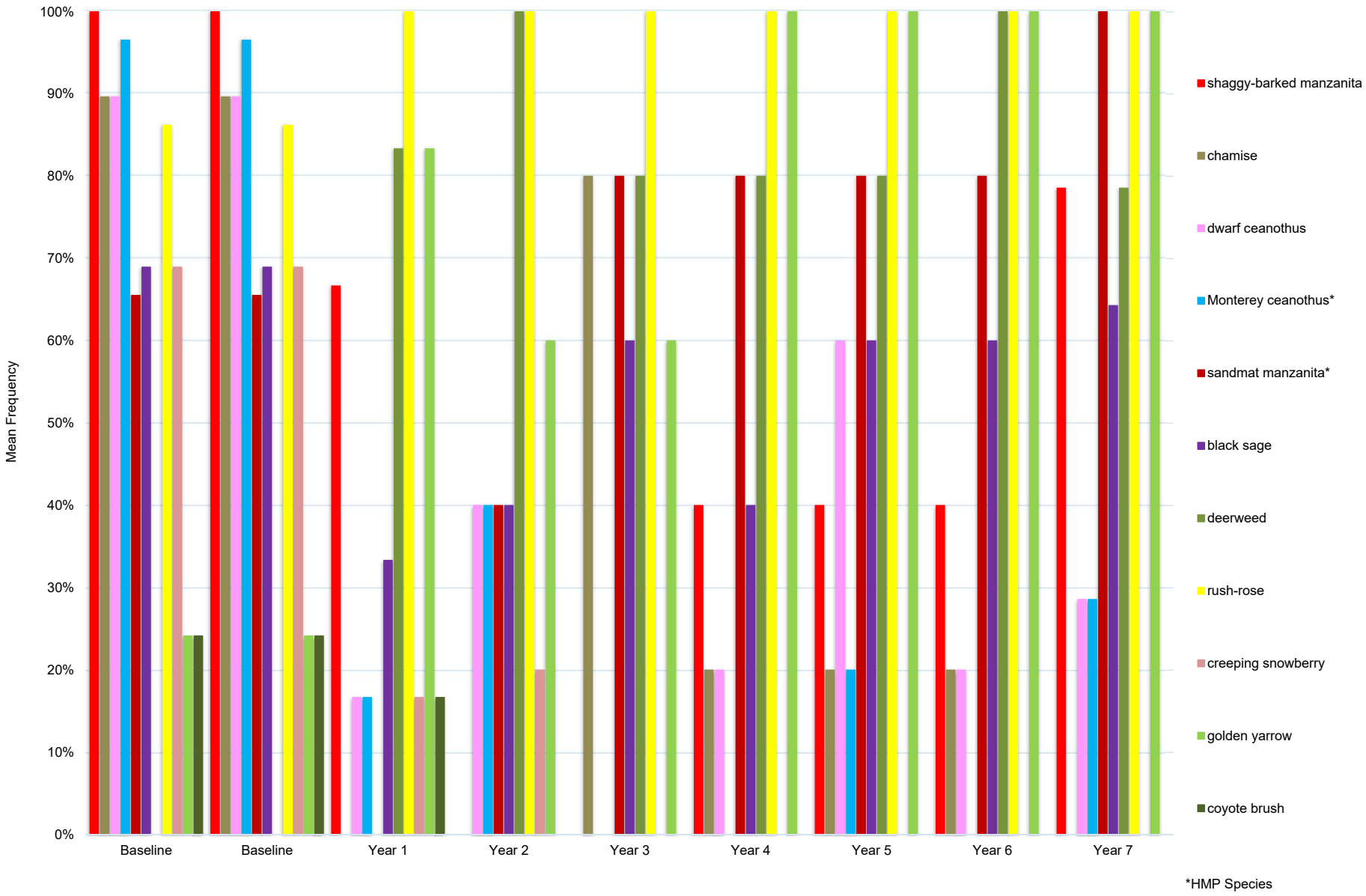


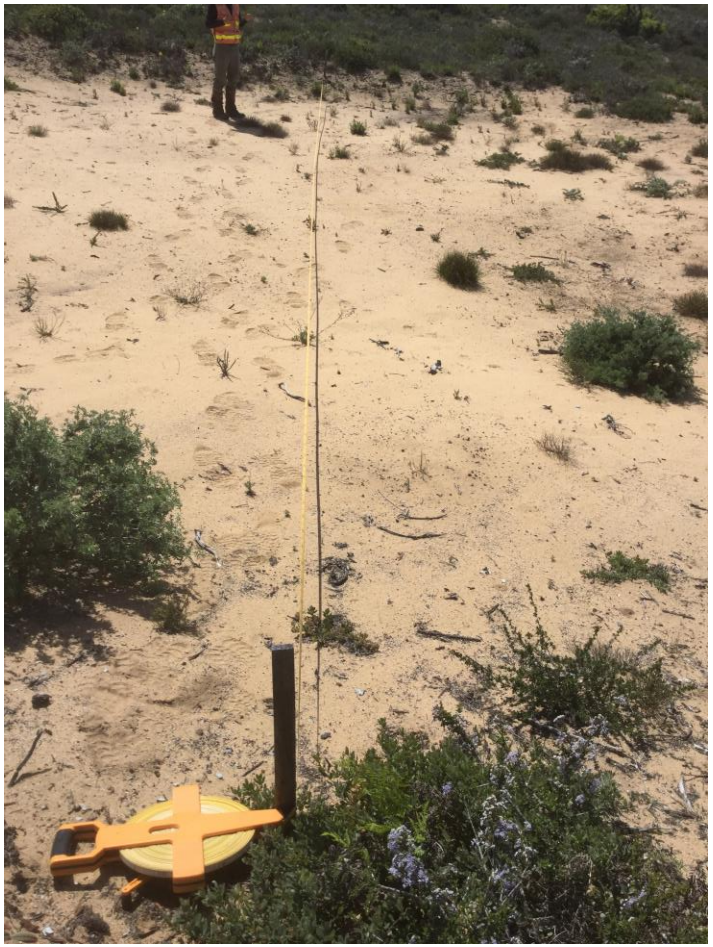
Figure A11
South Range 44 SCA and Central NCAs – Mean Shrub Cover after Small-scale Excavation



*HMP Species

Figure A12
South Range 44 SCA and Central NCAs– Mean Frequency of Shrub Species after Small-scale Excavation





Photographs 1 and 2

Range 44: North Range 44. April 2016, 2017

Small-scale excavation area (Transect 105) in 2016 (left) and 2017 (right)

View is facing west.

Photographs 3, 4, & 5

Range 44: South Range 44. April 2018
Small-scale excavation area transects
Views are facing north (left), west (center), and west (right).



Photographs 6, 7, & 8

Range 44: North and South Range 44. December 2018
Small-scale excavation area straw wattle, water bar, and mulching installation
Views are facing north (left), west (center), and south (right).

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

TAKE PRIDE IN AMERICA

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

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,

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:
O8EVEN00-2012-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,

for

Douglass M. Cooper
Deputy Assistant Field Supervisor

Table C-1
2018 Aquatic Feature Monitoring in Future East Garrison MRA Grenade Range

