

# FORA ESCA REMEDIATION PROGRAM

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## Appendix A.

### 2016 Habitat Restoration Monitoring Report Interim Action Ranges Munitions Response Area

Former Fort Ord  
Monterey County, California

April 7, 2017

*Prepared for:*

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## ACRONYMS AND ABBREVIATIONS

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

USFWS

United States Fish and Wildlife Service

## 1.0 INTRODUCTION

This Year 4 Habitat Restoration Monitoring Report summarizes the activities conducted by the Fort Ord Reuse Authority (FORA) during the fourth 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 2016 and 31 December 2016; it represents the fourth 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, and 2015 reporting periods (ESCA RP Team 2014, 2015b, and 2016).

All known 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. (WESTON), 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, 2015) 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 Annual Natural Resource Report (ESCA RP Team 2016) indicated that most areas in the Interim Action Ranges MRA had met Year 7 performance targets for vegetation cover, overall species diversity, and HMP shrub species richness, pursuant to the HRP; these areas include all of Range 47 SCA and the areas in North Range 44 SCA subject to vegetation cutting. Areas requiring ongoing vegetation monitoring until performance targets are met include North Range 44 SCA small-scale excavation areas and South Range 44 SCA and Central Area NCAs (vegetation cutting and small-scale excavation areas). 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.

This report summarizes the monitoring activities performed by the ESCA RP Team in 2016, 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 (Army 2002).

## 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.

### **1.3 Report Organization**

This Year 4 Habitat Restoration Monitoring Report is presented in numbered sections, tables, figures, and a photograph appendix. Tables are numbered to correspond with the section in which they are first referenced. Figures and photographs are numbered sequentially. Introductory information for the project, including site description and background information, is presented in Section 1.0. Section 2.0 presents the requirements for restoration associated with the ESCA RP Design Study and Phase II Interim Action activities. The goals, restoration strategies, and success criteria identified in the HRP are summarized in Section 3.0. Section 4.0 provides the methods for quantitative restoration monitoring, followed by Section 5.0, which summarizes routine restoration maintenance, including weed abatement, irrigation system monitoring, erosion control monitoring, and animal deterrent fence monitoring. Section 6.0 presents the quantitative monitoring results that document native plant establishment and monitoring results. Conclusions and recommendations are presented in Section 7.0. References are provided in Section 8.0.

## **2.0 REGULATORY RESTORATION REQUIREMENTS**

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

## 2.1 Habitat Management Plan

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

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

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

- Survey sites before disturbance to estimate restoration potential and establish success criteria (including information on species presence, soil composition, presence of non-native species, slope, aspect, and microhabitats)
- Develop a restoration plan
- Develop feedback mechanisms that allow restoration results to guide the Army’s restoration program
- Collect seed and cuttings from within 0.6 mile (1 kilometer [km]) of the restoration site
- Recontour excavation sites to recreate a natural landscape that grades smoothly into existing topography
- Implement erosion control
- Establish native vegetation and HMP species populations that are equitable with those that were removed



- Monitor re-establishment of vegetation in accordance with the Army’s protocol for vegetation monitoring
- Conduct monitoring to evaluate the success of restoration efforts
- Meet success criteria established to evaluate healthy central maritime chaparral using baseline data from undisturbed central maritime chaparral communities
- Meet success criteria related to vegetative cover and species diversity
- Meet success criteria for Monterey gilia, also known as sand gilia (*Gilia tenuiflora* subsp. *arenaria*), Monterey spineflower (*Chorizanthe pungens* var. *pungens*), and seaside bird’s-beak (*Cordylanthus rigidus* subsp. *littoralis*) including restoration results after five years consistent with self-sustaining populations (in different age stands) of central maritime chaparral, occupying the same amount of habitat and with population sizes comparable to those recorded during the Army’s vegetation survey of the former Fort Ord conducted in 1992 (USACE 1992)
- Prepare annual monitoring reports
- Implement corrective measures if monitoring indicates that success criteria for vegetation or HMP species are not being met, including recontouring, weeding, replanting, reseeding, and improvement of habitat for sand (Monterey) gilia and Monterey spineflower

## 2.2 Biological Opinions

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

Five BOs include requirements for habitat restoration related to ESCA RP Team’s remedial activities. The BO on closure and reuse of Fort Ord (USFWS 1999, p. 21) states that “The Army shall implement all portions of the April 1997 HMP for all predisposal activities undertaken.” The BO on critical habitat of Monterey spineflower (USFWS 2002) contains

restoration-related measures for excavation of soils. The BOs on California tiger salamander and critical habitat for Contra Costa goldfields (*Lasthenia conjugens*; USFWS 2005 and 2007) describe restoration requirements proposed by the Army. The BO on cleanup and property transfer actions (USFWS 2015) contains an updated analysis of the effects of Army cleanup and transfer activities on Contra Costa goldfields, California tiger salamander, Monterey spineflower, Monterey gilia, Smith's blue butterfly, Yadon's piperia (*Piperia yadonii*), and any relevant critical habitat. The 2015 BO 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, and 2015).

- Determine a baseline condition during pre-activity assessment
- Biological surveys for HMP plant species will be conducted using the protocol for conducting vegetation sampling at Fort Ord
- Allow sites to recover naturally or restore sites by planting species consistent with the baseline condition of central maritime chaparral plant species present prior to remediation. If recolonization does not appear likely; erosion and weed control will be implemented
- Conduct monitoring of disturbed populations in accordance with HMP protocols
- Identify plant species and population densities to be re-established at each site, including a monitoring plan and corrective measures if goals are not met
- Create goals to establish native vegetation at each site and to establish populations of any HMP species affected to levels equitable to those observed before the disturbance
- Develop a restoration plan with success criteria and a monitoring plan
- Develop measures to enhance natural regeneration and recolonization of the [excavated] site
- After excavation, fill will be added to the excavated areas or they will be recontoured into the natural landscape and smooth transition to surrounding topography
- Provide soil stabilization measures to prevent erosion
- Conduct invasive weed and erosion control
- Monitor, evaluate, and implement corrective actions annually for five years to determine if success criteria are met
- Report monitoring results to the USFWS annually

### 3.0 HABITAT RESTORATION PLAN

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

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

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

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

#### 3.1 Designated Ground Disturbance Categories Associated with MEC Remedial Activities

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

- North Range 44 (Figure A3; referred to as “Range 44 SCA [North]” in IAR MRA IRACR Volume 1)
- South Range 44: Includes South Range 44 SCA and Central Area NCAs (Figure A3; referred to as “Range 44 SCA [South] and Central Area NCAs” in IAR MRA IRACR Volume 1)

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

Four designated categories of MEC remedial activities correlated with ground-disturbing actions are addressed in the HRP (Table 3-1). 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). Removed vegetation was

stockpiled separately, along with the top 6 to 12 inches (15 to 30 centimeters [cm]) of soil, to preserve the existing seedbank. Stockpiled soils were used to backfill excavated areas within the IAR MRA. 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 3-2 and 3-3 and Year 4 and Year 5 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 2015) 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 3-2)

- Species and vegetation establishment that meet success criteria (Table 3-3)

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 third-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 6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-7, and 6-8)
- 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 6-3 and 6-8)
- Self-sustainability of the community will be assessed by: a) achievement of community equity and b) vegetative development as exhibited by the total percentage live plant cover at the site and in a pattern that is consistent with the anticipated trajectory of central maritime chaparral regeneration (Tables 6-9 to 6-12)
- Minimization of habitat degradation via exotic invasion will be assessed by preventing the total area of the site occupied collectively by populations of pampas grass (*Cortaderia jubata*), iceplant (*Carpobrotus edulis*) and French broom (*Genista monspessulana*) from exceeding a target value (Tables 6-9 to 6-12, 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 3-3 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 3-3). 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 Annual Natural Resource Report (ESCA RP Team 2016) indicated that most ESCA RP restoration areas in the Interim Action Ranges MRA had met Year 7 performance targets for vegetation cover, overall species diversity, and HMP shrub species richness, pursuant to the HRP; these areas include all of Range 47 SCA and the areas in North Range 44 SCA subject to vegetation cutting. All monitoring areas in the IAR MRA met Year 7 performance targets for HMP herbaceous species presence in 2015 and are no longer subject to ongoing monitoring. Performance targets for Activities A and D, container plantings, and HMP herbaceous species were met in 2015 so their methods are no longer described in this section.

Areas requiring vegetation monitoring in 2016 include North Range 44 SCA small-scale excavation areas and South Range 44 SCA and Central Area NCAs (vegetation cutting and small-scale excavation areas), since these areas did not meet Year 7 performance targets in 2015. Monitoring methods vary, depending on the investigation activity. The order of presentation of methods and results is based on Table 3-3, the Plant Species Diversity and Vegetation-based Success Criteria.

### 4.1 Native Plant Species Richness Methods (Activities B and 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 6-1, 6-2, 6-3, and 6-4). 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 6-1. A comprehensive list of species in the

IAR MRA is compiled and updated each year (Table 6-2), HMP species presence in the IAR MRA in Table 6-3, and shrub diversity in Table 6-4.

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 6-5, 6-6, and 6-7. These diversity tables also include information on mean species richness per transect or quadrat, evenness, and summary cover data.

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

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

Where:

$H'$  = Shannon-Wiener Index

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

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

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

Where:

$J'$  = evenness

$H'$  = Shannon-Wiener Index

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

$s$  = total number of species present

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

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

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 3-3).

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 (Activities B and C)**

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.

#### **4.3 Native Vegetation Cover Methods (Activities B and C)**

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

During 2016, aerial cover by shrub and tree species was recorded for all individuals that intercept the 50-m monitoring tape; including overlapping shrub layers, so there may be two or more species recorded in the same location. Herbaceous cover was only recorded in the absence of shrub or tree overstory, as per the 2009 protocol (Burleson 2009a). Cover by herbaceous plants were recorded by species and the percent cover for each species was recorded individually. Bare ground and/or litter was recorded in transect segments devoid of vegetation. Waypoints obtained from a Global Positioning System unit were recorded for

each end of the transect so that the same transect can be revisited in subsequent years. A photograph was taken from one end.

Herbaceous quadrat monitoring is conducted as a component of the vegetation transect monitoring effort if mean shrub cover is relatively low and herbaceous species cover is proportionately high, as is often observed the spring after remediation activities; methods follow Burleson (Burleson 2009a). These supplementary 2.7 square-foot (0.25 m<sup>2</sup>) 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 2015, Year 3 monitoring data revealed that 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). Therefore, monitoring for native vegetation cover was not conducted in Range 47 SCA or in released portions of North Range 44 in 2016.

#### **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.

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.

## **4.4 Target Weed Cover Methods (Activities B and C)**

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

In Range 44 SCA and NCAs, cover by non-native species was recorded during vegetation transects and estimated visually during monitoring events.

## **5.0 RESTORATION MAINTENANCE AND MONITORING**

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

Ongoing erosion control BMP maintenance in 2016 was required in Range 47 SCA where a 100-foot length of silt fence on the east side of Range 47 SCA was degrading. The silt fence was replaced on 7 January 2016 (Figure A6). Erosion control BMPs were installed after infrastructure removal as described in the following paragraphs.

All non-biodegradable infrastructure (e.g., PVC piping, valves, sprinklers, fencing) associated with the Range 47 Habitat Restoration Area was removed between 28 November and 16 December 2016. The infrastructure removal included the above- and below-ground animal

deterrent fencing and the irrigation system. The animal deterrent system included an 8-foot tall deer fence and rodent wire extending two feet above and below ground. The irrigation system covered much of the 14-acre restoration area and included a pump house and a mile of 4-inch HDPE pipe running north through the IAR MRA and a portion of Parker Flats MRA to a Marina Coast Water district tank. The HDPE pipe had been installed aboveground and along existing roads, therefore removal had virtually no impact on the surrounding habitat.

A qualified biologist was onsite to monitor the infrastructure removal to minimize and avoid impacts to HMP species and other native species during the field activities. All excavations were backfilled and uprooted plants were replanted whenever possible. All pipes in Range 47 SCA were cut and carried out by hand. All materials in Range 47 SCA were loaded into dumpsters and landfilled in the Marina landfill (Monterey Regional Waste Management) to prevent the potential spread of soil pathogens, such *Phytophthora tentaculata*, as directed by Hannah A. Wallis from the Monterey County Agricultural Commissioner's Office. Field boots, tools, and heavy equipment will be cleaned as crew enter and depart Range 47 SCA to prevent the spread of soil pathogens.

The only heavy equipment used on site was operated from the fence line where plantings were not installed in 2013 because of the need for perimeter access. Erosion control BMPs were re-installed to address potential erosion problems caused by the infrastructure removal activities. This involved sterile straw wattle and erosion control blanket installed where the fence and associated silt fence were located on the low (north) side of Range 47 SCA.

All photo points were monitored after infrastructure removal was completed. A subset of these photos are included in the photo-documentation (Attachment A).

## 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 6-1 to 6-13, and in Figures A7-A15.

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

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. Monitoring efforts in 2016 focused on only those areas and activities that had not yet met Year 7 performance targets -- South Range 44 Activity B monitoring areas and all 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 6-1. Observed species in the IAR MRA NCAs and SCAs are summarized in Table 6-2. HMP species presence by activity type is presented in Table 6-3, and native shrub species richness by activity type is summarized in Table 6-4. Comparisons



of species richness along baseline and post-activity transects in the IAR MRA for different locations and vegetation types are provided in Tables 6-5, 6-6, and 6-7. These tables also include number of HMP plant species, species by growth habit (tree, shrub, herbaceous species, ferns), the Shannon diversity index, as well as cover results for comparison purposes. Figure A7 compares species richness by activity type and year between 2010 and 2016, and Figure A8 presents the number of HMP species present by activity type and year between 2010 and 2016. 2016 cover and frequency data in sampled locations are summarized in Tables 6-8 to 6-12. Status of areas and activity types relative to performance targets is summarized in Table 6-13.

## 6.1 Native Plant Species Richness Results

The performance category for total native species richness applies to **Activity B** and **Activity C**, 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 3-3). In addition, total species richness (including native and non-native species) for grassland vegetation subject to **Activity C** is also included in Table 3-3. 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 B** detail the minimum proportion required to achieve success (starting with 5 species present in Year 1 [25% of 20], with a maximum of 14 species in Year 7 [70% of 20]). 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 B** and **Activity C**, based on combined observations from baseline and post-activity areas in North Range 44 and South Range 44 (Table 3-3). 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).