ESCA RP 2018 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.)
1/3/2018	AF09-1A*	0.00	-	-	-	-	-	no	no	no	0.00	0.00	1.50
	AF09-1B	0.00	-	-	-	-	-	no	no	no			
	AF09-2	0.00	-	-	-	-	-	no	no	no			
1/12/2018	AF09-1A*	1.35	Low	6.7	35%/35%	Mainly weeds starting to emerge such as *Tribolium obliterum* and *Plantago coronopus*.	Water strider, hummingbird	no	no	yes	2.04	2.62	4.12
	AF09-1B	0.00	-	-	-	Unidentifiable graminoids starting to emerge.	-	no	no	no			
	AF09-2	1.28	Low	7.2	30%/40%	Mainly weeds starting to emerge such as *Tribolium obliterum* and *Plantago coronopus*.	Water strider, hummingbird	no	no	yes			
2/13/2018	AF09-1A*	0.92	Medium	-	35%/35%	Algae present	-	no	no	no	0.12	0.96	5.08
	AF09-1B	0.00	-	-	-	-	-	no	no	no			
	AF09-2	0.78	Low	-	20%/20%	Algae present	-	no	no	no			
3/12/2018	AF09-1A*	1.24	Medium	7.2	20%/50%	Algae present	Water strider, water beetle, Hyla eggs, larvae, and adults, small flies on water surface	no	no	yes	0.08	1.41	6.49
	AF09-1B	0.00	-	-	-	-	-	no	no	no			
	AF09-2	1.14	Medium	6.4	50%/20%	Algae in middle part of pond	Water strider, water beetle, Hyla eggs, larvae, and adults, water boatmen, small flies on water surface	no	no	yes			
4/24/2018	AF09-1A*	1.38	Medium	7.3	55%/25%	*Lemna minor, Eleocharis macrostachya, Plantago coronopus*	Hyla larvae and adults, damselfly adult, dragonfly adult, water boatmen, water strider, water beetle	no	no	yes	0.00	2.15	10.80
	AF09-1B	0.00	-	-	-	*Juncus capitatus*	-	no	no	no			
	AF09-2	0.95	Medium	7.0	50%/25%	*Lemna minor, Juncus phaeocephalus, Plantago coronopus*	Hyla larvae, water beetle, damselfly adult, water strider	no	no	yes			
5/25/2018	AF09-1A*	0.76	None	7.0	50%/25%	*Eleocharis macrostachya, Callitriche* sp., *Salix lasiolepis*	Dark-eyed junco (*Junco hyemalis*), water beetle, black flies on water surface, Hyla larvae	no	no	no	0.04	0.04	10.84
	AF09-1B	0.00	-	-	-	*Juncus capitatus*	Dark-eyed junco (*Junco hyemalis*)	no	no	no			
	AF09-2	0.00	-	-	-	*Eleocharis macrostachya, Juncus phaeocephalus*	Dark-eyed junco (*Junco hyemalis*)	no	no	no			
6/22/2018	AF09-1A*	0.00	-	-	-	Abundant *Lasthenia glaberrima* beginning to flower, *Eleocharis macrostachya*	Water strider, water beetle, Hyla eggs, larvae, and adults, small flies on water surface	no	no	yes	0.00	0.01	10.85
	AF09-1B	0.00	-	-	-	-	-	no	no	no			
	AF09-2	0.00	-	-	-	*Eleocharis macrostachya* and *Juncus phaeocephalus* beginning to flower	Water strider, water beetle, Hyla eggs, larvae, and adults, water boatmen, small flies on water surface	no	no	yes			

Table C-1
2018 Aquatic Feature Monitoring in Future East Garrison MRA Grenade Range

ESCA RP 2018 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.)
No monitoring when aquatic features dry													
12/6/2018	AF09-1A*	1.38	Low	7	10%/60%		water beetles	no	no	yes	0.09	0.27	0.24
	AF09-1B	0.20	Low	6.8	2%/80%		water beetles	no	no	yes			
	AF09-2	1.37	Medium	6.8	20%/40%		water beetles, hyla eggs	no	no	yes			

Notes:
* Restored Aquatic Feature
** Percent vegetative cover is based on visual estimate and is affected by water turbidity.

Table C-2
2018 Aquatic Feature Monitoring in Future East Garrison MRA Grenade Range

ESCA RP 2018 Annual Natural Resource Report

Survey	Aquatic Feature Number	Water depth (ft.)			Turbidity**			pH			Percent Emergent and Submergent Vegetation***		
		2010	2011	2018	2010	2011	2018	2010	2011	2018	2010	2011	2018
		Total annual precipitation (inches): 2010 = 23.6, 2011 = 16.6, 2018 = 9.86											
1/13/2010 1/31/2011 and 1/12/2018	AF09-1A*	inundated	0.78	1.35	-	Low	Low	-	-	6.7	-	-	35% emergent; 35% submergent
	AF09-1B	0.00	0.14	0.00	-	N/A	-	-	-	-	-	-	-
	AF09-2	inundated	0.94	1.28	-	Medium	Low	-	-	7.2	-	-	40% emergent; 30% submergent
3/12/2010 3/28-29/2011 and 3/12/2018	AF09-1A*	0.94	0.98	1.24	Low	Low	Medium	-	6.6	7.2	-	-	60% emergent; 10% submergent
	AF09-1B	0.34	0.49	0.00	Medium	Medium	Medium	-	6.9	6.6	-	-	-
	AF09-2	1.08	1.08	1.14	Medium	Medium	Medium	-	6.1	6.6	-	-	25% emergent; 25% submergent
4/15/2010 4/21/2011 and 4/24/2018	AF09-1A*	0.96	0.46	1.38	Medium	Low	Medium	6.4	-	7.3	-	29% emergent; 10% submergent	55% emergent; 25% submergent
	AF09-1B	0.44	0.00	0.00	-	-	-	6.4	-	-	-	-	-
	AF09-2	1.06	0.00	0.95	Medium	-	Medium	6.1	-	7.0	-	-	50% emergent; 25% 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: 1/3/2018

Begin Time: 14:00 **End Time:** 14:30

Weather: Off and on rain, cloudy

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.:	—	—	—
% ponded with floating veg.:	—	—	—
Plant species observed:	—	—	—
Fauna species observed:	—	—	—
Other Observations:			Newly ponded waters observed beside pond.

Notes: * Soils were moist on the surface and cracked because it hasn't rained in over a month but rained today.

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet **Observer(s):** J. Tallis

Date: 1/12/2018

Begin Time: 1450 **End Time:** 1515

Weather: Clear, 68°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:	1.35	—	1.28
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:	6.7	—	7.2
Water surface area (sq. feet)	850	—	200
% ponded with submergent veg.:	35	—	~~70~~ 30
% ponded with emergent veg.:	35	—	~~80~~ 40
Plant species observed and other observations:	Triodium obliferum Same ←	Graminoides starting to emerge	Most veg is from last season. Plantago coronopus sp.
Fauna species observed and other observations:	Same ←		water strider humming bird
Other Observations:			

Notes: Pacific chorus frog audible in vicinity but not in ponds

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet | **Observer(s):** J. Tallis

Date: 2/13/2018

Begin Time: 11:00 **End Time:** 11:30

Weather: Partly cloudy, 60's

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:	0.92 ft	–	0.78 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:	Not recorded	–	Not recorded
Water surface area (sq. feet)	400	–	10
% ponded with submergent veg.:	35	–	20
% ponded with emergent veg.: / floating veg	35 / 2	–	20 / 0
% ponded with floating veg.:	↑	–	↑
Plant species observed:	Algae present.	–	Algae present
Fauna species observed:	None	–	None
Other Observations:	–	–	–

Notes: Despite dry winter AF09-1A still holds considerable water. Control wetland AF09-2 still holds water but has reduced in area considerably.

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet | **Observer(s):** J. Tallis

Date: 3/12/2018

Begin Time: 14:00 **End Time:** 14:30

Weather: Cloudy 68°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:	1.24 ft	–	1.14ft.
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:	7.2	–	6.4
Water surface area (sq. feet)	650	–	180
% ponded with submergent veg.:	50%	–	20
% ponded with emergent veg.: % floating	20% / 4%	–	50 / 0
Plant species observed and other observations:			Green algae growing in all of middle part of pond.
Fauna species observed and other observations:	water striders, water beetles, Hyla eggs, larvae and adults, small flies on water surface		Water striders, Hyla larvae + adults + egg masses, Water boatmen, water beetles
Other Observations:			Signs that AF recently overflowed out of basin.

Notes:

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet | **Observer(s):** J. Tallis, C. Nicely

Date: 4/24/2018

Begin Time: 12:30 **End Time:** 13:00

Weather: Clear, breezy, 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:	1.38	–	0.95 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)	650	–	140
% ponded with submergent veg.:	25	–	25
% ponded with emergent veg.:	55	–	50
% ponded with floating veg.:	5	–	Ø
Plant species observed:	Lemna minor Eleocharis macro. Plantago coronopus	Juncus capitatus	Eleocharis macrost. Juncus phaeocaph. Plantago coronop.
Fauna species observed:	Damselfly adult Dragonfly adult Water boatmen Water striders Water beetle		Water beetle Damselfly adult Water striders Pacific chorus frog larvae
Other Observations:	Pacific chorus frog adult + larvae		

Notes:

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet | **Observer(s):** J. Tallis

Date: 5/25/2018

Begin Time: 18:00 **End Time:** 18:30

Weather: Partly cloudy

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:	0.76 ft		0.0
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:	7.0	—	—
Water surface area (sq. feet)	175	—	—
% ponded with submergent veg.:	25%	—	—
% ponded with emergent veg.:	50%	—	—
% ponded with floating veg.:	15%	—	—
Plant species observed:	-Eleocharis macrostachya -Call. triche sp. -Salix lasiolepis	Juncus capitatus	Juncus phaeocephalus Eleocharis macrost.
Fauna species observed:	-Dark eyed Flies on water surface - Water beetle	junco ———	———
Other Observations:	-Tree frog larvae		

Notes:

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet — **Observer(s):** J. Tallis

Date: 6/22/2018

Begin Time: 08:20 **End Time:** 08:45

Weather: Overcast

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)	0%	0%	0%
% ponded with submergent veg.:	—	—	—
% ponded with emergent veg.:	—	—	—
% ponded with floating veg.:	—	—	—
Plant species observed:	Eleocharis macrostachya abundant Lasthenia glaberrima		Eleocharis macrostachya flowering Juncus phaeocephalus flowering.
Fauna species observed:			
Other Observations:			

Notes: AF09-1A and AF09-2 were moist below a cracking surface at the lowest point.

* First time all aquatic features dry since Jan 3, 2018

ESCA RP at the Former Fort Ord

Aquatic Feature Monitoring Data Sheet

Observer(s): J. Tallis

Date: 12-6-2018

Begin Time: 10:30 **End Time:** 11:30

Weather: clear, cool 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:	1.38ft	0.2 ft	1.37
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:	7.0	6.8	6.8
Water surface area (sq. feet)	750	4[illegible]	300
% ponded with submergent veg.:	60	80	40
% ponded with emergent veg.:	10	2	20
% ponded with floating veg.:	0	0	0
Plant species observed:			
Fauna species observed:		water beetles	water beetles Hyla eggs
Other Observations:			

Notes:

Appendix C – 2018 Aquatic Feature Monitoring and Maintenance Photo-documentation

Photograph 1

Future East Garrison (FEG) Munitions Response Area (MRA), Grenade Range

Restored Aquatic Feature AF09-1A prior to seasonal inundation.

3 January 2018

Photograph 2

FEG MRA, Grenade Range

Control (Reference) Aquatic Feature AF09-2 prior to seasonal inundation.

3 January 2018

Photograph 3

FEG MRA,
Grenade Range

Control (Reference) Aquatic Feature AF09-2 in April.

26 April 2018

Photograph 4

FEG MRA,
Grenade Range

Restored Aquatic Feature AF09-1A in April.

26 April 201\8

Appendix C – Aquatic Feature Monitoring and Maintenance Photo-documentation

Photograph 5

FEG MRA,
Grenade Range

Control (Reference) Aquatic Feature AF09-1B in late April when other features contained water.

26 April 2018

Photograph 6

FEG MRA,
Grenade Range

Reference (Control) Aquatic Feature AF09-1B in May.

25 May 2018

Photograph 7

FEG MRA,
Grenade Range

Restored Aquatic Feature AF09-1A in May. Arroyo willow (*Salix lasiolepis*) growing in foreground. View looking north.

25 May 2018

Photograph 8

FEG MRA,
Grenade Range

Restored Aquatic Feature AF09-1A densely vegetated in late May. View looking east.

25 May 2018

Appendix C – Aquatic Feature Monitoring and Maintenance Photo-documentation

Photograph 9

FEG MRA,
Grenade Range

Restored Aquatic Feature AF09-1A at end of 2017-2018 rainy season in May.

25 May 2018

Photograph 10

FEG MRA,
Grenade Range

Control (Reference) Aquatic Feature AF09-2 dry for the first time since filling in mid-January.

25 May 2018

Table D-1
2018 Weed Monitoring and Maintenance

2018 Annual Natural Resource Report - Appendix D

Date	MRA	Location	Type	Findings	Treatment
1/12/2018	IAR	North and South Range 44	Monitoring and Treatment	-3 new pampas seedlings observed outside of North Range 44 in the development parcel, 200 feet north of North Range 44. -Occasional iceplant seedlings observed. Very few present in small-scale excavations.	-Hand pulled 3 pampas grass seedlings.
3/12/2018	FEG	Grenade Range	Monitoring and Treatment	-Iceplant observed in the seeded area of FEG east of Aquatic Features.	-Hand-pulled 15 iceplant individuals that varied in size.
3/12/2018	IAR	North Range 44	Monitoring and Treatment	-Minor presence of red-stemmed filaree and hairy cat's ear.	-None
4/24/2018	FEG	Grenade Range	Monitoring and Treatment	-Minimal iceplant observed in the east slope near Aquatic Features.	-Hand pulled 20 iceplant seedlings.
5/25/2018	FEG	Grenade Range	Monitoring and Treatment	-Tiny iceplant individuals observed on east slope.	-Hand pulled 30 iceplant seedlings.
6/22/2018	FEG	Grenade Range	Monitoring and Treatment	-Tiny iceplant observed on east slope. Two large (2-3 foot long) plants observed and removed.	-Hand pulled two large iceplant individuals.

Table D-1
2018 Weed Monitoring and Maintenance

2018 Annual Natural Resource Report - Appendix D

Date	MRA	Location	Type	Findings	Treatment
10/10/2018	IAR	North Range 44	Monitoring and Treatment	-Completed CNPS Releve monitoring forms in 5 randomly located 200 square meter cut vegetation areas. No iceplant, French broom, or pampas grass observed in plots.	-Hand pulled 10 large iceplant individuals.
10/10/2018	IAR	Range 47	Monitoring and Treatment	-Completed CNPS Releve monitoring forms in 5 randomly selected 200 square meter plots located in large scale excavation.	-Hand pulled 2 small pampas grass plants.
10/10/2018	FEG	Grenade Range	Monitoring and Treatment	-No new iceplant observed. No target weeds observed.	-None.
11/7/2018	FEG	Grenade Range	Monitoring and Treatment	-Tiny iceplant individuals observed on east slope.	-Hand pulled small ice plant individuals.
11/7/2018	IAR	North Range 44	Monitoring and Treatment	-Occasional iceplant in small-scale excavations/scrapes. No French broom or pampas grass observed.	-None
11/7/2018	IAR	South Range 44	Monitoring and Treatment	-Limited presence of iceplant in small-scale excavations/scrapes. No French broom or pampas grass observed.	-Hand pulled approximately 15 medium-sized iceplant individuals.