### 6.1.1 Vegetation-Cut Areas (Activity B) in South Range 44

A total of 100 native species were documented in the entire Range 44 and Range 47 Subarea C area prior to munition investigation activities, including 22 shrub species (Table 6-1 and 6-2, Figure A7). Subsequent to vegetation cutting and target-specific investigation activities in Year 1 (2013), the total number of species in these areas dropped to 79 and the number of shrub and subshrub species dropped to 17 in Year 1, primarily as a result of removal of obligate seeding species and species with fleshy fruits.

In South Range 44, total native species recorded in baseline transects was 15 and the total native species in Year 5 after vegetation cutting was 43; the number of shrub species decreased slightly from 14 (baseline) to 13 (Year 5) and herbaceous species richness

increased from 1 to 30 during the same time interval (Table 6-5, Figure A7). A total of 62 species was observed within the one-meter belt along the transect in 2016 (the “surrounding species”), including one tree species, 16 shrub species, and 45 herbaceous species.

The Shannon index reflects species composition and relative abundance of each species based on transect cover values in central maritime chaparral; a higher Shannon index value reflects not just species diversity but the proportion that each species contributes to the entire sample. In the 2016 sampling effort, the Shannon index values do not incorporate the diversity of species observed within one meter of transects (since cover values were not recorded for species off the immediate transect line).

In the IAR MRA, the Shannon index variously dipped after vegetation cutting in locations. In South Range 44, the baseline Shannon index value was 1.8, and it fell to 1.4 in Year 1, where it remained in Years 3, 4, and 5 (Table 6-5).

South Range 44 had relatively low evenness values around 0.2 in baseline and post-activity data; a value of 1 represents complete evenness, or codominance by all species.

**Performance summary:** In 2016, the total native species present after vegetation cutting activities in South Range 44 was 62, including 16 shrub and subshrub species, which is more than 400% higher than the baseline of 15 species and higher than the Years 4 through 7 performance targets for all years (Tables 3-3, 6-5, and 6-13).

A total of six HMP species were documented in portions of Range 44 prior to vegetation cutting: 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 after vegetation cutting, a seventh was added to the list in North Range 44, coast wallflower (*Erysimum ammophilum*). All seven of these species were observed in 2016 (Tables 6-3, 6-6, Figure A8).

Three HMP shrub species were documented in Range 44 both before and after vegetation cutting, either due to resprouting or seedling germination: sandmat manzanita, Eastwood’s ericameria, and Monterey ceanothus (seedlings and juveniles).

**Performance summary:** The presence of all three HMP shrubs in Range 44 in 2016 (3 out of 3 or 100%) is higher than the Years 3 through 7 performance targets for HMP shrub species richness for areas subject to vegetation cutting (Tables 3-3 and 6-13).

### 6.1.2 Small-scale Excavation Areas (Activity C) in Range 44 SCAs and NCAs

**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 6-1, 6-2, and 6-4, 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 2016, a total of 68 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 6-1).

In North Range 44 SCA, total native species recorded in baseline transects was 15 and the total native species in Year 4 after small-scale excavation activities was 47; the number of shrub species equaled 11 and the number of herbaceous species, 35. A total of 60 species was observed within the one-meter belt along the transect in 2016, including one tree species, 15 shrub species, 43 herbaceous species, and one fern species (Table 6-6).

In South Range 44 SCA and Central Area NCAs, total native species recorded in baseline transects was 15, which increased to 39 in Year 5 after small-scale excavation activities. The number of shrub species dropped from 14 to 8, although it increased to 14 within the one-meter belt, as described below. Herbaceous species richness increased from 1 to 31 between baseline and Year 5 (Table 6-5). A total of 52 species were observed within the one-meter belt along the transects, including 14 shrub species, and 38 herbaceous species.

**Performance summary:** The total native species richness of 52 to 60 species present after small-scale excavation activities in 2016, including 25 shrub and subshrub species, is higher than the Years 3 through 7 performance targets for total native species richness (Tables 3-3 and 6-13).

A total of six HMP species were documented in portions of Range 44 prior to small-scale excavation: sandmat manzanita, Eastwood's ericameria, Monterey ceanothus, Monterey spineflower, sand (Monterey) gilia, and seaside bird's-beak. In 2013, coast wallflower appeared in small-scale excavation areas, in addition to areas subject to vegetation cutting. All seven of these species were observed in 2016 (Tables 6-3 and 6-6).

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 6-3).

**Performance summary:** The presence of all three HMP shrub species in 2016 (3 out of 3 or 100%) is higher than the Year 7 performance target for HMP shrub species richness (66%) for areas subject to small-scale excavation (Tables 3-3, 6-4, and 6-13).

**Grassland:** A small grassland area in South Range 44 SCA (Figure A2) supported 18 total species and six native species prior to munitions investigation activities during baseline monitoring and 20 native species and 11 non-native species in 2016, indicating a marked increase in native species richness over time (Table 6-7 and Figure A7).

**Performance summary:** Total species richness exceeds the Years 4 through 7 performance targets for this grassland area (Tables 3-3 and 6-13).

## 6.2 HMP Shrub Species Frequency Results in Vegetation-Cut Areas (Activity B) in South Range 44 SCA and Central Area NCAs

HMP shrub species frequency data were gathered during vegetation transect sampling. Frequency is a measure of evenness of a given species distribution, that is, how frequently a given species occurs in samples across a site. Performance targets for HMP shrub species frequency are included in the HRP for Activities B and D, with current data for Activity B shown in Table 6-8; the performance category for HMP shrub species frequency applies to areas subject to vegetation cutting, based on transect data from baseline and post-activity areas in North Range 44 and South Range 44 (Table 3-3).

HMP shrub species frequency is calculated based on the number of transects in which a given HMP species appears divided by the total transects.

Performance targets by year for **Activity B** detail the minimum proportion required to achieve success (starting with 0% HMP shrub species frequency in Year 1, with a maximum of 20% average HMP shrub species frequency in Year 7). This metric focuses on absolute HMP shrub frequency results.

All three HMP shrub species found in the IAR MRA (sandmat manzanita, Monterey ceanothus, and Eastwood's ericameria) were present after vegetation cutting and associated investigation activities in 2016 (Table 6-8). Only areas subject to vegetation cutting in South Range 44 SCA and Central Area NCAs were sampled in 2016, since vegetation-cut areas in North Range 44 met all performance metrics in 2015.

In 2016, sandmat manzanita had a frequency of 100% in South Range 44 SCA and Central Area NCAs Year 5 transects, which was greater than baseline frequency. Monterey ceanothus frequency was 57.1%, lower than baseline. Eastwood's ericameria was present in fewer transects, 14.3% in South Range 44 SCA and Central Area NCAs Year 5 transects, the same as in baseline data (Tables 6-8 and 6-9; Figures A9 and A10).

**Performance summary:** For Activity B in South Range 44 in 2016, the mean combined HMP shrub frequency in transects was 92.3%, which exceeds performance targets for Years 5 through 7, and individual HMP shrubs also exceed performance standards.

### **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**

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 2016 post-activity sampling data are summarized in this section based on two activity types: vegetation cutting and target-specific investigations and small-scale excavations. During 2016, a total of 20 transects were monitored in the IAR MRA (Figure A2).

#### **6.5.1 Vegetation-Cut Areas (Activity B) in South Range 44**

Dominance is shared by two stump-sprouting common shrubs and several obligate-seeding regional endemic shrubs in the IAR MRA; the latter category includes HMP shrubs as well as species restricted to the Central Coast region such as dwarf ceanothus. The four shrubs with the greatest cover were in baseline transects in the IAR MRA include: shaggy-barked manzanita (29.3% average cover), dwarf ceanothus (20.2% cover), Monterey ceanothus (13.5% cover), and chamise (9.0 % average cover), all of which had frequencies of 90% or greater (Table 6-9, Figures A9 and A10); mean total shrub and subshrub cover was 94.5%.

When baseline transect data are segregated by site, different localized patterns emerge. South Range 44 has the lowest combined mean baseline cover of shaggy-barked manzanita and chamise (25.8%), compared with North Range 44 (37.8%) and Range 47 Subarea C (44.8%). Dwarf ceanothus is an important associated species in all three areas: South Range 44 (30.4%), North Range 44 (23.4%), and Range 47 Subarea C (13.7%). Monterey ceanothus has similar cover (16%) in South Range 44, but lower cover in North Range 44 (9.4%).

All post-activity vegetation monitoring transects showed a decline in native shrub cover immediately after vegetation cutting, with a fairly rapid rise in cover two to three years after munitions investigation activities were complete (Figures A9 and A11). Mean native shrub cover was 33.8% in Year 4 post-activity transects in South Range 44, which increased to 51.3% in Year 5 transects in 2016. Total mean native cover in South Range 44 Year 5 post-activity transects in areas subject to vegetation cutting was 57.5%.

Since the greatest initial cover in post-activity transects is initially provided by stump-sprouting dominants such as shaggy-barked manzanita and chamise, a comparison of baseline and post-activity data for those two species by site points to a pattern of strong vegetation recovery, with combined Year 5 mean cover of these two species equaling 70% of baseline cover in South Range 44. These two species are found in every transect (100% frequency) in South Range 44 (Table 6-9).

Obligate-seeding species with cover exceeding 4% include black sage (4.7%), sandmat manzanita (6.3%), and rush-rose (9.1%) in South Range 44. Obligate-seeding HMP species also exhibit high frequencies in post-activity data (Figures A10). In South Range 44, sandmat manzanita are documented in 100% of South Range 44 transects, and Eastwood's ericameria occurred in 14.3% of South Range 44 baseline transects, the same frequency as in baseline transects. Monterey ceanothus was found in 57.1% of Year 5 transects in South Range 44.

Other more widespread obligate-seeding shrubs ranged in frequency from 85.7% (black sage, deerweed) to 71.4% (golden yarrow), 57.1% (rush-rose), or lower. Resprouting by burl-forming shrubs, combined with establishment of obligate-seeding species and pioneering subshrubs such as deerweed and rush-rose, suggests that IAR MRA sites are on a recovery trajectory that will mirror the species composition and diversity present under pre-activity conditions.

Native herbaceous cover in transects totaled 6.2% in Year 5 transects in South Range 44, almost double the herbaceous cover in Year 4 (3.3%).

Native plant species richness increased after vegetation cutting in the IAR MRA (Table 6-9, Figure A7). In South Range 44, total native species recorded in baseline transects was 15 and 43 in Year 5, with 13 shrub species and 30 herbaceous species. A total of 62 species were observed within the one-meter belt along the transects, including one tree species, 16 shrub species, and 45 herbaceous species.

**Performance summary:** Native vegetation cover in South Range 44 in areas subject to vegetation cutting was 57.5% in Year 5, which meets the Year 7 performance target.

### 6.5.2 Small-scale Excavation Areas (Activity C) in Range 44

Because all above-ground and below-ground vegetation parts are removed during this process, 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.

North Range 44: Year 4 (2016) mean native vegetation cover in small-scale excavated areas was 23.8%, more than double the mean cover in 2015, with 12.5% mean native shrub and tree cover and 11.3% mean native herbaceous cover (Table 6-10, Figure A11). The greatest mean cover in 2016 North Range 44 transects in small-scale excavation areas was provided by deerweed (4.4%), rush-rose (2.7%), and sandmat manzanita (2%). Several shrubs exhibit

widespread establishment with greater than 50% frequency, including the HMP shrub, sandmat manzanita (87.5%); Monterey ceanothus exhibited 37.5% mean frequency. Rush-rose, golden yarrow, and deerweed all had 75% mean frequency, with dwarf ceanothus at 62.5% and shaggy-barked manzanita at 50% mean frequency (Table 6-10 and Figure A12). Native cover values continue to increase quickly through time as the newly recruited seedlings enlarge in size.

Non-native species cover was 1.8%, primarily comprised of filaree species, tocalote, smooth cat's ears, and rattail fescue. No target weeds were present in these transects.

**South Range 44:** Year 5 (2016) transects in South Range 44 supports a total of 18.6% mean native cover, with 14.0% native shrub and subshrub cover and 4.6% herbaceous cover (Table 6-11, Figure A13). Deerweed continues to have the greatest cover of any species (5.9%), and rush-rose, golden-yarrow, the HMP shrub, sandmat manzanita all have cover ranging from 1.9% to 2.4%. Shrubs that occurred in more than 50% of small-scale excavation transects include rush-rose (100% frequency), golden yarrow (100% frequency), deerweed (80% frequency), sandmat manzanita (80% frequency), and dwarf ceanothus and black sage, both with 60% mean frequency (Figure A14). Mean cover increased in the exposed small-scale excavation areas in South Range 44 in 2016, from 14.8% to 18.6%.

Non-native species cover was 1.5%, with no weed species with 1% or more cover. No target weeds were present in these transects.

**Grassland:** 2010 baseline herbaceous vegetation cover in grassland vegetation in a small area (0.13 acre) in South Range 44 averaged 44.3% in six herbaceous quadrats, with 19% native vegetative cover and 25.3% non-native vegetative cover (Table 6-12). The HMP annual Monterey spineflower averaged 4.7% cover. Six native species were recorded during baseline sampling.

In post-activity Year 5 (2016) transects, total average vegetative cover in six herbaceous quadrats was 29.7%, with 20.2% native cover and 9.5% non-native cover. Mean native cover in 2016 was comprised primarily of sky lupine (*Lupinus nanus*, 6.8%), tidy tips (*Layia platyglossa*, 6.0%), common lessingia (*Lessingia pectinata* var. *pectinata*, 2.2%), and California poppy (*Eschscholzia californica*, 1.3%), see Figure A15. Mean cover by the HMP annual, Monterey spineflower, was 0.9% and it was found in two-thirds of the quadrats. Of the 9.5% non-native species cover in Year 5, 5.3% cover consisted of ripgut brome (*Bromus diandrus*), 1.8% of slender wild oat (*Avena barbata*), and less than 1% of redstem filaree (*Erodium cicutarium*), smooth cat's ears (*Hypochaeris glabra*), and others.