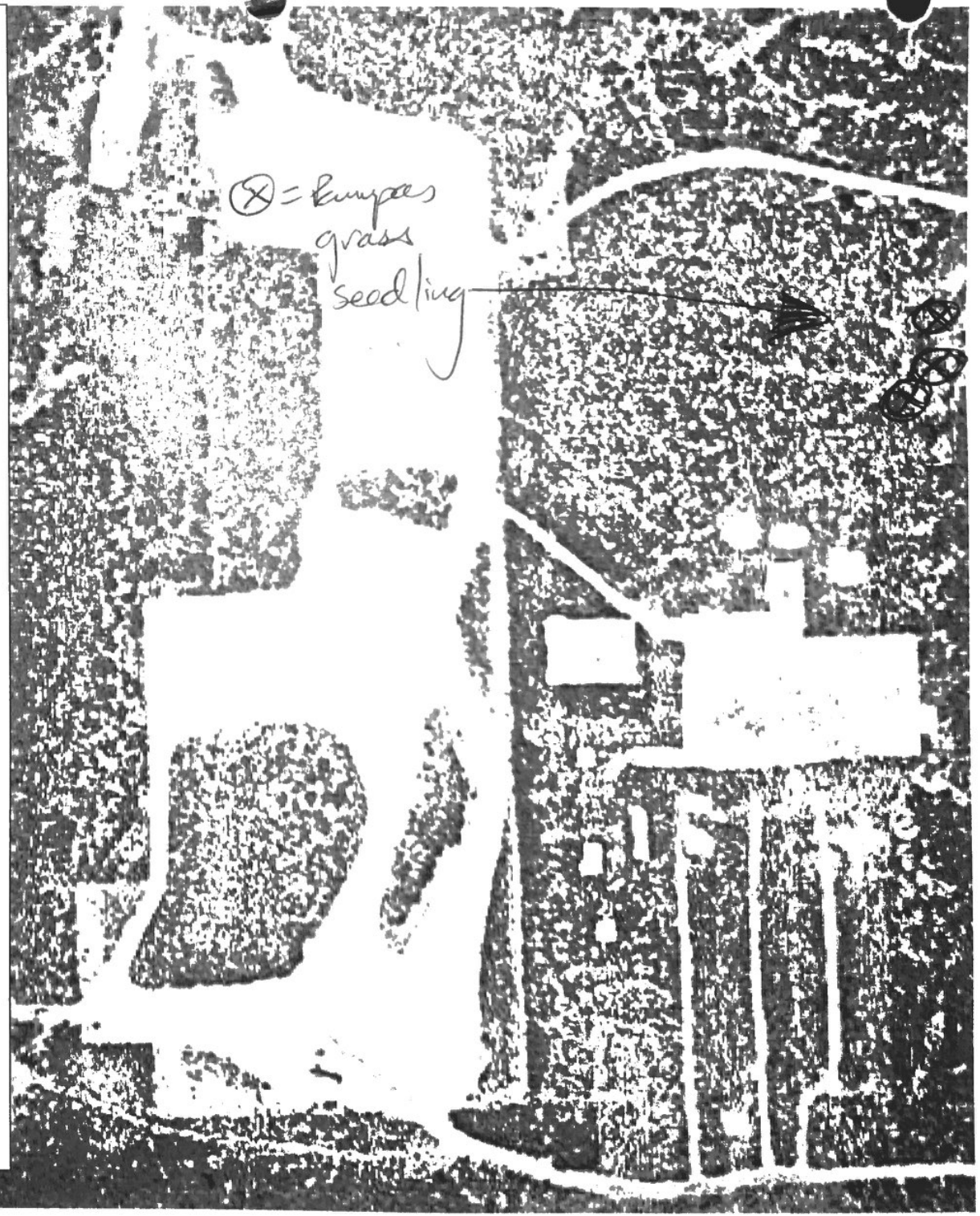
ESCA RP at the Former Fort Ord
Weed Management Program
Target Weed Monitoring and Treatment Field Form

Date: 1/12/2018	Time begin monitoring/treatment: 12:00	Time end monitoring/treatment: 13:00
Observer(s) - please list all persons present: Jo Tallis		
Weather conditions: Clear, 68°F		
General location (MRA, nearby crossroads, etc): IAR	Specific location description: North + South Range 44	
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 - Pampas grass		
Diagnostic features observed: —		
Estimated population size:	1	(2-30) Both species
31-100	101-500	>500
Proportion of population with reproductive structures (indicate buds, flowers, fruits):	(<1%) Both	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: Hand removal of 3 pampas grass plants		
Photographs: —		
Notes, non-target weeds observed or treated: —		
Followup activities and dates: —		

IAR-Devel, Parcel/NR44 ~~Erosion~~ Weed Monitoring

Date: 1/12/2018

3 separate non-flowering pampas grass individuals pulled by hand.



ESCA RP at the Former Fort Ord
Weed Management Program
Target Weed Monitoring and Treatment Field Form

Date: 3/12/2018	Time begin monitoring/treatment: 1300	Time end monitoring/treatment: 1400
Observer(s) - please list all persons present: J. Tallis		
Weather conditions: Partly cloudy, high 60's °F		
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: Vegetative		
Estimated population size:	1	2-30
31-100	101-500	>500
Proportion of population with reproductive structures (indicate buds, flowers, fruits):	<1% None	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: Hand pulled 15 iceplants, some tiny and others large mats		
Photographs:		
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: 3/12/2018	Time begin monitoring/treatment: 1400	Time end monitoring/treatment: 1500
Observer(s) - please list all persons present: J. Tallis		
Weather conditions: Raining off and on.		
General location (MRA, nearby crossroads, etc): IAR	Specific location description: North Range 4 4	
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: None		
Diagnostic features observed: N/A		
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): Extensive rodent activity		
Weed treatment activities: None		
Photographs: -		
Notes, non-target weeds observed or treated: Minor presence of filaree and hairy cats ear.		
Followup activities and dates:		

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-N44 - 1	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR NR44; Fort Ord, Marina, CA

GPS name: -

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 36.625 1066 LONG -121.7901937 WGS84

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: IT iPhone Cardinal photos at ID point: N E S W

Other photos:

Stand Size (acres): (<1) 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 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: SAAL 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)

H_20: 0 BA Stems: 3 Litter: 8 Bedrock: 0 Boulder: 0 Stone: 0 Cobble: 0 Gravel: 0 Fines: 89 =100%

% Current year bioturbation _____ 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:

All vegetation was cut to ground level in 2011-2012.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" _Veg Removal_____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L Shrub L Tree ___ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARN44- 1 SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 64

% Cover - **Conifer tree / Hardwood tree:** — **Regenerating Tree:** — **Shrub:** 56 **Herbaceous:** 8

Height Class - Conifer tree / Hardwood tree: — **Regenerating Tree:** — **Shrub:** 1 **Herbaceous:** 9

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	Arctostaphylos pumila	20		
|	Arctostaphylos tomentosa	20		
|	Adenostoma fasciculatum	6		
|	Ceanothus rigidus	1		
|	Ceanothus dentatus	5		
|	Quercus agrifolia	—		
|	Baccharis pilularis subsp. consanguinea	—		
|	Crocanthemum scoparium	1		
|	Ericameria ericoides	—		
|	Ericameria fasciculata	1		
|	~~Ericameria fasciculata~~			
|	Frangula californica subsp. californica	1		
|	Salvia mellifera	1		
|	Mimulus aurantiacus	—		
V	Horkelia cuneata	1		
H	Pteridium aquilinum	5		
S	Lupinus chamissonis	—		
H	Allium sp.	r		
|	Carex globosa	1		
|	Cordylanthus rigidus subsp. littoralis	r		
|	Acmispon glaber	—		
|	Lessingia pectinata var. pectinata	—		
|	Navarretia intertexta	—		
|	Monardella sp.	—		
V	Deinandra increscens subsp. increscens	—		
	No pampas grass, French broom			
	or ice plant			

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-N44 -2	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR NR44; Fort Ord, Marina, CA

GPS name: -

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 . 6243973 LONG -121 . 7902504 WGS84

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: ST iPhone Cardinal photos at ID point: NESW

Other photos:

Stand Size (acres): (<1) 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 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: _____ Soil Texture code: _____ | (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: 3 Litter: 11 Bedrock: Boulder: Stone: Cobble: Gravel: Fines: 86 =100%

% Current year bioturbation _____ 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:

All vegetation was cut to ground level in 2011-2012.

Disturbance code / Intensity (L,M,H): ____/___ ____/___ ____/___ ____/___ ____/___ "Other" _Veg Removal_____ / ___

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 vegetation undisturbed

Phenology (E,P,L): Herb L Shrub L Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARN44- 2

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: — **Total % Vasc Veg cover:** 79

% Cover - **Conifer tree / Hardwood tree:** — **Regenerating Tree:** — **Shrub:** 78 **Herbaceous:** 1

Height Class - Conifer tree / Hardwood tree: — **Regenerating Tree:** — **Shrub:** 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	C	Final species determination
S	Arctostaphylos pumila	6		
↓	Arctostaphylos tomentosa	10		
	Adenostoma fasciculatum	40		
	Ceanothus rigidus	4		
	Ceanothus dentatus	4		
	Quercus agrifolia	—		
	Baccharis pilularis subsp. consanguinea	—		
	Crocanthemum scoparium	—		
	Ericameria ericoides	2		
	Ericameria fasciculata	—		
	~~Ericameria fasciculata~~	—		
	Frangula californica subsp. californica	4		
	Salvia mellifera	—		
	Mimulus aurantiacus	—		
↓	Horkelia cuneata	3		
H	Pteridium aquilinum	—		
S	Lupinus chamissonis	2		
H	Allium sp.	—		
	Carex globosa	—		
↓	Cordylanthus rigidus subsp. littoralis	—		
S	Acmispon glaber	3		
H	Lessingia pectinata var. pectinata	r		
	Navarretia intertexta	r		
	Monardella sp.	r		
↓	Deinandra increscens subsp. increscens	—		