**Performance summary:** Native vegetation cover (23.8%) for small-scale excavation areas in Year 4 in North Range 44 is higher than the Year 4 performance target of 20% and almost meets the Year 5 target of 25% (Tables 3-3 and 6-13).

Native vegetation cover in Year 5 transects in South Range 44 in central maritime chaparral areas subject to small-scale excavation was 18.6%, which is below the Year 5 performance target of 25%.

Native vegetation cover in South Range 44 in grassland areas subject to small-scale excavation was 20.2%, which is below the Year 5 performance target of 30% and the Year 7 performance target of 40%. However, native vegetation cover in 2016 quadrats is slightly more than native vegetation cover recorded in baseline grassland quadrats, suggesting complete recovery of the native vegetation in these areas. Furthermore, native species diversity, based on quadrat data only, rose from 6 native species in baseline transects to 20 native species in Year 5 quadrats. These data suggest an error was made in selecting a 40% native cover target for a small grassland area dominated by non-native grasses, which supported 19% native cover prior to munitions response activities during baseline sampling; a more appropriate performance target would be for post-activity native cover to be equal to or exceed baseline native cover in this small weedy grassland area.

### 6.5.3 Vegetation Monitoring Discussion

Central maritime chaparral is the dominant vegetation type in the IAR MRA. 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). A number of central maritime chaparral shrubs, such as shaggy-barked manzanita, and chamise, have 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.

These differences are consistently reflected in monitoring data. Central maritime chaparral subject to vegetation cutting met the Year 7 performance targets in Range 47 SCA and North Range 44 in 2015; the remaining vegetation-cut monitoring area in South Range 44 met the Year 7 performance target in 2016. In contrast, monitoring areas subject to small-scale excavation have been slower to recover, especially with the prolonged drought contributing to poor seed germination and seedling mortality.



Post-activity data in areas subject to vegetation cutting show a resurgence of dominance by stump-sprouting manzanita and chamise individuals, with 25% or greater cover, and gradual recolonization by obligate-seeding shrubs within a few years (Figures A7 and A10). Subshrubs such as the nitrogen-fixing deerweed are common immediately after vegetation cutting in some areas, along with rush-rose, which also tolerates disturbance of various types. Vegetation cover generally increases rapidly in the first few years following vegetation cutting, and as obligate-seeding shrubs germinate and enlarge, the mix of species becomes more diverse over time.

In contrast, native vegetation recovery after excavation is dependent on either the existing seedbank in topsoil, if topsoil has been salvaged and replaced, or on gradual colonization of the bare excavated areas by means of seed dispersal into the excavated area over time and the contributions of any remaining seedbank. Often, small-scale excavation areas exhibit higher cover and diversity at the immediate edge of the excavation and lower diversity in the center. Although recovery is generally slower than in vegetation-cut areas, the presence and cover of central maritime chaparral dominant species is expected to increase over time.

In grassland areas, native vegetation has completely recovered to baseline conditions, based on equal cover (19% native cover in baseline quadrats and 20.2% native cover in Year 5 quadrats), and native species diversity has more than tripled. Although native vegetation in small-scale excavation areas do not reach the Year 7 performance target of 40% absolute cover, the vegetation has reached 100% relative cover when comparing the baseline and Year 5 data. These data suggest an error was made in selecting a 40% native cover target for a small grassland that is dominated by non-native grasses and had 19% native cover prior to munitions response activities.-.

## 6.6 Target Weed Cover Results

Target weed cover for all activity types is at or below 1%, based on vegetation sampling in 2016 (Tables 6-9 to 6-11). Weed monitoring and removal activities are summarized in Appendix D in the main report.

## 7.0 CONCLUSIONS AND RECOMMENDATIONS

Munitions investigation activities in the IAR MRA were completed in early 2013. Biological monitoring in 2016 included completion of 20 vegetation transects and 6 HMP herbaceous species plots; these monitoring events and associated data provide the ESCA RP Team with valuable information to guide in site management.

Vegetation cover and species diversity data indicate 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 diversity, and number of individual HMP herbaceous species; and ongoing weed and erosion control management activities promote habitat recovery after munitions investigation activities.

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

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

In Range 44, all areas have reached all performance targets for species richness, HMP shrub species, and HMP herbaceous species presence in all areas. Vegetation cover in all locations in the IAR MRA met the Year 7 performance target for areas subject to vegetation-cutting in 2015 and 2016. Areas supporting central maritime chaparral vegetation and subject to small-scale excavation show considerable recruitment, based on frequency data, but will require additional years to reach vegetation cover performance targets.

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

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

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

Year 5 and 6 quantitative surveys will begin in selected areas in spring 2017 that have not yet reached Year 7 performance targets in order to satisfy conditions set forth in the HRP. The following tasks will be performed in 2017 to complete mitigation efforts:

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

- Vegetation transects in North Range 44 small-scale excavation areas until performance targets are met
- Vegetation transects in South Range 44 small-scale excavation areas until performance targets are met
- Conduct weed control program for target weeds, as needed; since cover by target weeds was at or less than 1% in 2016, weed control in 2017 will be conducted in areas of IAR, FEG, and Parker Flats 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 2017 annual monitoring report.

- Herbaceous quadrats, if needed (for transects where shrub cover is low and herbaceous cover is high – see Section 4.5)
- Species diversity documentation
- Grassland monitoring will continue pending agency review and concurrence that success criteria have been met (% native cover equals or exceeds baseline cover, vs. % native cover equals 40%, which is twice the native cover documented under baseline conditions)
- Submit annual monitoring report

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

ESCA RP 2016 Annual Natural Resource Report – Appendix A

<b>Activity Type</b>	<b>Activity Category</b>	<b>Anticipated Investigation Area (acres)</b>	<b>Completed Investigation Area (acres)</b>	<b>Restoration Strategy</b>	<b>Planned Actions</b>
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
<b>Totals</b>		<b>34.1</b>	<b>28.8</b>		

**Table 3-2  
Soil and Topography Remediation Success Criteria**

ESCA RP 2016 Annual Natural Resource Report – Appendix A

<b>Restoration Strategy</b>	<b>Success Criteria</b>	<b>Evaluation Method/Procedure</b>	<b>Monitoring Frequency</b>
Soil decompaction on trails and roads	Match soil texture and structure to that of nearby native soils	Linear measurements via GIS of trails and roads requiring restoration	At end of construction activities prior to restoration
		Comparison of samples every 0.25 mile with nearby native soils	After completion of de-compaction efforts
Remove constructed berm in Range 47 and restore to pre-existing conditions	Match original topography as closely as possible	Comparison with 1964 aerial image for reference	At end of construction activities prior to remediation
		Ground-level photographic imagery before and after remediation	After completion of re-contouring
Topsoil and subsoil placement in Range 47 Subarea A	6-inch topsoil improvement on 80% of exposed dune hill in Range 47 Subarea A	Comparison with 1964 aerial image for reference	At end of construction activities prior to remediation
		Volume calculations	During re- contouring
		Document soil placement in specified manner	During re- contouring
		Ground-level photographic imagery before and after remediation	After completion of re-contouring



**Table 3-3  
Plant Species Diversity and Vegetation-Based Success Criteria**

ESCA RP 2016 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	<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 <sup>1</sup>	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	2012 baseline monitoring plots
								Monterey spineflower presence	% focus species baseline	100	70	60	50	30	20	10	
								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 3-3  
Plant Species Diversity and Vegetation-Based Success Criteria**

ESCA RP 2016 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-wide baseline	0	0	33	33	33	66	66	2012 baseline monitoring plots
				Monterey spineflower presence	% focus species baseline	100	70	60	50	30	20	10	
				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 6-1  
Total Native Species Richness by Activity Type**

ESCA RP 2016 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 <sup>2</sup>
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
	Grassland grid cell in South Range 44 SCA		18	20	28	28	20
Large-scale soil excavation (Activity D)	Range 47 Subarea A (low recruitment area)	Passive (seeding)	25 <sup>1</sup>	47	41	41	--
	Range 47 Subarea B	Active (container planting and seeding)	25 <sup>1</sup>	115	115	115	--

<sup>1</sup> Only limited field surveys allowed in Range 47 prior to munitions investigations activities

<sup>2</sup> Areas that met or exceeded performance criteria targets in 2015 were not sampled in 2016

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

ESCA RP 2016 Annual Natural Resource Report – Appendix A

<i>Scientific Name</i>	<i>Common Name</i>	<i>HMP species</i>	<i>CNPS Rare Plant Rank</i>	<i>Cal-IPC Invasiveness Status</i>	<i>Interim Action Ranges MRA - Range 44</i>	<i>Interim Action Ranges MRA - Range 44 Grassland</i>
<b>Trees</b>						
<i>Arbutus menziesii</i>	Pacific madrone					
<i>Hesperocyparis macrocarpa</i>	Monterey cypress		1B.2			
<i>Pinus radiata</i>	Monterey pine		1B.1			
<i>Populus trichocarpa</i>	black cottonwood					
<i>Quercus agrifolia</i>	coast live oak				x	
<i>Salix lasiolepis</i>	arroyo willow				x	
<b>Shrubs and Subshrubs</b>						
<i>Acmispon glaber</i>	deerweed				x	
<i>Adenostoma fasciculatum</i>	chamise				x	
<i>Arctostaphylos pumila</i>	sandmat manzanita	HMP	1B.2		x	
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita				x	
<i>Artemisia californica</i>	California sagebrush				x	
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote bush, coyote brush				x	
<i>Ceanothus dentatus</i>	dwarf ceanothus				x	
<i>Ceanothus rigidus</i>	Monterey ceanothus	HMP	4.2		x	
<i>Crocanthemum scoparium</i>	rush-rose				x	
<i>Ericameria ericoides</i>	dune-heather, mock-heather				x	
<i>Ericameria fasciculata</i>	Eastwood's ericameria	HMP	1B.1		x	
<i>Eriophyllum confertiflorum</i>	golden yarrow				x	
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry				x	
<i>Garrya elliptica</i>	coast silk-tassel				x	
<i>Heteromeles arbutifolia</i>	toyon				x	
<i>Lepechinia calycina</i>	pitcher sage				x	
<i>Lupinus arboreus</i>	coastal bush lupine				x	
<i>Lupinus chamissonis</i>	silver bush lupine				x	x
<i>Mimulus aurantiacus</i>	bush monkeyflower				x	
<i>Ribes malvaceum</i>	chaparral currant				x	
<i>Ribes speciosum</i>	fuchsia-flowered gooseberry				x	
<i>Salvia mellifera</i>	black sage				x	
<i>Solanum umbelliferum</i>	blue witch nightshade				x	
<i>Symphoricarpos mollis</i>	creeping snowberry				x	
<i>Toxicodendron diversilobum</i>	<i>poison-oak</i>				x	

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

ESCA RP 2016 Annual Natural Resource Report – Appendix A

<i>Scientific Name</i>	<i>Common Name</i>	<i>HMP species</i>	<i>CNPS Rare Plant Rank</i>	<i>Cal-IPC Invasiveness Status</i>	<i>Interim Action Ranges MRA - Range 44</i>	<i>Interim Action Ranges MRA - Range 44 Grassland</i>
<b>Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)</b>						
<i>Achillea millefolium</i>	common yarrow				x	
<i>Acmispon heermannii</i> var. <i>orbicularis</i>	wooly lotus				x	x
<i>Acmispon strigosus</i>	Bishop's lotus				x	
<i>Aira caryophyllea</i>	common silver-hair grass				x	x
<i>Amblyopappus pusillus</i>	amblyopappus				x	
<i>Amsinckia intermedia</i>	common fiddleneck				x	x
<i>Anagallis arvensis</i>	scarlet pimpernel				x	
<i>Antirrhinum majus</i>	snapdragon					
<i>Apiastrum angustifolium</i>	wild celery				x	
<i>Armeria maritima</i> subsp. <i>californica</i>	California sea-pink, sea thrift				x	
<i>Artemisia douglasiana</i>	mugwort					
<i>Avena barbata</i>	slender wild oat				x	x
<i>Avena fatua</i>	wild oat					
<i>Briza maxima</i>	rattlensnake grass					
<i>Bromus diandrus</i>	ripgut brome				x	x
<i>Bromus hordeaceus</i>	soft chess				x	x
<i>Bromus madritensis</i> subsp. <i>rubens</i>	red brome			high	x	
<i>Calandrinia ciliata</i>	red maids				x	
<i>Calochortus albus</i> var. <i>albus</i>	fairy lanterns, globe lily				x	
<i>Calyptridium monandrum</i>	pussy paws				x	
<i>Calystegia subacaulis</i>	hill morning-glory				x	
<i>Camissonia contorta</i>	contorted suncups				x	x
<i>Camissoniopsis cheiranthifolia</i> subsp. <i>cheiranthifolia</i>	beach primrose					
<i>Camissoniopsis micrantha</i>	small suncups				x	
<i>Cardionema ramosissimum</i>	sand mat				x	
<i>Carex globosa</i>	round-fruited sedge				x	
<i>Carpobrotus edulis</i>	hottentot fig/ice plant			high	x	
<i>Castilleja exserta</i> subsp. <i>latifolia</i>	wideleaf purple owl's clover				x	x
<i>Caulanthus lasiophyllus</i>	California mustard				x	
<i>Centaurea melitensis</i>	tocalote			mod	x	x