No pampas grass, French broom, or iceplant

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-N44 – 3	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR NR44; Fort Ord, Marina, CA

GPS name: -

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 36.6231695 LONG -121.7906309 WGS84

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: JT, Phone Cardinal photos at ID point: N E S W

Other photos:

Stand Size (acres): (<1), 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 20 x 20 m | RA Radius____ m

Exposure, Actual °: N 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: SAAL 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: BA Stems: 4 Litter: 14 Bedrock: Boulder: Stone: Cobble: Gravel: Fines: 82 =100%

% Current year bioturbation _____ 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:

All vegetation was cut to ground level in 2011-2012.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" Veg Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L Shrub L Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARN44- 3

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 103

% Cover - **Conifer tree / Hardwood tree:** — / — **Regenerating Tree:** — **Shrub:** 98 **Herbaceous:** 5

Height Class - Conifer tree / Hardwood tree: — / — **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	Arctostaphylos pumila	10		
	Arctostaphylos tomentosa	40		
	Adenostoma fasciculatum	10		
	Ceanothus rigidus	5		
	Ceanothus dentatus	4		
	Quercus agrifolia	1		
	Baccharis pilularis subsp. consanguinea	2		
	Crocanthemum scoparium	2		
	Ericameria ericoides	—		
	Ericameria fasciculata	2		
	~~Ericameria fasciculata~~	—		
	Frangula californica subsp. californica	—		
	Salvia mellifera	10		
	Mimulus aurantiacus	—		
H	Horkelia cuneata	5		
H	Pteridium aquilinum	—		
S	Lupinus chamissonis	—		
H	Allium sp.	—		
	Carex globosa	—		
	Cordylanthus rigidus subsp. littoralis	—		
S	Acmispon glaber	4		
H	Lessingia pectinata var. pectinata	—		
	Navarretia intertexta	—		
	Monardella sp.	—		
	Deinandra increscens subsp. increscens	—		
	No pampas grass, French broom or iceplant			

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-N44 -4	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR NR44; Fort Ord, Marina, CA

GPS name: -

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 36.6225998 LONG -121.7902970 WGS84

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: JT iPhone Cardinal photos at ID point: NESW

Other photos:

Stand Size (acres): (<1) 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 20 x 20 m | RA Radius____ m

Exposure, Actual °: _____ NE NW SE (SW) Flat Variable | Steepness, Actual °: 1 0° 1-5° > 5-25° > 25

Topography: Macro: top (upper) mid lower bottom | Micro: convex flat concave (undulating)

Geology code: SAL 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: BA Stems: 4 Litter: 18 Bedrock: Boulder: Stone: Cobble: Gravel: Fines: 78 =100%

% Current year bioturbation _____ 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:

All vegetation was cut to ground level in 2011-2012.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" _Veg Removal_____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L Shrub L Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARN44- 4

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 90

% Cover - **Conifer tree / Hardwood tree:** — / — **Regenerating Tree:** — **Shrub:** 86 **Herbaceous:** 4

Height Class - Conifer tree / Hardwood tree: — / — **Regenerating Tree:** — **Shrub:** 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	C	Final species determination
S	Arctostaphylos pumila	9		
	Arctostaphylos tomentosa	24		
	Adenostoma fasciculatum	8		
	Ceanothus rigidus	4		
	Ceanothus dentatus	3		
	Quercus agrifolia	6		
	Baccharis pilularis subsp. consanguinea	—		
	Crocanthemum scoparium	1		
	Ericameria ericoides	—		
	Ericameria fasciculata	4		
	~~Ericameria fasciculata~~	—		
	Frangula californica subsp. californica	4		
	Salvia mellifera	20		
↓	Mimulus aurantiacus	—		
H	Horkelia cuneata	3		
H	Pteridium aquilinum	—		
S	Lupinus chamissonis	—		
H	Allium sp.	—		
	Carex globosa	1		
↓	Cordylanthus rigidus subsp. littoralis	—		
S	Acmispon glaber	3		
H	Lessingia pectinata var. pectinata	—		
	Navarretia intertexta	—		
	Monardella sp.	—		
↓	Deinandra increscens subsp. increscens	—		
	No pampas grass, French broom,			
	or ice plant			

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-N44 -5	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR NR44; Fort Ord, Marina, CA

GPS name: -

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 36.622760 LONG -121.790100 WGS84

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: JT, Phone Cardinal photos at ID point: NESE

Other photos:

Stand Size (acres): (<1), 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 20 x 20 m | RA Radius____ m

Exposure, Actual °: N 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: SAL 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: BA Stems: 4 Litter: 2 Bedrock: Boulder: Stone: Cobble: Gravel: Fines: 94 =100%

% Current year bioturbation ____ 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:

All vegetation was cut to ground level in 2011-2012.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" _Veg Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb____ Shrub____ Tree____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARN44-5 SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: ___ **Total % Vasc Veg cover:** 90

% Cover - **Conifer tree / Hardwood tree:** — **Regenerating Tree:** — **Shrub:** 82 **Herbaceous:** 11

Height Class - **Conifer tree / Hardwood tree:** — **Regenerating Tree:** — **Shrub:** 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	C	Final species determination
S	Arctostaphylos pumila	8		
↓	Arctostaphylos tomentosa	50		
↓	Adenostoma fasciculatum	7		
↓	Ceanothus rigidus	4		
↓	Ceanothus dentatus	3		
↓	Quercus agrifolia	—		
↓	Baccharis pilularis subsp. consanguinea	—		
↓	Crocanthemum scoparium	6		
↓	Ericameria ericoides	—		
↓	Ericameria fasciculata	1		
↓	~~Ericameria fasciculata~~	—		
↓	Frangula californica subsp. californica	—		
↓	Salvia mellifera			
↓	Mimulus aurantiacus	1		
H	Horkelia cuneata	10		
H	Pteridium aquilinum	—		
SH	Lupinus chamissonis	—		
H	Allium sp.	—		
↓	Carex globosa	1		
↓	Cordylanthus rigidus subsp. littoralis	—		
S	Acmispon glaber	2		
H	Lessingia pectinata var. pectinata	—		
↓	Navarretia intertexta	—		
↓	Monardella sp.	—		
↓	Deinandra increscens subsp. increscens	—		

No pampas grass, French broom, or iceplant

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-S44- 1	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR SR44; Fort Ord, Marina, CA

GPS name: -

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 36.619033 LONG -121.791534 WGS84

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: JT iPhone Cardinal photos at ID point: N, E, S, W

Other photos:

Stand Size (acres): (<1) 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 3.3 x 133 m | RA Radius____ m

Exposure, Actual °: N NE NW SE SW Flat Variable | Steepness, Actual °: 8 0° 1-5° (>5-25°) >25

Topography: Macro: top (upper) mid lower bottom | Micro: convex (flat) concave undulating

Geology code: SAAL 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)

H_20: BA Stems: 3 Litter: 18 Bedrock: Boulder: Stone: Cobble: Gravel: Fines: 79 =100%

% Current year bioturbation _____ 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:

All vegetation cut to ground level in 2011 along long narrow strips.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" Veg Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L Shrub L Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARS44- | SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 108

% Cover - **Conifer tree / Hardwood tree:** — / — **Regenerating Tree:** — **Shrub:** 108 **Herbaceous:** 1

Height Class - **Conifer tree / Hardwood tree:** — / — **Regenerating Tree:** — **Shrub:** 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	C	Final species determination
	Arctostaphylos pumila			
	Arctostaphylos tomentosa	65		
	Adenostoma fasciculatum	8		
	Ceanothus rigidus			
	Ceanothus dentatus	15		
	Quercus agrifolia			
	Baccharis pilularis subsp. consanguinea	4		
	Crocanthemum scoparium	4		
	Ericameria ericoides			
	Ericameria fasciculata			
	Ericameria fasciculata			
	Frangula californica subsp. californica			
	Salvia mellifera	3		
	Mimulus aurantiacus			
	Horkelia cuneata	3		
	Pteridium aquilinum			
	Lupinus chamissonis			
	Allium sp.			
	Carex globosa	1		
	Cordylanthus rigidus subsp. littoralis			
	Acmispon glaber	6		
	Lessingia pectinata var. pectinata			
	Navarretia intertexta			
	Monardella sp.			
	Deinandra increscens subsp. increscens			
	No pampas grass, French broom, or iceplant observed			