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

ESCA RP 2016 Annual Natural Resource Report – Appendix A

<i>Scientific Name</i>	<i>Common Name</i>	<i>HMP species</i>	<i>CNPS Rare Plant Rank</i>	<i>Cal-IPC Invasiveness Status</i>	<i>Interim Action Ranges MRA - Range 44</i>	<i>Interim Action Ranges MRA - Range 44 Grassland</i>
<b>Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)</b>						
<i>Chenopodium californicum</i>	California goosefoot					
<i>Chorizanthe diffusa</i>	diffuse chorizanth				x	
<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	HMP	1B.2		x	x
<i>Cirsium occidentale</i> var. <i>occidentale</i>	cobweb thistle				x	x
<i>Cirsium vulgare</i>	bull thistle			mod		
<i>Clarkia amoena</i>	farewell-to-spring					
<i>Claytonia perfoliata</i>	miner's lettuce				x	
<i>Collinsia heterophylla</i>	Chinese houses					
<i>Cordylanthus rigidus</i> subsp. <i>littoralis</i>	seaside bird's-beak	HMP	1B.1		x	
<i>Corethrogyne filaginifolia</i>	California aster				x	
<i>Cortaderia jubata</i>	pampas grass, jubata grass			high	x	
<i>Crassula connata</i>	pygmy weed				x	
<i>Croton californicus</i>	California croton				x	x
<i>Cryptantha clevelandii</i> var. <i>florosa</i>	coastal cryptantha				x	x
<i>Cryptantha micromeres</i>	small-flowered cryptantha				x	x
<i>Cryptantha microstachys</i>	Tejon cryptantha					
<i>Daucus pusillus</i>	rattlesnake weed				x	
<i>Deinandra increscens</i> subsp. <i>increscens</i>	coast tarplant				x	x
<i>Dichelostemma capitatum</i>	blue dicks, wild hyacinth				x	x
<i>Drymocallis glandulosa</i> var. <i>glandulosa</i>	sticky cinquefoil				x	
<i>Elymus glaucus</i> subsp. <i>glaucus</i>	western wild-rye				x	
<i>Epilobium brachycarpus</i>	tall annual willowherb					
<i>Epilobium canum</i>	California-fuchsia					
<i>Epilobium ciliatum</i> var. <i>ciliatum</i>	northern willowherb					
<i>Eriastrum virgatum</i>	wand woollystar		4.3		x	x
<i>Erigeron bonariensis</i>	flax-leaved fleabane					
<i>Erigeron canadensis</i>	horseweed				x	x
<i>Erigeron foliosus</i> var. <i>foliosus</i>	leafy daisy				x	
<i>Erigeron sumatrensis</i>	tropical horseweed					

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

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<i>Scientific Name</i>	<i>Common Name</i>	<i>HMP species</i>	<i>CNPS Rare Plant Rank</i>	<i>Cal-IPC Invasiveness Status</i>	<i>Interim Action Ranges MRA - Range 44</i>	<i>Interim Action Ranges MRA - Range 44 Grassland</i>
<b>Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)</b>						
<i>Erodium botrys</i>	long-beaked filaree				x	x
<i>Erodium cicutarium</i>	red-stemmed filaree			lim	x	x
<b><i>Erysimum amophilum</i></b>	<b>coast wallflower</b>	HMP	1B.2		x	
<b><i>Eschscholzia californica</i></b>	<b>California poppy</b>				x	x
<i>Euphorbia peplus</i>	petty spurge					
<b><i>Festuca microstachya</i></b>	<b>small fescue</b>				x	
<i>Festuca myuros</i>	rattail fescue			mod	x	x
<b><i>Festuca octoflora</i></b>	<b>six-weeks fescue</b>				x	x
<b><i>Fritillaria affinis</i></b>	<b>checker lily, Mission bells</b>				x	
<b><i>Galium californicum</i></b>	<b>California bedstraw</b>				x	
<b><i>Galium porrigens</i> var. <i>porrigens</i></b>	<b>climbing bedstraw</b>				x	
<b><i>Gamochaeta ustulata</i></b>	<b>purple cudweed</b>				x	
<b><i>Gilia capitata</i> subsp. <i>abrotanifolia</i></b>	<b>ball gilia</b>					
<b><i>Gilia capitata</i> subsp. <i>capitata</i></b>	<b>ball gilia</b>					
<b><i>Gilia tenuiflora</i> subsp. <i>arenaria</i></b>	<b>Monterey gilia</b>	HMP	1B.2		x	
<b><i>Gilia tricolor</i></b>	<b>bird's eyes gilia</b>					
<i>Helminthotheca echioides</i>	bristly ox-tongue			lim		
<i>Hemiaria hirsuta</i> subsp. <i>cinerea</i>	hairy rupturewort					
<b><i>Heterotheca grandifolia</i></b>	<b>telegraph weed</b>				x	x
<b><i>Hordeum brachyantherum</i> subsp. <i>brachyantherum</i></b>	<b>meadow barley</b>					
<b><i>Horkelia cuneata</i> var. <i>cuneata</i></b>	<b>coast horkelia, wedge-leaved horkelia</b>				x	x
<i>Hypochaeris glabra</i>	smooth cat's ears			lim	x	x
<i>Hypochaeris radicata</i>	cat's ears			mod	x	
<b><i>Juncus effusus</i> var. <i>pacificus</i></b>	<b>bog rush</b>					
<b><i>Koeleria macrantha</i></b>	<b>June grass</b>				x	
<b><i>Lepidium nitidum</i></b>	<b>common peppergress</b>					
<b><i>Leptochloa fusca</i> subsp. <i>fascicularis</i></b>	<b>bearded sprangletop</b>					
<b><i>Lessingia pectinata</i> var. <i>pectinata</i></b>	<b>common lessingia</b>				x	x
<b><i>Leptosiphon parviflorus</i></b>	<b>common linanthus</b>					
<i>Logfia [Filago] gallica</i>	narrow-leaved filago				x	
<b><i>Logfia filaginoides [Filago californica]</i></b>	<b>California filago</b>				x	
<b><i>Lomatium parvifolium</i></b>	<b>coastal biscuitroot</b>		4.2		x	

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

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<i>Scientific Name</i>	<i>Common Name</i>	<i>HMP species</i>	<i>CNPS Rare Plant Rank</i>	<i>Cal-IPC Invasiveness Status</i>	<i>Interim Action Ranges MRA - Range 44</i>	<i>Interim Action Ranges MRA - Range 44 Grassland</i>
<b>Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)</b>						
<i>Lupinus bicolor</i>	miniature lupine					x
<i>Lupinus concinnus</i>	elegant lupine					
<i>Lupinus nanus</i>	sky lupine				x	x
<i>Lupinus truncatus</i>	blunt-leaved lupine					
<i>Madia exigua</i>	small tarplant				x	
<i>Melica imperfecta</i>	Coast Range melic				x	
<i>Mellilotus indicus</i>	yellow sweet-clover					
<i>Micropus californicus</i> var. <i>californicus</i>	cottontop				x	
<i>Mimulus cardinalis</i>	scarlet monkeyflower					
<i>Monardella sinuata</i> subsp. <i>nigrescens</i>	northern curly-leaved monardella		4.2		x	x
<i>Navarretia hamata</i> subsp. <i>parviloba</i>	hooked navarretia				x	
<i>Navarretia intertexta</i>	needle-leaved navarretia					x
<i>Navarretia squarrosa</i>	skunkweed				x	
<i>Nemophila menziesii</i>	baby blue-eyes					
<i>Nuttallanthus texanus</i> [ <i>Linaria canadensis</i> ]	toad-flax				x	x
<i>Orobanche bulbosa</i>	chaparral broomrape				x	
<i>Orobanche californica</i>	California broomrape				x	
<i>Oxalis pilosa</i>	hairy wood sorrel					
<i>Parapholis incurva</i>	sicklegrass					
<i>Pectocarya penicillata</i>	winged combseed				x	
<i>Petrorhagia dubia</i>	hairypink				x	x
<i>Phacelia campanularia</i>	desert bluebells					
<i>Phacelia distans</i>	wild heliotrope				x	
<i>Phacelia douglasii</i>	Douglas' phacelia				x	
<i>Piperia michaelii</i>	Michael's rein-orchid		4.2		x	
<i>Plagiobothrys collinus</i> var. <i>fulvescens</i>	rusty-haired popcorn flower				x	
<i>Plantago coronopus</i>	cut-leaved plantain				x	



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

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<i>Scientific Name</i>	<i>Common Name</i>	<i>HMP species</i>	<i>CNPS Rare Plant Rank</i>	<i>Cal-IPC Invasiveness Status</i>	<i>Interim Action Ranges MRA - Range 44</i>	<i>Interim Action Ranges MRA - Range 44 Grassland</i>
<b>Herbaceous species (annuals, perennial herbs, grasses, and grass-like species)</b>						
<i>Poa annua</i>	annual bluegrass					
<b><i>Poa secunda</i></b>	<b>one-sided bluegrass, pine bluegrass</b>				x	
<i>Polypogon interruptus</i>	ditch beard grass					
<i>Polypogon monspeliensis</i>	rabbitsfoot grass			lim		
<i>Polypogon viridis</i>	water beard grass					
<b><i>Pseudognaphalium beneolens</i></b>	<b>fragrant everlasting</b>				x	
<b><i>Pseudognaphalium californicum</i></b>	<b>California everlasting</b>				x	x
<b><i>Pseudognaphalium ramosissimum</i></b>	<b>pink everlasting</b>				x	
<b><i>Pseudognaphalium stramineum</i></b>	<b>cottonbatting plant</b>				x	
<b><i>Psilocarphus tenellus</i></b>	<b>slender woolly marbles</b>					
<b><i>Pterostegia drymarioides</i></b>	<b>fairy mist</b>				x	
<i>Rumex acetosella</i>	sheep sorrel			mod	x	
<b><i>Sagina apetela</i></b>	<b>sticky pearlwort</b>					
<b><i>Senecio c.f. aphanactis</i></b>	<b>chaparral ragwort</b>		2B.2		x	
<i>Senecio glomeratus</i>	cut-leaved fireweed			mod		
<i>Senecio vulgare</i>	common ragwort					
<i>Silene gallica</i>	windmill pink				x	
<i>Sisymbrium orientale</i>	Indian hedgemustard					
<b><i>Sisyrinchium bellum</i></b>	<b>blue-eyed grass</b>					
<b><i>Solanum americanum</i> (herbaceous)</b>	<b>American nightshade</b>					
<i>Sonchus asper</i> subsp. <i>asper</i>	prickly sow-thistle				x	
<i>Sonchus oleraceus</i>	common sow-thistle				x	
<i>Spergula arvensis</i>	corn spurrey					
<i>Spergularia rubra</i>	red sand-spurrey					
<b><i>Stachys bullata</i></b>	<b>wood mint</b>				x	
<b><i>Stipa pulchra</i></b>	<b>purple needlegrass</b>				x	
<b><i>Stylocline gnaphaloides</i></b>	<b>everlasting neststraw</b>				x	
<b><i>Taraxia [Camissonia] ovata</i></b>	<b>suncups</b>				x	
<b><i>Toxicoscordion fremontii</i></b>	<b>Fremont's star lily</b>				x	
<b><i>Trifolium ciliolatum</i></b>	<b>foothill clover</b>					x
<b><i>Trifolium gracilentum</i></b>	<b>pinpoint clover</b>				x	
<i>Trifolium hirtum</i>	rose clover			mod		
<b><i>Trifolium microcephalum</i></b>	<b>hairy clover, small-headed clover</b>					
<b><i>Uropappus lindleyi</i></b>	<b>silver puffs</b>				x	
<i>Viola cultivar</i>	pansy					

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

ESCA RP 2016 Annual Natural Resource Report – Appendix A

Scientific Name	Common Name	HMP species	CNPS Rare Plant Rank	Cal-IPC Invasiveness Status	Interim Action Ranges MRA - Range 44	Interim Action Ranges MRA - Range 44 Grassland
<b>Ferns and Fern-relatives</b>						
<i>Pteridium aquilinum</i> var. <i>pubescens</i>	western bracken fern				x	

**Native species in bold**

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

**Status Codes:**

**California Native Plant Society (CNPS)**

**Rare Plant Rank (RPR)**

**Extensions to List Categories**

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

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

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

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

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

0.3 - Moderately threatened in California, 20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

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

RPR 4: Plants of Limited Distribution - A Watch List

**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 disturbance.

limited (lim) – invasive but impacts not widespread statewide, low to moderate rates of dispersal, may be locally persistent and problematic.

**Table 6-3  
Interim Action Ranges MRA HMP Species Presence by Activity Type**

ESCA RP 2016 Annual Natural Resource Report - Appendix A

Activity Category	Location	Restoration Strategy	Total HMP Species <sup>1</sup> Present				
			Prior to Activities	After Activities 2013	After Activities 2014	After Activities 2015	After Activities 2016 <sup>3</sup>
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	7	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
	Grassland grid cells in South Range 44 SCA		1	1	2	2	2
Large-scale soil excavation (Activity D)	Range 47 Subarea A (low recruitment area)	Passive (seeding)	1 <sup>2</sup>	3	5	5	--
	Range 47 Subarea B	Active (container planting and seeding)	5 <sup>2</sup>	6	6	6	--

<sup>1</sup> 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.

<sup>2</sup> Only limited field surveys allowed in Range 47 prior to munitions investigations activities

<sup>3</sup> Areas that met or exceeded performance criteria targets in 2015 were not sampled in 2016: 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 6-4  
Interim Action Ranges MRA Native Shrub Species Richness by Activity Type**

ESCA RP 2016 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	Presence of HMP Shrub Species					
			Prior to Activities <sup>2</sup>	After Activities				2016 Compared with Baseline (percent of presence)		Prior to Activities <sup>2</sup>	After Activities				2016 Compared with Baseline Requirement of 3 HMP Shrubs (percent of presence)
				2013	2014	2015	2016 <sup>3</sup>				2013	2014	2015	2016 <sup>3</sup>	
Ingress/egress routes (Activity A)	All ingress/egress routes	Monitoring only	0	0	11	11	--	no baseline <sup>1</sup>	0	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	20	14	22	22	22	110.0%	14	3	3	3	3	3	100.0%
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	110.0%	14	3	2	3	3	3	100.0%
	Grassland grid cell in South Range 44 SCA		0	0	0	1	1	no baseline <sup>1</sup>	0	0	0	1	0	0	no baseline <sup>1</sup>
Large-scale soil excavation (Activity D)	Range 47 Subarea A (low recruitment area)	Passive (seeding)	10	14	15	15	--	--	8	2	2	3	3	--	--
	Range 47 Subarea B	Active (container planting and seeding)	22	22	22	22	--	--	8	3	3	3	3	--	--

<sup>1</sup> No baseline = no performance criteria or baseline for this activity type or location

<sup>2</sup> Only limited field surveys allowed in Range 47 prior to munitions investigations activities

<sup>3</sup> Areas that met or exceeded performance criteria targets in 2015 were not sampled in 2016

Table 6-5  
Interim Action Ranges MRA South Range 44 SCA and Central NCAs  
2016 Plant Species Richness and Diversity

ESCA RP 2016 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA in Central Maritime Chaparral																	
Location	Interim Action Ranges MRA Range R44																
Area	All	South Range 44 NCAs and Central Area SCAs															
Activity Type	Baseline	Vegetation Cutting								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 1 (2012)	Year 2 (2013)	Year 3 (2014)	Year 3 with surrounding species included (2014)	Year 4 (2015)	Year 4 with surrounding species included (2015)	Year 5 (2016)	Year 5 with surrounding species included (2016)
Number of Transects/Quadrats	Seven Transects	Seven Transects								Five Transects and 30 Quadrats				Five Transects			
Total Number of Native Species	15	24	18	23	41	37	52	43	62	18	29	26	39	44	70	39	52
Total Number of HMP Species Present	3	4	3	3	3	6	6	4	6	1	3	5	5	3	5	3	5
Total Number of HMP Herbaceous Species Present	0	1	0	1	1	3	3	2	3	1	1	3	2	2	2	2	2
Total Tree Species in All Transects	0	0	1	1	1	1	1	0	1	0	0	0	0	1	1	0	0
Total Shrub Species in All Transects	14	16	16	12	17	15	16	13	16	7	12	11	14	17	20	8	14
Total Herbaceous Species in All Transects or Related Herbaceous Plots	1	8	1	10	23	21	35	30	45	11	17	15	25	26	49	31	38
Total Fern and Fern Allies Species in All Transects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean Number of Tree Species per Transect	0.0	0.0	0.1	0.1	0.3	0.1	0.3	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mean Number of Shrub Species per Transect	9.6	4.7	8.6	7.1	10.6	8.0	11.1	6.4	10.3	4.0	5.8	5.0	9.2	5.2	9.2	4.4	9.0
Mean Number of Herbaceous Species per Transect	0.0	0.7	0.3	2.1	5.9	6.3	13.7	16.1	24.9	4.6	6.6	3.0	11.2	7.0	14.0	14.8	23.4
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	0.0	0.0	0.0	0.0
Diversity - Shannon Index	1.8	1.4	1.5	1.4	--	1.4	--	1.4	--	0.7	0.6	0.8	--	1.0	--	1.2	--
Evenness	0.2	0.2	0.2	0.2	--	0.2	--	0.2	--	0.2	0.1	0.2	--	0.2	--	0.2	--
Total Percent Mean Native Cover (Transects)	108.8%	24.6%	34.2%	30.6%	--	34.5%	--	--	--	7.5%	14.4%	19.7%	--	14.8%	--	--	--
Percent Mean Shrub Cover	107.6%	21.1%	31.3%	28.4%	--	32.6%	--	--	--	2.3%	7.6%	16.4%	--	11.3%	--	--	--
Percent Mean Herbaceous Cover (Transects)	1.2%	3.5%	2.8%	2.2%	--	1.8%	--	--	--	5.1%	6.8%	3.3%	--	3.5%	--	--	--
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 6-6  
Interim Action Ranges MRA North Range 44 SCA and Central Area NCAs  
2010 - 2016 Plant Species Richness and Diversity

ESCA RP 2016 Annual Natural Resource Report - Appendix A

Interim Action Ranges MRA in Central Maritime Chaparral													
Location	Interim Action Ranges MRA Range R44												
Area	All	North Range 44 NCA and Central Area SCAs											
Activity Type	Baseline	Vegetation Cutting					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 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)
Number of Transects/Quadrats	Five Transects	Five Transects					Eight Transects						
Total Number of Native Species	15	17	28	50	47	56	24	41	58	44	62	47	60
Total Number of HMP Species Present	3	3	5	5	6	6	3	6	7	6	7	6	7
Total Number of HMP Herbaceous Species Present	0	0	2	2	3	3	1	3	4	3	4	3	4
Total Tree Species in All Transects	0	0	0	1	0	1	1	1	1	1	1	1	1
Total Shrub Species in All Transects	14	14	13	18	16	17	10	15	18	13	17	11	15
Total Herbaceous Species in All Transects or Related Herbaceous Plots	1	3	14	30	30	37	12	24	38	30	43	35	43
Total Fern and Fern Allies Species in All Transects	0	0	1	1	1	1	1	1	1	0	1	0	1
Mean Number of Tree Species per Transect	0.0	0.0	0.0	0.2	0.0	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mean Number of Shrub Species per Transect	9.8	9.4	8.6	11.2	10.0	8.8	2.9	4.9	8.3	5.0	11.0	3.9	9.5
Mean Number of Herbaceous Species per Transect <sup>2</sup>	0.0	2.0	4.2	11.6	12.0	16.8	1.9	5.0	11.3	8.8	15.6	10.1	18.0
Mean Number of Fern and Fern Allies Species per Transect	0.0	0.0	0.2	0.2	0.2	0.2	0.3	0.1	0.3	0.0	0.3	0.0	0.4
Diversity - Shannon Index	1.8	1.7	1.7	--	1.8	1.8	0.8	0.9	--	1.1	--	1.2	--
Evenness	0.2	0.2	0.2	--	0.2	0.2	0.3	0.2	--	0.2	--	0.2	--
Total Percent Mean Native Cover (Transects)	99.6%	49.1%	51.2%	--	55.2%	55.2%	2.8%	4.4%	--	10.9%	--	23.8%	--
Percent Mean Shrub Cover	98.0%	35.2%	38.4%	--	46.3%	46.3%	0.8%	1.9%	--	5.0%	--	11.5%	--
Percent Mean Herbaceous Cover (Transects)	1.7%	14.0%	12.7%	--	8.8%	8.8%	0.0%	2.4%	--	5.4%	--	11.3%	--
Percent Mean Herbaceous Species Cover (Quadrats)	--	--	--	--	--	--	0.9%	0.7%	--	--	--	--	--
Total Percent Mean Native Cover (Herbaceous Quadrats)	--	--	--	--	--	--	0.5%	0.6%	--	--	--	--	--

**Table 6-7  
Interim Action Ranges MRA South Range 44 SCA Grassland  
2010 - 2016 Plant Species Richness and Diversity**

ESCA RP 2016 Annual Natural Resource Report - Appendix A

<b>Interim Action Ranges MRA - South Range 44 SCA Grassland</b>						
<b>Activity Year</b>	<b>Baseline (2010)</b>	<b>Year 1 (2012)</b>	<b>Year 2 (2013)</b>	<b>Year 3 (2014)</b>	<b>Year 4 (2015)</b>	<b>Year 5 (2016)</b>
<b>Number of Transects/Quadrats</b>	Three Quadrats	Six Quadrats				
<b>Total Number of Native Species</b>	<b>6</b>	9	16	15	18	20
<b>Total Number of HMP Species Present</b>	<b>1</b>	1	1	2	1	1
<b>Total Number of HMP Herbaceous Species Present</b>	<b>1</b>	1	1	1	1	1
<b>Total Native Tree Species in All Herbaceous Plots</b>	<b>0</b>	0	0	0	0	0
<b>Total Shrub Species in All Herbaceous Plots</b>	<b>1</b>	0	1	1	0	1
<b>Total Native Herbaceous Species in All Herbaceous Plots</b>	<b>5</b>	9	15	14	18	19
<b>Total Native Ferns and Fern Allies in Herbaceous Plots</b>	<b>0</b>	0	0	0	0	0
<b>Mean Number Tree Species per Herbaceous Plots</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	0.0
<b>Mean Number Shrub Species per Herbaceous Plot</b>	<b>0.3</b>	0.0	0.2	0.2	0.0	0.2
<b>Mean Number of Native Herbaceous Species per Herbaceous Plots</b>	<b>3.0</b>	3.2	5.0	5.0	7.0	7.8
<b>Mean number of Native Ferns and Fern Allies per Herbaceous Plots</b>	<b>0.0</b>	0.0	0.0	0.0	0.0	0.0
<b>Diversity - Shannon Index</b>	<b>1.61</b>	1.49	2.14	2.14	1.32	1.47
<b>Evenness</b>	<b>0.20</b>	0.09	0.09	0.09	0.16	0.20
<b>Total Percent Mean Native Cover (Herbaceous Quadrats)</b>	<b>23.7%</b>	4.3%	23.8%	10.0%	12.4%	30.6%

Table 6-8

HMP Shrub Species Frequency in Interim Action Ranges MRA South Range 44 before and after Vegetation Cutting

ESCA RP 2016 Annual Natural Resource Report – Appendix A

Activity Type	Location	Restoration Strategy	Percent Frequency of HMP Shrub Species - Sandmat Manzanita					Percent of Baseline for 2016
			2010-2011 Seven Baseline Transects	2013	2014	2015	2016	
Above-ground vegetation cutting followed by target-specific excavation (Activity B)	South Range 44 SCAs	Monitoring Only	<b>sandmat manzanita</b>					
			71.4%	85.7%	85.7%	100.0%	100.0%	140.0%
			<b>Monterey ceanothus</b>					
			100.0%	71.4%	85.7%	57.1%	57.1%	57%
			<b>Eastwood's ericameria</b>					
			14.3%	14.3%	14.3%	14.3%	14.3%	100%
<b>Mean Frequency for HMP Shrub Species Combined (Percent of Baseline)</b>			<b>61.9%</b>				<b>57.1%</b>	<b>92.3%</b>



**Table 6-9**  
**Interim Action Ranges MRA South and Central Range 44**  
**Vegetation Cover in Areas Subject to Vegetation Cutting Conducted in 2011**

ESCA RP 2016 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Twenty-nine Baseline Transects				
		Baseline Data 2010 - 2011 (all IAR MRA baseline transects)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
<b>Tree Species</b>						
<i>Quercus agrifolia</i>	coast live oak	0.0%	0.0%	--	0.0%	0.0%
<b>Total Cover by Native Tree Species</b>		<b>0.0%</b>			<b>0%</b>	
<b>Shrub and Sub-shrub Species</b>						
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	29.3%	15.6%	4.9%	31.0%	100%
<i>Crocanthemum scoparium</i>	rush-rose	8.1%	9.1%	2.9%	8.6%	86.2%
<i>Adenostoma fasciculatum</i>	chamise	9.0%	6.9%	2.2%	9.5%	89.7%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>1.6%</b>	<b>2.0%</b>	<b>0.6%</b>	<b>1.7%</b>	<b>65.5%</b>
<i>Salvia mellifera</i>	black sage	5.3%	7.2%	2.3%	5.6%	69.0%
<i>Acmispon glaber</i>	deerweed	1.4%	0.0%	--	1.5%	0.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	1.5%	5.6%	1.8%	1.6%	24.1%
<i>Eriophyllum confertiflorum</i>	golden yarrow	1.5%	2.2%	0.7%	1.6%	65.5%
<i>Symphoricarpos mollis</i>	creeping snowberry	0.0%	0.0%	--	0.0%	0.0%
<i>Garrya elliptica</i>	coast silk-tassel	0.0%	0.0%	--	0.0%	0.0%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>13.5%</b>	<b>9.3%</b>	<b>2.9%</b>	<b>14.3%</b>	<b>96.6%</b>
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.5%	0.9%	0.3%	0.5%	27.6%
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	0.0%	--	0.0%	0.0%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.2%</b>	<b>0.5%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>17.2%</b>
<i>Ceanothus dentatus</i>	dwarf ceanothus	20.2%	16.0%	5.0%	21.4%	89.7%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.7%	1.8%	0.6%	0.7%	24.1%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.9%	1.9%	0.6%	1.0%	31.0%
<i>Lepechinia calycina</i>	pitcher sage	0.4%	1.4%	0.5%	0.4%	20.7%
<i>Lupinus chamissonis</i>	silver bush lupine	0.4%	1.1%	0.4%	0.4%	13.8%
<b>Total Cover by Native Shrub and Subshrub Species</b>		<b>94.5%</b>			<b>99%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>1.3%</b>	<b>2.3%</b>	<b>1.3%</b>	<b>1%</b>	<b>90%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.0%</b>	<b>0.0%</b>		<b>0%</b>	<b>0%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>na</b>				
<b>Total Mean Percent Native Vegetative Cover</b>		<b>95.8%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>19.3%</b>				
<b>Total Mean Percent Masticated Vegetation (calculated in 2014 only)</b>		<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>
<b>Total Mean Percent Bare Ground Only</b>		<b>19.3%</b>	<b>9.3%</b>	<b>2.9%</b>	<b>--</b>	<b>100%</b>

**HMP Species in Bold**

Not all species observed along transects listed in this table  
 \*A calculation error was discovered after report submission in 2015; updated values reported here.