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-S44- 2	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR SR44; Fort Ord, Marina, CA

GPS name: -

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 36.620125 LONG -121.791928 WGS84

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: JT iPhone Cardinal photos at ID point: N, E, S, W

Other photos:

Stand Size (acres): (<1) 1-5, >5 | Plot Area (m^2): 100 / 400m2 | Plot Dimensions 3.3 x 133 m | RA Radius____ m

Exposure, Actual °: N NE NW SE SW Flat Variable | Steepness, Actual °: 2 0° 1-5° >5-25° >25

Topography: Macro: top upper mid (lower) bottom | Micro: convex flat (concave) undulating

Geology code: SAAL 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)

H_20: BA Stems: 2 Litter: 16 Bedrock: Boulder: Stone: Cobble: Gravel: Fines: 82 =100%

% Current year bioturbation ____ 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:

All vegetation cut to ground level in 2011 along long narrow strips.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" Veg Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L Shrub L Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARS44- 2

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 83

% Cover - **Conifer tree / Hardwood tree:** — **Regenerating Tree:** — **Shrub:** 68 **Herbaceous:** 15

Height Class - Conifer tree / Hardwood tree: — **Regenerating Tree:** — **Shrub:** 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	C	Final species determination
	Arctostaphylos pumila	6		
	Arctostaphylos tomentosa	36		
	Adenostoma fasciculatum	6		
	Ceanothus rigidus			
	Ceanothus dentatus			
	Quercus agrifolia			
	Baccharis pilularis subsp. consanguinea			
	Crocanthemum scoparium	8		
	Ericameria ericoides			
	Ericameria fasciculata			
	Ericameria fasciculata			
	Frangula californica subsp. californica			
	Salvia mellifera	12		
	Mimulus aurantiacus			
	Horkelia cuneata	11		
	Pteridium aquilinum			
	Lupinus chamissonis			
	Allium sp.			
	Carex globosa	4		
	Cordylanthus rigidus subsp. littoralis			
	Acmispon glaber			
	Lessingia pectinata var. pectinata			
	Navarretia intertexta			
	Monardella sp.			
	Deinandra increscens subsp. increscens			

No pampas grass, French broom, or iceplant observed.

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-S44- 3	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR SR44; Fort Ord, Marina, CA

GPS name: -

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 36.621432 LONG -121.790932 WGS84

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: JT iPhone Cardinal photos at ID point: N, E, S, W

Other photos:

Stand Size (acres): (<1) 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 3.3 x 133 m | RA Radius____ m

Exposure, Actual °: 3 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: SAAL 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)
H_20:	BA Stems: 4	Litter: 10	Bedrock:	Boulder:	Stone:	Cobble:	Gravel:	Fines: 86 =100%

% Current year bioturbation _____ 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:

All vegetation cut to ground level in 2011 along long narrow strips.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" Veg Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L Shrub L Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARS44- 3

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 104

% Cover - Conifer tree / Hardwood tree: — **Regenerating Tree:** — **Shrub:** 98 **Herbaceous:** 6

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
	Arctostaphylos pumila	10		
	Arctostaphylos tomentosa	10		
	Adenostoma fasciculatum	6		
	Ceanothus rigidus	12		
	Ceanothus dentatus	6		
	Quercus agrifolia			
	Baccharis pilularis subsp. consanguinea			
	Crocanthemum scoparium	6		
	Ericameria ericoides	12		
	Ericameria fasciculata	2		
	Ericameria fasciculata			
	Frangula californica subsp. californica	15		
	Salvia mellifera	11		
	Mimulus aurantiacus	4		
	Horkelia cuneata	3		
	Pteridium aquilinum			
	Lupinus chamissonis			
	Allium sp.			
	Carex globosa	1		
	Cordylanthus rigidus subsp. littoralis			
	Acmispon glaber	4		
	Lessingia pectinata var. pectinata	2		
	Navarretia intertexta			
	Monardella sp.			
	Deinandra increscens subsp. increscens			
	Chorizanthe pungens var. pungens	r		

No pampas grass, French broom, or ice plant observed

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-S44- 4	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR SR44; Fort Ord, Marina, CA

GPS name: -

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 36.618487 LONG -121.789642 WGS84

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: JT iPhone Cardinal photos at ID point: N, E, S, W

Other photos:

Stand Size (acres): (<1), 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 3.3 x 133 m | RA Radius____ m

Exposure, Actual °: N NE NW SE SW Flat Variable | Steepness, Actual °: 5 0° 1-5° > 5-25° > 25

Topography: Macro: top (upper) mid lower bottom | Micro: convex flat concave (undulating)

Geology code: SAAL 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: BA Stems: 4 Litter: 12 Bedrock: Boulder: Stone: Cobble: Gravel: Fines: 84 =100%

% Current year bioturbation _____ 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:

All vegetation cut to ground level in 2011 along long narrow strips.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" Veg Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb ___ Shrub L Tree ___ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised March 27, 2018)
SPECIES SHEET

Database #: IARS44- 4

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 84

% Cover - **Conifer tree / Hardwood tree:** — **Regenerating Tree:** — **Shrub:** 83 **Herbaceous:** 1

Height Class - Conifer tree / Hardwood tree: — **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
	Arctostaphylos pumila			
	Arctostaphylos tomentosa	60		
	Adenostoma fasciculatum	12		
	Ceanothus rigidus	4		
	Ceanothus dentatus			
	Quercus agrifolia			
	Baccharis pilularis subsp. consanguinea			
	Crocanthemum scoparium	2		
	Ericameria ericoides			
	Ericameria fasciculata			
	Ericameria fasciculata			
	Frangula californica subsp. californica			
	Salvia mellifera	5		
	Mimulus aurantiacus			
	Horkelia cuneata			
	Pteridium aquilinum			
	Lupinus chamissonis			
	Allium sp.			
	Carex globosa	1		
	Cordylanthus rigidus subsp. littoralis			
	Acmispon glaber			
	Lessingia pectinata var. pectinata			
	Navarretia intertexta	r		
	Monardella sp.			
	Deinandra increscens subsp. increscens			

No pampas grass, French broom, or iceplant observed.

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #: IAR-S44- 5

Date: 10/10/2018

UID:

Name of recorder: J. Tallis

Other surveyors: None

Location Name: IAR SR44; Fort Ord, Marina, CA

GPS name: -

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** 36.618549 **LONG** -121.790479 WGS84

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: JT iPhone **Cardinal photos at ID point:** N, E, S, W

Other photos:

Stand Size (acres): (<1) 1-5, >5 | **Plot Area (m²):** 100 / 400m2 | **Plot Dimensions** 3.3 x 133 m | **RA Radius**____ m

Exposure, Actual °: N 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: SAAL **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: **BA Stems:** 4 **Litter:** 20 **Bedrock:** **Boulder:** **Stone:** **Cobble:** **Gravel:** **Fines:** 76 =100%

% Current year bioturbation ____ **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:

All vegetation cut to ground level in 2011 along long narrow strips.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ **"Other"** Veg Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L **Shrub** L **Tree** ____ **Other identification or mapping information:**

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARS44-5 SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 80

% Cover - **Conifer tree / Hardwood tree:** — **Regenerating Tree:** — **Shrub:** 79 **Herbaceous:** 1

Height Class - Conifer tree / Hardwood tree: — **Regenerating Tree:** — **Shrub:** 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	C	Final species determination
	Arctostaphylos pumila			
	Arctostaphylos tomentosa	35		
	Adenostoma fasciculatum			
	Ceanothus rigidus	8		
	Ceanothus dentatus	12		
	Quercus agrifolia			
	Baccharis pilularis subsp. consanguinea			
	Crocanthemum scoparium	6		
	Ericameria ericoides	5		
	Ericameria fasciculata			
	Ericameria fasciculata			
	Frangula californica subsp. californica			
	Salvia mellifera	8		
	Mimulus aurantiacus			
	Horkelia cuneata	1		
	Pteridium aquilinum			
	Lupinus chamissonis			
	Allium sp.			
	Carex globosa	1		
	Cordylanthus rigidus subsp. littoralis			
	Acmispon glaber	3		
	Lessingia pectinata var. pectinata			
	Navarretia intertexta	r		
	Monardella sp.			
	Deinandra increscens subsp. increscens			