**Table 6-9**  
**Interim Action Ranges MRA South and Central Range 44**  
**Vegetation Cover in Areas Subject to Vegetation Cutting Conducted in 2011**

ESCA RP 2016 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Seven Baseline Transects				
		Baseline Data 2010 - 2011 (South Range 44 MRA baseline transects only)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
<b>Tree Species</b>						
<i>Quercus agrifolia</i>	coast live oak	0.0%	0.0%	--	0.0%	0.0%
<b>Total Cover by Native Tree Species</b>		<b>0%</b>			<b>0%</b>	
<b>Shrub and Sub-shrub Species</b>						
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	25.8%	9.5%	6.9%	23.7%	100%
<i>Crocanthemum scoparium</i>	rush-rose	10.0%	8.5%	6.2%	9.2%	100%
<i>Adenostoma fasciculatum</i>	chamise	9.9%	7.1%	5.2%	9.1%	100%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>0.7%</b>	<b>0.6%</b>	<b>0.4%</b>	<b>0.7%</b>	<b>71.4%</b>
<i>Salvia mellifera</i>	black sage	8.7%	9.7%	7.1%	8.0%	100%
<i>Acmispon glaber</i>	deerweed	1.2%	1.1%	0.8%	1.1%	85.7%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.0%	0.0%	--	0.0%	0.0%
<i>Eriophyllum confertiflorum</i>	golden yarrow	3.0%	2.7%	2.0%	2.8%	85.7%
<i>Symphoricarpos mollis</i>	creeping snowberry	0.0%	0.0%	--	0.0%	0.0%
<i>Garrya elliptica</i>	coast silk-tassel	0.0%	0.0%	--	0.0%	0.0%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>16.3%</b>	<b>5.0%</b>	<b>3.7%</b>	<b>14.9%</b>	<b>100%</b>
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	0.0%	--	0.0%	0.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	0.0%	--	0.0%	0.0%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.1%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.1%</b>	<b>14.3%</b>
<i>Ceanothus dentatus</i>	dwarf ceanothus	30.4%	14.9%	10.9%	27.9%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.2%	0.4%	0.3%	0.2%	28.6%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.1%	0.2%	0.2%	0.1%	14.3%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	1.2%	2.1%	1.5%	1.1%	28.6%
<b>Total Cover by Native Shrub and Subshrub Species</b>		<b>108%</b>			<b>99%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>1.2%</b>	<b>1.2%</b>	<b>0.9%</b>	<b>1.1%</b>	<b>71%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0%</b>	<b>0%</b>	<b>--</b>	<b>0%</b>	<b>0%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>na</b>				
<b>Total Mean Percent Native Vegetative Cover</b>		<b>108.8%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>16.2%</b>				
<b>Total Mean Percent Masticated Vegetation (calculated in 2014 only)</b>		<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>
<b>Total Mean Percent Bare Ground Only</b>		<b>16.2%</b>	<b>7.9%</b>	<b>5.8%</b>	<b>14.8%</b>	<b>100%</b>

**HMP Species in Bold**

Not all species observed along transects listed in this table

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

**Table 6-9**  
**Interim Action Ranges MRA South and Central Range 44**  
**Vegetation Cover in Areas Subject to Vegetation Cutting Conducted in 2011**

ESCA RP 2016 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Seven Transects in Vegetation Cut in 2011				
		Post-activity Data 2015* (Year 4)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
<b>Tree Species</b>						
<i>Quercus agrifolia</i>	coast live oak	0.4%	1.2%	0.9%	1.2%	14.3%
<b>Total Cover by Native Tree Species</b>		<b>0.4%</b>			<b>1.2%</b>	
<b>Shrub and Sub-shrub Species</b>						
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	13.2%	8.1%	5.9%	35.1%	100%
<i>Crocanthemum scoparium</i>	rush-rose	0.1%	0.1%	0.1%	0.2%	42.9%
<i>Adenostoma fasciculatum</i>	chamise	6.1%	3.2%	2.4%	16.3%	100%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>5.1%</b>	<b>3.1%</b>	<b>2.2%</b>	<b>13.5%</b>	<b>100.0%</b>
<i>Salvia mellifera</i>	black sage	3.8%	5.1%	3.7%	10.1%	85.7%
<i>Acmispon glaber</i>	deerweed	2.7%	4.2%	3.1%	7.1%	86%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.9%	2.3%	1.7%	2.3%	14.3%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.4%	0.6%	0.4%	1.2%	71.4%
<i>Symphoricarpos mollis</i>	creeping snowberry	0.3%	0.7%	0.5%	0.7%	14.3%
<i>Garrya elliptica</i>	coast silk-tassel	0.5%	1.4%	1.0%	1.4%	14.3%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>0.4%</b>	<b>0.6%</b>	<b>0.5%</b>	<b>1.2%</b>	<b>57.1%</b>
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.1%	0.2%	0.1%	0.2%	28.6%
<i>Toxicodendron diversilobum</i>	poison-oak	0.2%	0.3%	0.3%	0.5%	28.6%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.0%</b>	<b>0.0%</b>	0.0%	<b>0.0%</b>	<b>14.3%</b>
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.0%	0.0%	0.0%	0.1%	42.9%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	0.0%	--	0.0%	0.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	0.0%	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.0%	0.0%	--	0.0%	0.0%
<b>Total Cover by Native Shrub and Subshrub Species</b>		<b>33.8%</b>			<b>90.1%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>3.3%</b>	<b>4.0%</b>	<b>2.9%</b>	<b>5.1%</b>	<b>100.0%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.0%</b>	<b>0.0%</b>	-	--	<b>0.0%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>0.0%</b>	--	--	--	
<b>Total Mean Percent Native Vegetative Cover</b>		<b>37.6%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>62.1%</b>				
<b>Total Mean Percent Masticated Vegetation (calculated in 2014 only)</b>		<b>4.3%</b>	<b>5.1%</b>	<b>3.7%</b>	--	<b>57.1%</b>
<b>Total Mean Percent Bare Ground Only</b>		<b>57.7%</b>	<b>10.3%</b>	<b>7.5%</b>	--	<b>100%</b>

**HMP Species in Bold**

Not all species observed along transects listed in this table

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

**Table 6-9**  
**Interim Action Ranges MRA South and Central Range 44**  
**Vegetation Cover in Areas Subject to Vegetation Cutting Conducted in 2011**

ESCA RP 2016 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Seven Transects in Vegetation Cut in 2011				
		Post-activity Data 2016 (Year 5)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
<b>Tree Species</b>						
<i>Quercus agrifolia</i>	coast live oak	0.0%	0.0%	0.0%	0.0%	14.3%
<b>Total Cover by Native Tree Species</b>		<b>0.0%</b>			<b>0.0%</b>	
<b>Shrub and Sub-shrub Species</b>						
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	17.0%	10.1%	7.4%	29.2%	100.0%
<i>Crocanthemum scoparium</i>	rush-rose	9.1%	22.9%	16.9%	15.6%	57.1%
<i>Adenostoma fasciculatum</i>	chamise	7.9%	3.8%	2.8%	13.6%	100.0%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>6.3%</b>	<b>3.8%</b>	<b>2.8%</b>	<b>10.9%</b>	<b>100.0%</b>
<i>Salvia mellifera</i>	black sage	4.7%	6.0%	4.4%	8.1%	85.7%
<i>Acmispon glaber</i>	deerweed	2.4%	2.1%	1.5%	4.2%	85.7%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.9%	2.3%	1.7%	1.5%	14.3%
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.7%	0.8%	0.6%	1.3%	71.4%
<i>Symphoricarpos mollis</i>	creeping snowberry	0.7%	1.8%	1.3%	1.2%	14.3%
<i>Garrya elliptica</i>	coast silk-tassel	0.7%	1.7%	1.3%	1.1%	14.3%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>0.6%</b>	<b>0.9%</b>	<b>0.7%</b>	<b>1.0%</b>	<b>57.1%</b>
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.1%	0.3%	0.2%	0.2%	14.3%
<i>Toxicodendron diversilobum</i>	poison-oak	0.1%	0.2%	0.2%	0.1%	14.3%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.1%</b>	<b>0.2%</b>	0.1%	<b>0.1%</b>	<b>14.3%</b>
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.0%	0.1%	0.1%	0.1%	14.3%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	0.0%	--	0.0%	0.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	0.0%	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.0%	0.0%	--	0.0%	0.0%
<b>Total Cover by Native Shrub and Subshrub Species</b>		<b>51.3%</b>			<b>89.2%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>6.2%</b>	<b>4.9%</b>	<b>3.6%</b>	<b>10.7%</b>	<b>100.0%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.1%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.1%</b>	<b>14.3%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>0.6%</b>	<b>0.5%</b>	<b>0.4%</b>	<b>1.1%</b>	<b>100.0%</b>
<b>Total Mean Percent Native Vegetative Cover</b>		<b>57.5%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>51.9%</b>				
<b>Total Mean Percent Masticated Vegetation (calculated in 2014 only)</b>		<b>0.0%</b>	--	--	--	<b>0.0%</b>
<b>Total Mean Percent Bare Ground Only</b>		<b>51.9%</b>	<b>8.7%</b>	<b>6.4%</b>	--	<b>100%</b>

**HMP Species in Bold**

Not all species observed along transects listed in this table  
 \*A calculation error was discovered after report submission in 2015; updated values reported here.

**Table 6-10**  
**Interim Action Ranges MRA North Range 44 SCA**  
**Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)**

ESCA RP 2016 Annual Natural Resources 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
<b>Tree Species</b>						
<i>Quercus agrifolia</i>	coast live oak	0.0%	--	--	0.0%	0.0%
<b>Total Cover by Native Tree Species</b>		<b>0.0%</b>			<b>0%</b>	
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	29.3%	15.6%	4.9%	31.0%	100%
<i>Ceanothus dentatus</i>	dwarf ceanothus	20.2%	16.0%	5.0%	21.4%	89.7%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>13.5%</b>	<b>9.3%</b>	<b>2.9%</b>	<b>14.3%</b>	<b>96.6%</b>
<i>Adenostoma fasciculatum</i>	chamise	9.0%	6.9%	2.2%	9.5%	89.7%
<i>Crocanthemum scoparium</i>	rush-rose	8.1%	9.1%	2.9%	8.6%	86.2%
<i>Salvia mellifera</i>	black sage	5.3%	7.2%	2.3%	5.6%	69.0%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>1.6%</b>	<b>2.0%</b>	<b>0.6%</b>	<b>1.7%</b>	<b>65.5%</b>
<i>Eriophyllum confertiflorum</i>	golden yarrow	1.5%	2.2%	0.7%	1.6%	65.5%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	1.5%	5.6%	1.8%	1.6%	24.1%
<i>Acmispon glaber</i>	deerweed	1.4%	0.0%	--	1.5%	0.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.9%	1.9%	0.6%	1.0%	31.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.7%	1.8%	0.6%	0.7%	24.1%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.5%	0.9%	0.3%	0.5%	27.6%
<i>Lepechinia calycina</i>	pitcher sage	0.4%	1.4%	0.5%	0.4%	20.7%
<i>Lupinus chamissonis</i>	silver bush lupine	0.4%	1.1%	0.4%	0.4%	13.8%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.2%</b>	<b>0.5%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>17.2%</b>
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	--	--	0.0%	0.0%
<b>Total Mean Percent Shrub and Subshrub Cover</b>		<b>94.5%</b>			<b>100.0%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>0.0%</b>	--	--	<b>0.0%</b>	--
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.0%</b>				
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>na</b>				
<b>Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)</b>		<b>94.5%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>19.3%</b>				
<b>Total Mean Percent Masticated Vegetation (only calculated in 2014)</b>		--				
<b>Total Mean Percent Bare Ground</b>		<b>19.3%</b>	<b>9.3%</b>	<b>2.9%</b>	--	<b>100%</b>

**HMP Species in Bold**

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

**Table 6-10**  
**Interim Action Ranges MRA North Range 44 SCA**  
**Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)**

ESCA RP 2016 Annual Natural Resources 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
<b>Tree Species</b>						
<i>Quercus agrifolia</i>	coast live oak	0.0%	0.0%	--	0.0%	0.0%
<b>Total Cover by Native Tree Species</b>		<b>0%</b>			<b>0%</b>	
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	22%	6%	6%	22%	100%
<i>Ceanothus dentatus</i>	dwarf ceanothus	23.4%	19.3%	18.4%	23.5%	100.0%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>9.4%</b>	<b>10.3%</b>	<b>9.9%</b>	<b>9.4%</b>	<b>100.0%</b>
<i>Adenostoma fasciculatum</i>	chamise	16.1%	6.1%	5.8%	16.2%	100.0%
<i>Crocanthemum scoparium</i>	rush-rose	11.6%	11.0%	10.5%	11.6%	100.0%
<i>Salvia mellifera</i>	black sage	6.1%	5.8%	5.6%	6.1%	60.0%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>2.4%</b>	<b>3.3%</b>	<b>3.1%</b>	<b>2.4%</b>	<b>60.0%</b>
<i>Eriophyllum confertiflorum</i>	golden yarrow	2.8%	3.2%	3.0%	2.8%	100.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.8%	1.2%	1.1%	0.8%	40.0%
<i>Acmispon glaber</i>	deerweed	0.8%	0.9%	0.8%	0.8%	80.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	1.8%	2.2%	2.1%	1.8%	60.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	0.0%	--	0.0%	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	0.1%	0.1%	0.1%	20.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.3%	0.7%	0.7%	0.3%	20.0%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.6%</b>	<b>0.9%</b>	<b>0.8%</b>	<b>0.6%</b>	<b>40.0%</b>
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	0.0%	--	0.0%	0.0%
<b>Total Mean Percent Shrub and Subshrub Cover</b>		<b>98.0%</b>			<b>98.3%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>1.7%</b>	<b>1.4%</b>	<b>1.3%</b>	<b>1.7%</b>	<b>100.0%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.0%</b>	<b>0.0%</b>	<b>--</b>	<b>0.0%</b>	<b>0.0%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>na</b>				
<b>Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)</b>		<b>99.6%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>20.3%</b>				
<b>Total Mean Percent Masticated Vegetation (only calculated in 2014)</b>		<b>--</b>				
<b>Total Mean Percent Bare Ground</b>		<b>20%</b>	<b>10%</b>	<b>10%</b>	<b>--</b>	<b>100%</b>

**HMP Species in Bold**

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

**Table 6-10**  
**Interim Action Ranges MRA North Range 44 SCA**  
**Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)**

ESCA RP 2016 Annual Natural Resources Report - Appendix A

Scientific Name	Common Name	Eight Transects in Small Scale Excavations in North Range 44				
		Post-Activity Data 2015* (Year 3)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
<b>Tree Species</b>						
<i>Quercus agrifolia</i>	coast live oak	0.5%	1.5%	1.0%	4.2%	12.5%
<b>Total Cover by Native Tree Species</b>		<b>0.5%</b>			<b>4.9%</b>	
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.4%	0.7%	0.5%	2.8%	37.5%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.4%	0.6%	0.4%	3.1%	50.0%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>0.2%</b>	<b>0.4%</b>	<b>0.2%</b>	<b>1.4%</b>	<b>50.0%</b>
<i>Adenostoma fasciculatum</i>	chamise	0.0%	0.0%	0.0%	0.1%	12.5%
<i>Crocanthemum scoparium</i>	rush-rose	1.0%	1.1%	0.7%	7.6%	75.0%
<i>Salvia mellifera</i>	black sage	0.0%	0.1%	0.1%	0.3%	25.0%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>0.9%</b>	<b>0.9%</b>	<b>0.6%</b>	<b>7.5%</b>	<b>75.0%</b>
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.3%	0.3%	0.2%	2.2%	62.5%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.0%	0.0%	0.0%	0.1%	12.5%
<i>Acmispon glaber</i>	deerweed	1.1%	2.3%	1.6%	8.4%	62.5%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	--	--	--	0.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	--	--	--	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	--	--	--	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	--	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.1%	0.4%	0.2%	1.1%	25.0%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.1%</b>	<b>0.4%</b>	<b>0.3%</b>	<b>1.1%</b>	<b>12.5%</b>
<i>Toxicodendron diversilobum</i>	poison-oak	0.5%	0.9%	0.6%	3.7%	25.0%
<b>Total Mean Percent Shrub and Subshrub Cover</b>		<b>5.0%</b>			<b>45.7%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>5.4%</b>	<b>7.9%</b>	<b>5.3%</b>	<b>49.4%</b>	<b>100.0%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>12.5%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>1.7%</b>	<b>3.6%</b>	<b>2.4%</b>		
<b>Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)</b>		<b>10.9%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>54.3%</b>				
<b>Total Mean Percent Masticated Vegetation (only calculated in 2014)</b>		<b>0.0%</b>	<b>0.0%</b>	--	--	--
<b>Total Mean Percent Bare Ground</b>		<b>54.3%</b>	<b>40.4%</b>	<b>27.0%</b>	--	<b>100%</b>