No pampas grass, French broom, or iceplant observed

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-N47- 1	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR NR47; Fort Ord, Marina, CA

GPS name: -

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 36.6234994 LONG -121.7942720 WGS84

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: JT iPhone Cardinal photos at ID point: N, E, S, W

Other photos:

Stand Size (acres): (<1), 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 20 x 20 m | RA Radius____ m

Exposure, Actual °: N NE NW SE SW Flat Variable | Steepness, Actual °: 2 0° 1-5° >5-25° >25

Topography: Macro: top upper mid lower bottom | Micro: convex flat concave undulating

Geology code: ____ 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)

H_20: BA Stems: 3 Litter: 40 Bedrock: Boulder: Stone: Cobble: Gravel: Fines: 57 =100%

% Current year bioturbation ____ 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:

All soil removed and replaced in 2012 and replanted and reseeded in 2013.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" Soil Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb ___ Shrub L Tree ___ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARN47- \ SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: ____ **Total % Vasc Veg cover:** 112

% Cover - **Conifer tree / Hardwood tree:** — **Regenerating Tree:** — **Shrub:** 108 **Herbaceous:** 4

Height Class - Conifer tree / Hardwood tree: — **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	Arctostaphylos pumila	12		
	Arctostaphylos tomentosa	3		
	Adenostoma fasciculatum	3		
	Ceanothus rigidus	20		
	Ceanothus dentatus	5		
	Quercus agrifolia	—		
	Baccharis pilularis subsp. consanguinea	47		
	Crocanthemum scoparium	1		
	Ericameria ericoides	8		
	Ericameria fasciculata	—		
	~~Ericameria fasciculata~~ Eriophyllum conf.	2		
	Frangula californica subsp. californica			
	Salvia mellifera	7		
↓	Mimulus aurantiacus			
H	Horkelia cuneata	3		
H	Pteridium aquilinum			
S	Lupinus chamissonis	—		
H	Allium sp.			
	Carex globosa			
↓	Cordylanthus rigidus subsp. littoralis			
S	Acmispon glaber			
H	Lessingia pectinata var. pectinata			
	Navarretia intertexta			
	Monardella sp.			
↓	Deinandra increscens subsp. increscens	1		
No pampas grass, French broom or iceplant!				

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-N47-2	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR-N47; Fort Ord, Marina, CA

GPS name: -

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 36.6236487 LONG -121.7953613 WGS84

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: JT iPhone Cardinal photos at ID point: N, E, S, W

Other photos:

Stand Size (acres): (<1), 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 20 x 20 m | RA Radius____ m

Exposure, Actual °: N 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: SAAL 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)
H_2O:	BA Stems: 3	Litter: 10	Bedrock:	Boulder:	Stone:	Cobble:	Gravel:	Fines: 87 =100%

% Current year bioturbation _____ 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:

All soil removed and replaced in 2012 and replanted and reseeded in 2013.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" Soil Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L Shrub L Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARN47- 2

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 77

% Cover - **Conifer tree / Hardwood tree:** + **Regenerating Tree:** — **Shrub:** 73 **Herbaceous:** 4

Height Class - Conifer tree / Hardwood tree: + **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	Arctostaphylos pumila	3		
|	Arctostaphylos tomentosa	1		
|	Adenostoma fasciculatum	5		
|	Ceanothus rigidus			
|	Ceanothus dentatus	6		
|	Quercus agrifolia			
|	Baccharis pilularis subsp. consanguinea	50		
|	Crocanthemum scoparium	1		
|	Ericameria ericoides			
|	Ericameria fasciculata	1		
|	Ericameria fasciculata			
|	Frangula californica subsp. californica	5		
|	Salvia mellifera			
V	Mimulus aurantiacus	3		
H	Horkelia cuneata	2		
H	Pteridium aquilinum			
S	Lupinus chamissonis			
H	Allium sp.			
|	Carex globosa			
V	Cordylanthus rigidus subsp. littoralis			
S	Acmispon glaber	3		
H	Lessingia pectinata var. pectinata			
|	Navarretia intertexta			
|	Monardella sp.			
V	Deinandra increscens subsp. increscens	1		
	No Pampas grass, French broom,			
	or iceplant observed.			

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-N47- 3	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR-N47; Fort Ord, Marina, CA

GPS name: -

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 36.623527 LONG -121.7965301 WGS84

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: JT iPhone **Cardinal photos at ID point:** N, E, S, W

Other photos:

Stand Size (acres): (<1), 1-5, >5 | **Plot Area (m²):** 100 / 400m2 | **Plot Dimensions** 20 x 20 m | **RA Radius**____ m

Exposure, Actual °: N NE NW SE SW Flat Variable | **Steepness, Actual °:** 1 0° 1-5° >5-25° >25

Topography: Macro: top upper (mid) lower bottom | Micro: convex (flat) concave undulating

Geology code: SAAL **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: **BA Stems:** 3 **Litter:** 5 **Bedrock:** **Boulder:** **Stone:** **Cobble:** **Gravel:** **Fines:** 92 =100%

% Current year bioturbation _____ **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:

All soil removed and replaced in 2012 and replanted and reseeded in 2013.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ **"Other"** Soil Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L Shrub L Tree ____ **Other identification or mapping information:**

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARN47- 3

SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 78

% Cover - **Conifer tree / Hardwood tree:** — **Regenerating Tree:** — **Shrub:** 72 **Herbaceous:** 6

Height Class - Conifer tree / Hardwood tree: — **Regenerating Tree:** — **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
S	Arctostaphylos pumila			
↓	Arctostaphylos tomentosa	3		
	Adenostoma fasciculatum	5		
	Ceanothus rigidus	17		
	Ceanothus dentatus	15		
	Quercus agrifolia			
	Baccharis pilularis subsp. consanguinea	4		
	Crocanthemum scoparium	5		
	Ericameria ericoides	10		
	Ericameria fasciculata	5		
	Ericameria fasciculata			
	Frangula californica subsp. californica			
	Salvia mellifera	3		
↓	Mimulus aurantiacus	3		
H	Horkelia cuneata	6		
↓	Pteridium aquilinum			
S	Lupinus chamissonis			
H	Allium sp.			
↓	Carex globosa			
↓	Cordylanthus rigidus subsp. littoralis			
S	Acmispon glaber	2		
H	Lessingia pectinata var. pectinata			
↓	Navarretia intertexta			
↓	Monardella sp.			
↓	Deinandra increscens subsp. increscens			
	No pampas grass, French broom,			
	or iceplant.			

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #:	Date:	Name of recorder: J. Tallis
IAR-N47- 4	10/10/2018	Other surveyors: None
	UID:	Location Name: IAR NR47; Fort Ord, Marina, CA

GPS name: -

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 36.6226859 LONG -121.7957911 WGS84

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: JT iPhone Cardinal photos at ID point: N, E, S, W

Other photos:

Stand Size (acres): (<1) 1-5, >5 | Plot Area (m²): 100 / 400m2 | Plot Dimensions 20 x 20 m | RA Radius____ m

Exposure, Actual °: N NE NW SE SW Flat Variable | Steepness, Actual °: 5 0° 1-5° > 5-25° > 25

Topography: Macro: top (upper) mid lower bottom | Micro: convex flat (concave) undulating

Geology code: SAAL 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: BA Stems: 3 Litter: 5 Bedrock: Boulder: Stone: Cobble: Gravel: Fines: 92 =100%

% Current year bioturbation ____ 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:

All soil removed and replaced in 2012 and replanted and reseeded in 2013.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" Soil Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L Shrub L Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: IARN47- 4 SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 98

% Cover - **Conifer tree / Hardwood tree:** T **Regenerating Tree:** — **Shrub:** 94 **Herbaceous:** 4