**HMP Species in Bold**

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

**Table 6-10**  
**Interim Action Ranges MRA North Range 44 SCA**  
**Vegetation Cover in Areas Subject to Small-scale Excavations (Activity C)**

ESCA RP 2016 Annual Natural Resources Report - Appendix A

Scientific Name	Common Name	Eight Transects in Small Scale Excavations in North Range 44				
		Post-Activity Data 2016 (Year 4)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
<b>Tree Species</b>						
<i>Quercus agrifolia</i>	coast live oak	1.0%	2.9%	1.9%	3.9%	12.5%
<b>Total Cover by Native Tree Species</b>		<b>1.0%</b>			<b>4.3%</b>	
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.5%	0.8%	0.5%	1.8%	50.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.4%	0.6%	0.4%	1.5%	62.5%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>0.1%</b>	<b>0.3%</b>	<b>0.2%</b>	<b>0.6%</b>	<b>37.5%</b>
<i>Adenostoma fasciculatum</i>	chamise	0.1%	0.2%	0.1%	0.3%	25.0%
<i>Crocanthemum scoparium</i>	rush-rose	2.7%	2.6%	1.8%	10.4%	75.0%
<i>Salvia mellifera</i>	black sage	0.1%	0.2%	0.1%	0.3%	25.0%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>2.0%</b>	<b>1.1%</b>	<b>0.7%</b>	<b>7.9%</b>	<b>87.5%</b>
<i>Eriophyllum confertiflorum</i>	golden yarrow	0.8%	1.1%	0.7%	3.1%	75.0%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.0%	--	--	0.0%	0.0%
<i>Acmispon glaber</i>	deerweed	4.4%	10.9%	7.3%	17.1%	75.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	--	--	0.0%	0.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	--	--	0.0%	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	--	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.3%	0.7%	0.5%	1.0%	25.0%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.2%</b>	<b>0.4%</b>	<b>0.3%</b>	<b>0.6%</b>	<b>25.0%</b>
<i>Toxicodendron diversilobum</i>	poison-oak	0.1%	0.3%	0.2%	0.4%	12.5%
<b>Total Mean Percent Shrub and Subshrub Cover</b>		<b>11.5%</b>			<b>48.4%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>11.3%</b>	<b>15.1%</b>	<b>10.1%</b>	<b>44.0%</b>	<b>61.5%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>7.7%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>1.8%</b>	<b>3.8%</b>	<b>2.6%</b>	<b>7.1%</b>	<b>46.2%</b>
<b>Total Mean Percent Native Vegetative Cover (Tree, Shrub, and Herbaceous)</b>		<b>23.8%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>82.4%</b>				
<b>Total Mean Percent Masticated Vegetation (only calculated in 2014)</b>		<b>0.0%</b>	<b>--</b>	<b>--</b>	<b>0%</b>	<b>0%</b>
<b>Total Mean Percent Bare Ground</b>		<b>82.4%</b>	<b>14.4%</b>	<b>9.6%</b>		<b>62%</b>

**HMP Species in Bold**

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



**Table 6-11  
Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs  
Vegetation Cover in Areas Subject to Small-scale Excavations**

ESCA RP 2016 Annual Natural Resources Report - Appendix A

Scientific Name	Common Name	Twenty-nine Baseline Transects				
		Baseline Data 2010 - 2011 (all Interim Action Ranges MRA baseline transects)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
<i>Acmispon glaber</i>	deerweed	1.4%	0.0%	--	1.5%	0.0%
<i>Adenostoma fasciculatum</i>	chamise	9.0%	6.9%	2.2%	9.5%	89.7%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>1.6%</b>	<b>2.0%</b>	<b>0.6%</b>	<b>1.7%</b>	<b>65.5%</b>
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	29.3%	15.6%	4.9%	31.0%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.7%	1.8%	0.6%	0.7%	24.1%
<i>Ceanothus dentatus</i>	dwarf ceanothus	20.2%	16.0%	5.0%	21.4%	89.7%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>13.5%</b>	<b>9.3%</b>	<b>2.9%</b>	<b>14.3%</b>	<b>96.6%</b>
<i>Crocanthemum scoparium</i>	rush-rose	8.1%	9.1%	2.9%	8.6%	86.2%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	1.5%	5.6%	1.8%	1.6%	24.1%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.2%</b>	<b>0.5%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>17.2%</b>
<i>Eriophyllum confertiflorum</i>	golden yarrow	1.5%	2.2%	0.7%	1.6%	65.5%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.9%	1.9%	0.6%	1.0%	31.0%
<i>Lepechinia calycina</i>	pitcher sage	0.4%	1.4%	0.5%	0.4%	20.7%
<i>Lupinus chamissonis</i>	silver bush lupine	0.4%	1.1%	0.4%	0.4%	13.8%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.5%	0.9%	0.3%	0.5%	27.6%
<i>Salvia mellifera</i>	black sage	5.3%	7.2%	2.3%	5.6%	69.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	--	--	--	0.0%
<b>Total Mean Percent Shrub and Subshrub Cover</b>		<b>94.5%</b>			<b>99%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>1.3%</b>	<b>2.3%</b>	<b>1.3%</b>	<b>1.4%</b>	<b>90.0%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.0%</b>	<b>0.0%</b>		<b>0.0%</b>	<b>0.0%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>na</b>				
<b>Total Mean Percent Native Vegetative Cover</b>		<b>95.8%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>19.3%</b>				
<b>Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)</b>		<b>--</b>				
<b>Total Mean Percent Bare Ground</b>		<b>19.3%</b>	<b>9.3%</b>	<b>2.9%</b>	<b>--</b>	<b>100.0%</b>

**HMP Species in Bold**

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

**Table 6-11**  
**Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs**  
**Vegetation Cover in Areas Subject to Small-scale Excavations**

ESCA RP 2016 Annual Natural Resources Report - Appendix A

Scientific Name	Common Name	Seven Baseline Transects				
		Baseline Data 2010 - 2011 (South Range 44 baseline transects only)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Mean Relative Cover	Mean Frequency
<i>Acmispon glaber</i>	deerweed	1.2%	1.1%	0.8%	1.1%	85.7%
<i>Adenostoma fasciculatum</i>	chamise	9.9%	7.1%	5.2%	9.1%	100%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>0.7%</b>	<b>0.6%</b>	<b>0.4%</b>	<b>0.7%</b>	<b>71.4%</b>
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	25.8%	9.5%	6.9%	23.7%	100%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.2%	0.4%	0.3%	0.2%	28.6%
<i>Ceanothus dentatus</i>	dwarf ceanothus	30.4%	14.9%	10.9%	27.9%	100%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>16.3%</b>	<b>5.0%</b>	<b>3.7%</b>	<b>14.9%</b>	<b>100%</b>
<i>Crocanthemum scoparium</i>	rush-rose	10.0%	8.5%	6.2%	9.2%	100%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.0%	0.0%	--	0.0%	0.0%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.1%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>0.1%</b>	<b>14.3%</b>
<i>Eriophyllum confertiflorum</i>	golden yarrow	3.0%	2.7%	2.0%	2.8%	85.7%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.1%	0.2%	0.2%	0.1%	14.3%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	0.0%	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	1.2%	2.1%	1.5%	1.1%	28.6%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	0.0%	--	0.0%	0.0%
<i>Salvia mellifera</i>	black sage	8.7%	9.7%	7.1%	8.0%	100%
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	0.0%	--	0.0%	0.0%
<b>Total Mean Percent Shrub and Subshrub Cover</b>		<b>107.6%</b>			<b>98.9%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>1.2%</b>	<b>1.2%</b>	<b>0.9%</b>	<b>1.1%</b>	<b>71.4%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.0%</b>	<b>0.0%</b>	<b>--</b>	<b>0.0%</b>	<b>0.0%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>na</b>				
<b>Total Mean Percent Native Vegetative Cover</b>		<b>108.8%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>16.2%</b>				
<b>Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)</b>		<b>--</b>				
<b>Total Mean Percent Bare Ground</b>		<b>16.2%</b>	<b>7.9%</b>	<b>5.8%</b>	<b>14.8%</b>	<b>100.0%</b>

**HMP Species in Bold**

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

**Table 6-11**  
**Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs**  
**Vegetation Cover in Areas Subject to Small-scale Excavations**

ESCA RP 2016 Annual Natural Resources Report - Appendix A

Scientific Name	Common Name	Five Transects in Small-scale Excavations in South Range 44 Conducted in 2011				
		Post-activity Data 2015* (Year 4)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Cover	Mean Frequency
<i>Acmispon glaber</i>	deerweed	7.0%	7.4%	7.1%	46.1%	80%
<i>Adenostoma fasciculatum</i>	chamise	0.4%	0.9%	0.9%	2.6%	20.0%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>0.9%</b>	<b>1.2%</b>	<b>1.2%</b>	<b>6.2%</b>	<b>80.0%</b>
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.1%	0.1%	0.1%	0.6%	40.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	--	--	--	0.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.0%	0.0%	0.0%	0.1%	20.0%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>0.0%</b>	--	--	--	<b>0.0%</b>
<i>Crocanthemum scoparium</i>	rush-rose	1.4%	1.6%	1.5%	9.4%	100%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.1%	0.3%	0.3%	0.8%	20.0%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.0%</b>	--	--	<b>0.0%</b>	<b>0.0%</b>
<i>Eriophyllum confertiflorum</i>	golden yarrow	1.2%	1.2%	1.2%	7.7%	100.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	--	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.0%	--	--	0.0%	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	--	--	0.0%	0.0%
<i>Salvia mellifera</i>	black sage	0.0%	0.1%	0.1%	0.3%	40.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.2%	0.3%	0.3%	1.0%	20.0%
<b>Total Mean Percent Shrub and Subshrub Cover</b>		<b>11.3%</b>			<b>76.0%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>3.6%</b>	<b>5.2%</b>	<b>5.0%</b>	<b>23.7%</b>	<b>100%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.0%</b>	--	--	--	<b>0.0%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>0.2%</b>	<b>0.4%</b>	<b>0.0%</b>		
<b>Total Mean Percent Native Vegetative Cover</b>		<b>14.9%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>85.3%</b>				
<b>Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)</b>		<b>0.0%</b>				
<b>Total Mean Percent Bare Ground</b>		<b>85.3%</b>	<b>6.0%</b>	<b>5.7%</b>	--	<b>100%</b>

**HMP Species in Bold**

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

**Table 6-11**  
**Interim Action Ranges MRA South Range 44 SCA and Central Area NCAs**  
**Vegetation Cover in Areas Subject to Small-scale Excavations**

ESCA RP 2016 Annual Natural Resources Report - Appendix A

Scientific Name	Common Name	Five Transects in Small-scale Excavations in South Range 44 Conducted in 2011				
		Post-activity Data 2016 (Year 5)				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Cover	Mean Frequency
<i>Acmispon glaber</i>	deerweed	5.9%	5.2%	4.9%	29.7%	80%
<i>Adenostoma fasciculatum</i>	chamise	0.4%	0.8%	0.8%	1.8%	20.0%
<b><i>Arctostaphylos pumila</i></b>	<b>sandmat manzanita</b>	<b>1.9%</b>	<b>1.4%</b>	<b>1.4%</b>	<b>7.7%</b>	<b>80.0%</b>
<i>Arctostaphylos tomentosa</i> subsp. <i>tomentosa</i>	shaggy-barked manzanita	0.3%	0.5%	0.5%	1.3%	40.0%
<i>Baccharis pilularis</i> subsp. <i>consanguinea</i>	coyote brush	0.0%	--	--	--	0.0%
<i>Ceanothus dentatus</i>	dwarf ceanothus	0.1%	0.2%	0.1%	0.5%	60.0%
<b><i>Ceanothus rigidus</i></b>	<b>Monterey ceanothus</b>	<b>0.1%</b>	<b>0.1%</b>	<b>0.1%</b>	<b>0.2%</b>	<b>20.0%</b>
<i>Crocanthemum scoparium</i>	rush-rose	2.4%	2.0%	1.9%	9.3%	100%
<i>Ericameria ericoides</i>	dune-heather, mock-heather	0.1%	0.3%	0.3%	0.5%	20.0%
<b><i>Ericameria fasciculata</i></b>	<b>Eastwood's ericameria</b>	<b>0.0%</b>	--	--	<b>0.0%</b>	<b>0.0%</b>
<i>Eriophyllum confertiflorum</i>	golden yarrow	2.3%	2.1%	2.0%	9.2%	100.0%
<i>Frangula californica</i> subsp. <i>californica</i>	California coffeeberry	0.0%	--	--	0.0%	0.0%
<i>Lepechinia calycina</i>	pitcher sage	0.0%	--	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.0%	--	--	0.0%	0.0%
<i>Mimulus aurantiacus</i>	bush monkeyflower	0.0%	--	--	0.0%	0.0%
<i>Salvia mellifera</i>	black sage	0.4%	0.8%	0.8%	1.5%	60.0%
<i>Toxicodendron diversilobum</i>	poison-oak	0.0%	--	--	0.0%	0.0%
<b>Total Mean Percent Shrub and Subshrub Cover</b>		<b>14.0%</b>			<b>75.3%</b>	
<b>Total Combined Mean Native Cover Between Shrubs and Subshrubs</b>		<b>4.6%</b>	<b>6.0%</b>	<b>5.8%</b>	<b>22.9%</b>	<b>100%</b>
<b>Target Weed Total (<i>Carpobrotus edulis</i>)</b>		<b>0.0%</b>	--	--	--	<b>0.0%</b>
<b>Total Mean Non-native Herbaceous Species Cover</b>		<b>1.5%</b>	<b>1.7%</b>	<b>1.6%</b>	<b>7.3%</b>	<b>80.0%</b>
<b>Total Mean Percent Native Vegetative Cover</b>		<b>18.6%</b>				
<b>Total Mean Percent Bare Ground (Including Masticated Vegetation)</b>		<b>80.2%</b>				
<b>Total Mean Percent Masticated Vegetation (calculated in 2014 and 2015)</b>		<b>0.0%</b>				
<b>Total Mean Percent Bare Ground</b>		<b>80.2%</b>	<b>5.7%</b>	<b>5.4%</b>	--	<b>100%</b>