Height Class - Conifer tree / Hardwood tree: ____/____ **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	Arctostaphylos pumila	15		
↓	Arctostaphylos tomentosa	4		
	Adenostoma fasciculatum	10		
	Ceanothus rigidus	8		
	Ceanothus dentatus			
	Quercus agrifolia			
	Baccharis pilularis subsp. consanguinea	25		
	Crocanthemum scoparium	3		
	Ericameria ericoides	10		
	Ericameria fasciculata	8		
	Ericameria fasciculata			
	Frangula californica subsp. californica			
	Salvia mellifera	8		
V	Mimulus aurantiacus	2		
H	Horkelia cuneata	4		
H	Pteridium aquilinum			
S	Lupinus chamissonis			
H	Allium sp.			
↓	Carex globosa			
V	Cordylanthus rigidus subsp. littoralis			
S	Acmispon glaber	1		
H	Lessingia pectinata var. pectinata			
↓	Navarretia intertexta			
	Monardella sp.			
V	Deinandra increscens subsp. increscens			

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: (Relevé) or RA

Database #: IAR-N47- 5 | **Date:** 10/10/2018 | **Name of recorder:** J. Tallis | **Other surveyors:** None | **UID:** | **Location Name:** IAR-N47; Fort Ord, Marina, CA

GPS name: - 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** 36.6224777 **LONG** -121.7942633 WGS84

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: JT iPhone **Cardinal photos at ID point:** N, E, S, W

Other photos:

Stand Size (acres): (<1), 1-5, >5 | **Plot Area (m²):** 100 / 400m2 | **Plot Dimensions** 20 x 20 m | **RA Radius**____ m

Exposure, Actual °: N NE NW SE SW Flat Variable | **Steepness, Actual °:** 2 0° 1-5° >5-25° >25

Topography: Macro: top (upper) mid lower bottom | Micro: convex (flat) concave undulating

Geology code: SAAL **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: **BA Stems:** 4 **Litter:** 12 **Bedrock:** **Boulder:** **Stone:** **Cobble:** **Gravel:** **Fines:** 84 =100%

% Current year bioturbation _____ **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:

All soil removed and replaced in 2012 and replanted and reseeded in 2013.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ **"Other"** Soil Removal____/____

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 vegetation undisturbed

Phenology (E,P,L): Herb L **Shrub** L **Tree** ____ **Other identification or mapping information:**

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

SPECIES SHEET

Database #: IARN47- 5

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 91

% Cover - **Conifer tree / Hardwood tree:** — **Regenerating Tree:** — **Shrub:** 91 **Herbaceous:** 0

Height Class - Conifer tree / Hardwood tree: — **Regenerating Tree:** — **Shrub:** 2 **Herbaceous:** NA

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	Arctostaphylos pumila	1		
↓	Arctostaphylos tomentosa	6		
	Adenostoma fasciculatum	28		
	Ceanothus rigidus	12		
	Ceanothus dentatus	6		
	Quercus agrifolia			
	Baccharis pilularis subsp. consanguinea	8		
	Crocanthemum scoparium	3		
	Ericameria ericoides	18		
	Ericameria fasciculata	2		
	Ericameria fasciculata			
	Frangula californica subsp. californica			
	Salvia mellifera	5		
↓	Mimulus aurantiacus			
H	Horkelia cuneata			
H	Pteridium aquilinum			
S	Lupinus chamissonis			
H	Allium sp.			
↓	Carex globosa			
↓	Cordylanthus rigidus subsp. littoralis			
S	Acmispon glaber			
H	Lessingia pectinata var. pectinata			
↓	Navarretia intertexta			
↓	Monardella sp.			
↓	Deinandra increscens subsp. increscens			

Unusual species: _____

Appendix D - Weed Monitoring and Maintenance Photo-documentation

Photograph 1

FEG MRA
Grenade Range

Iceplant (*Carpobrotus edulis*) hand-pulled in Grenade Range.

03 August 2018

Photograph 2

FEG MRA

Young pampas grass (*Cortaderia jubata*) hand-pulled within the habitat parcel in the FEG MRA.

03 August 2018

Table E-1
2018 Erosion Monitoring and Maintenance

ESCA RP 2018 Annual Natural Resource Report - Appendix E

Date	MRA	Location	Type of Monitoring	Findings	Actions
1/3/2018	IAR	North Range 44	Pre-Rain Event	-Conditions stable. One wattle in place on steepest small-scale excavation slope.	-None
1/4/2018	IAR	South Range 44	Pre/Post-Rain Event	-More water bars are needed to capture seeds and divert water in small-scale excavation areas. -Install erosion blanket as needed.	-Water bars and depressions constructed to capture seeds and slow and divert water flow.
1/12/2018	IAR	South and North Range 44	Post-Rain Event	-Water bars and wattle functioning well.	-Water bars were dug longer and deeper than previously.

ESCA RP at the Former Fort Ord

ESCA RP Erosion Monitoring Form

Conducted By: J. Tallis

MRA: IAR - NR44 + SR44

Monitoring Date: 1/3/2018

Weather: Raining (beginning of several days of forecasted rain

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)		N	only 1 in NR44
Blanket	—		
Silt Fence	—		
Sand Bags	—		

2. Are there signs of water erosion? Y - (N) - N/A (no new erosion)

Rilling - gullying - Loss of fines from surface - Sand/silt deposit in fans/basins

Comment

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?

In SR44 there are steep slopes that are eroding slowly. The surface was roughened with holes that can pond water and water bars to prevent accumulation of water/energy.

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.

ESCA RP Erosion Monitoring Form

Conducted By: J. Tallis

MRA: IAR - SR44

Monitoring Date: 1/4/2018

Weather: Cloudy, 60°F

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	–		
Blanket	–		
Silt Fence	–		
Sand Bags	–		

2. Are there signs of water erosion? (Y) - N - N/A

Rilling - gullying - (Loss of fines from surface) - (Sand/silt deposit in fans/basins)

Comment: Water bars or wattles needed on steep slopes

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

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.

ESCA RP at the Former Fort Ord

ESCA RP Erosion Monitoring Form

Conducted By: J. Tallis

MRA: IAR - R44 N + S

Monitoring Date: 1/12/2018

Weather: Clear 65°F

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	Yes	N	Need more rain to test adequately
Blanket	—		
Silt Fence	—		
Sand Bags	—		
Water Bar	Yes	N	Some repairs were made to improve function but a longer rain event is needed to test water bars.

2. Are there signs of water erosion? Y / (N) - N/A

Rilling - gullying - Loss of fines from surface - Sand/silt deposit in fans/basins

Comment

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,

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.

ESCA RP Erosion Monitoring Form

Conducted By: J. Tallis

MRA: FEG - Grenade Range

Monitoring Date: 1/12/2018

Weather: Clear, 68°F

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	—		
Blanket	Yes	No	
Silt Fence	—		
Sand Bags	Yes	No	
Water Bars	Yes		Water was flowing through the water bars during monitoring

2. Are there signs of water erosion? Y - (N) - N/A

Rilling - gullying - Loss of fines from surface - Sand/silt deposit in fans/basins

Comment

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:

Water is flowing off site through water bars

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 nicely. Some of the Manzanitas are dieing or dieing back. Unclear why.

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.

ESCA RP Erosion Monitoring Form

Conducted By: J. Tallis

MRA: FEG-Grenade Range

Monitoring Date: 2/13/2018

Weather: Partly cloudy, 60's

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	–		
Blanket	–		
Silt Fence	–		
Sand Bags	–		
Water Bar	Yes	No	

2. Are there signs of water erosion? Y - (N) - N/A

Rilling - gullying - Loss of fines from surface - Sand/silt deposit in fans/basins

Comment:

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

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.

ESCA RP at the Former Fort Ord

ESCA RP Erosion Monitoring Form

Conducted By: J. Tallis

MRA: IAR - NR44

Monitoring Date: 3/12/2018

Weather: Raining

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	Yes (in scrapes)	N	
Blanket	—		
Silt Fence	—		
Sand Bags	—		
Water Bars	Yes	N	

2. Are there signs of water erosion? Y - (N) - N/A

Rilling - gullying - Loss of fines from surface - Sand/silt deposit in fans/basins

Comment: There are clear signs of rain but limited soil movement

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

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 – 2018 Erosion Monitoring Photo-documentation

Photograph 1

Future East Garrison (FEG) Munitions Response Area (MRA), Grenade Range

Restored hillside well stabilized by native plant growth from hydroseeding and natural recruitment.

22 June 2018

Photograph 2

FEG MRA, Grenade Range

Manzanita regrowth enhances soil stabilization in the Grenade Range after 2013 munitions investigation activities.

22 June 2018

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