**HMP Species in Bold**

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

**Table 6-12**  
**2012 - 2016 Cover and Frequency of Herbaceous Species in South Range 44 Grassland (6 Quadrats)**

ESCA RP 2016 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	2010 Baseline				
		Six Quadrats in South Range 44 Grassland				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Percent Cover	Mean Frequency
<b>Shrub and Subshrub Species</b>						
<i>Frangula californica</i> subsp. <i>californica</i>	California coffee berry	0.7%	1.6%	1.3%	1.5%	16.7%
<i>Lupinus chamissonis</i>	silver bush lupine	0.0%	--	--	0.0%	0.0%
<b>Total Cover by Native Shrub and Subshrub Species</b>		<b>0.7%</b>			<b>1.51%</b>	
<b>Native Herbaceous Species</b>						
<b><i>Chorizanthe pungens</i> var. <i>pungens</i></b>	<b>Monterey spineflower</b>	<b>4.7%</b>	<b>6.4%</b>	<b>5.3%</b>	<b>10.2%</b>	<b>50.0%</b>
<i>Layia platyglossa</i>	tidytips	0.0%	--	--	0.0%	0.0%
<i>Lessingia pectinata</i> var. <i>pectinata</i>	common lessingia	0.0%	--	--	0.0%	0.0%
<i>Eschscholzia californica</i>	California poppy	0.0%	--	--	0.0%	0.0%
<i>Lupinus nanus</i>	sky lupine	0.0%	--	--	0.0%	0.0%
<i>Calandrinia ciliata</i>	red maids	0.0%	--	--	0.0%	0.0%
<i>Castilleja exserta</i> subsp. <i>latifolia</i>	wideleaf purple owl's clover	0.0%	--	--	0.0%	0.0%
<i>Deinandra increscens</i> subsp. <i>increscens</i>	coast tarplant	5.7%	0.5%	0.4%	10.9%	83.3%
<i>Camissonia strigulosa</i>	strigose suncups	0.0%	--	--	0.0%	0.0%
<i>Acmispon strigosus</i>	strigose lotus	0.0%	--	--	0.0%	0.0%
<i>Heterotheca grandifolia</i>	telegraph weed	0.0%	--	--	0.0%	0.0%
<i>Cryptantha micromeres</i>	small-flowered cryptantha	0.0%	--	--	0.0%	0.0%
<i>Cryptantha microstachys</i>	Tejon cryptantha	0.0%	--	--	0.0%	0.0%
<i>Plantago erecta</i>	California plantain	0.0%	--	--	0.0%	0.0%
<i>Crassula connata</i>	pygmy weed	0.0%	--	--	0.0%	0.0%
<i>Trifolium ciliolatum</i>	foothill clover	0.0%	--	--	0.0%	0.0%
<i>Trifolium gracilentum</i>	pinpoint clover	0.0%	--	--	0.0%	0.0%
<i>Trifolium microcephalum</i>	hairy clover, small-headed clover	0.0%	--	--	0.0%	0.0%
<i>Eriastrum virgatum</i>	wand woollystar	0.0%	--	--	0.0%	0.0%
<i>Festuca octoflora</i>	six-weeks fescue	0.0%	--	--	0.0%	0.0%
<i>Nuttallanthus texanus</i>	blue toad-flax	0.0%	--	--	0.0%	0.0%
<i>Croton californicus</i>	California croton	2.0%	3.3%	2.8%	4.4%	33.3%
<i>Erigeron canadensis</i>	horseweed	10.0%	--	--	14.7%	33.3%
<i>Logfia filaginoides</i>	California filago	0.0%	--	--	0.0%	0.0%
<i>Galium californicum</i>	California bedstraw	0.7%	1.6%	1.3%	1.5%	16.7%
<b>Total Cover by Native Herbaceous Species</b>		<b>18.3%</b>			<b>41.4%</b>	
<b>Non-native Herbaceous Species</b>						
<i>Hypochaeris glabra</i> *	smooth cat's-ear	0.0%	--	--	0.0%	0.0%
<i>Aira caryophyllea</i>	common silver-hair grass	0.0%	--	--	0.0%	0.0%
<i>Erodium cicutarium</i> *	red-stemmed filaree	0.0%	--	--	0.0%	0.0%
<i>Centaurea melitensis</i> *	toalote	0.0%	--	--	0.0%	0.0%
<i>Avena barbata</i> *	slender wild oat	0.0%	--	--	0.0%	0.0%
<i>Bromus diandrus</i> *	ripgut brome	0.0%	--	--	0.0%	0.0%
<i>Bromus hordeaceus</i> *	soft chess	0.0%	--	--	0.0%	0.0%
<i>Silene gallica</i> *	windmill pink	0.0%	--	--	0.0%	0.0%
<i>Petrorhagia dubia</i> *	hairypink	0.0%	--	--	0.0%	0.0%
<i>Logfia gallica</i> *	narrowleaf cottonrose	0.0%	--	--	0.0%	0.0%
<i>Rumex acetosella</i> *	sheep sorrel	6.0%	12.8%	10.6%	13.1%	33.3%
<i>Festuca myuros</i> *	rattail fescue	19.3%	23.4%	19.2%	47.9%	66.7%
<b>Total Cover by Non-native Herbaceous Species</b>		<b>25.3%</b>			<b>57.1%</b>	
<b>Total Mean Non-native Grass Species Cover</b>		<b>19.3%</b>				
<b>Total Cover by All Herbaceous Species</b>		<b>43.6%</b>				
<b>Total Mean All Vegetative Cover</b>		<b>44.3%</b>				
<b>Total Mean Native Vegetative Cover</b>		<b>19.0%</b>			<b>42.9%</b>	
<b>Total Mean Bare ground</b>		<b>55.7%</b>				

\*non-native species

**HMP species in bold**

Note: Not all species observed along transects listed in this table

**Table 6-12**  
**2012 - 2016 Cover and Frequency of Herbaceous Species in South Range 44 Grassland (6 Quadrats)**

ESCA RP 2016 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Post-activity Data 2015 (Year 4)				
		Six Quadrats in South Range 44 Grassland				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Percent Cover	Mean Frequency
<b>Shrub and Subshrub Species</b>						
<i>Frangula californica</i> subsp. <i>californica</i>	California coffee berry	0.0%	--	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.1%	0.2%	0.2%	0.4%	16.7%
<b>Total Cover by Native Shrub and Subshrub Species</b>		<b>0.1%</b>			<b>0.6%</b>	
<b>Native Herbaceous Species</b>						
<b><i>Chorizanthe pungens</i> var. <i>pungens</i></b>	<b>Monterey spineflower</b>	<b>5.0%</b>	<b>7.5%</b>	<b>6.1%</b>	<b>26.2%</b>	<b>83.3%</b>
<i>Layia platyglossa</i>	tidytips	3.2%	4.0%	3.3%	16.6%	66.7%
<i>Lessingia pectinata</i> var. <i>pectinata</i>	common lessingia	1.3%	1.3%	1.0%	6.6%	66.7%
<i>Eschscholzia californica</i>	California poppy	1.1%	1.0%	0.8%	5.7%	83.3%
<i>Lupinus nanus</i>	sky lupine	0.8%	1.2%	1.0%	3.9%	50.0%
<i>Calandrinia ciliata</i>	red maids	0.0%	--	--	0.0%	0.0%
<i>Castilleja exserta</i> subsp. <i>latifolia</i>	wideleaf purple owl's clover	0.2%	0.4%	0.3%	1.0%	50.0%
<i>Deinandra increscens</i> subsp. <i>increscens</i>	coast tarplant	0.2%	0.4%	0.3%	1.0%	50.0%
<i>Camissonia strigulosa</i>	strigose suncups	0.2%	0.4%	0.3%	1.0%	33.0%
<i>Acmispon strigosus</i>	strigose lotus	0.2%	0.4%	0.3%	0.9%	16.7%
<i>Heterotheca grandifolia</i>	telegraph weed	0.2%	0.4%	0.3%	0.9%	16.7%
<i>Cryptantha micromeres</i>	small-flowered cryptantha	0.0%	--	--	0.0%	0.0%
<i>Cryptantha microstachys</i>	Tejon cryptantha	0.1%	0.2%	0.2%	0.5%	33.3%
<i>Plantago erecta</i>	California plantain	0.1%	0.2%	0.2%	0.5%	33.3%
<i>Crassula connata</i>	pygmy weed	0.1%	0.2%	0.2%	0.4%	16.7%
<i>Trifolium ciliolatum</i>	foothill clover	0.1%	0.1%	0.0%	0.3%	50.0%
<i>Trifolium gracilentum</i>	pinpoint clover	0.0%	--	--	0.0%	0.0%
<i>Trifolium microcephalum</i>	hairy clover, small-headed clover	0.0%	--	--	0.0%	0.0%
<i>Eriastrum virgatum</i>	wand woollystar	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Festuca octoflora</i>	six-weeks fescue	0.0%	--	--	0.0%	0.0%
<i>Nuttallanthus texanus</i>	blue toad-flax	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Croton californicus</i>	California croton	0.0%	--	--	0.0%	0.0%
<i>Erigeron canadensis</i>	horseweed	0.0%	--	--	0.0%	0.0%
<i>Logfia filaginoides</i>	California filago	0.0%	--	--	0.0%	0.0%
<i>Galium californicum</i>	California bedstraw	0.0%	--	--	0.0%	0.0%
<b>Total Cover by Native Herbaceous Species</b>		<b>7.5%</b>			<b>55.0%</b>	
<b>Non-native Herbaceous Species</b>						
<i>Hypochaeris glabra</i> *	smooth cat's-ear	0.6%	0.7%	0.6%	3.2%	100.0%
<i>Aira caryophyllea</i>	common silver-hair grass	0.0%	--	--	0.0%	0.0%
<i>Erodium cicutarium</i> *	red-stemmed filaree	0.7%	0.5%	0.4%	3.5%	66.7%
<i>Centaurea melitensis</i> *	toalote	0.4%	0.4%	0.3%	1.8%	66.7%
<i>Avena barbata</i> *	slender wild oat	0.2%	0.4%	0.3%	1.0%	50.0%
<i>Bromus diandrus</i> *	ripgut brome	4.0%	7.9%	6.5%	21.1%	66.7%
<i>Bromus hordeaceus</i> *	soft chess	0.0%	--	--	0.0%	0.0%
<i>Silene gallica</i> *	windmill pink	0.0%	--	--	0.0%	0.0%
<i>Petrorhagia dubia</i> *	hairypink	0.0%	--	--	0.0%	0.0%
<i>Logfia gallica</i> *	narrowleaf cottonrose	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Rumex acetosella</i> *	sheep sorrel	0.0%	--	--	0.0%	0.0%
<i>Festuca myuros</i> *	rattail fescue	0.2%	0.2%	0.2%	1.1%	83.3%
<b>Total Cover by Non-native Herbaceous Species</b>		<b>6.1%</b>			<b>44.4%</b>	
<b>Total Mean Non-native Grass Species Cover</b>		<b>4.4%</b>				
<b>Total Cover by All Herbaceous Species</b>		<b>13.6%</b>				
<b>Total Mean All Vegetative Cover</b>		<b>13.7%</b>				
<b>Total Mean Native Vegetative Cover</b>		<b>7.6%</b>			<b>55.6%</b>	
<b>Total Mean Bare ground</b>		<b>86.3%</b>				

\*non-native species

**HMP species in bold**

Note: Not all species observed along transects listed in this table

**Table 6-12**  
**2012 - 2016 Cover and Frequency of Herbaceous Species in South Range 44 Grassland (6 Quadrats)**

ESCA RP 2016 Annual Natural Resource Report - Appendix A

Scientific Name	Common Name	Post-activity Data 2016 (Year 5)				
		Six Quadrats in South Range 44 Grassland				
		Mean Percent Cover	Standard Deviation	90% Confidence Interval	Relative Percent Cover	Mean Frequency
<b>Shrub and Subshrub Species</b>						
<i>Frangula californica</i> subsp. <i>californica</i>	California coffee berry	0.0%	--	--	0.0%	0.0%
<i>Lupinus chamissonis</i>	silver bush lupine	0.2%	0.4%	0.3%	0.5%	16.7%
<b>Total Cover by Native Shrub and Subshrub Species</b>		0.2%			0.6%	
<b>Native Herbaceous Species</b>						
<b><i>Chorizanthe pungens</i> var. <i>pungens</i></b>	<b>Monterey spineflower</b>	<b>0.9%</b>	<b>0.9%</b>	<b>0.8%</b>	<b>3.0%</b>	<b>66.7%</b>
<i>Layia platyglossa</i>	tidytips	6.0%	6.0%	4.9%	19.7%	83.3%
<i>Lessingia pectinata</i> var. <i>pectinata</i>	common lessingia	2.2%	2.8%	2.3%	7.1%	66.7%
<i>Eschscholzia californica</i>	California poppy	1.3%	2.4%	1.9%	4.1%	50.0%
<i>Lupinus nanus</i>	sky lupine	6.8%	5.6%	4.6%	22.4%	83.3%
<i>Calandrinia ciliata</i>	red maids	0.2%	0.4%	0.3%	0.5%	16.7%
<i>Castilleja exserta</i> subsp. <i>latifolia</i>	wideleaf purple owl's clover	0.2%	0.4%	0.3%	0.6%	33.3%
<i>Deinandra increscens</i> subsp. <i>increscens</i>	coast tarplant	0.7%	1.6%	1.3%	2.2%	33.3%
<i>Camissonia strigulosa</i>	strigose suncups	0.9%	1.6%	1.3%	2.8%	50.0%
<i>Acmispon strigosus</i>	strigose lotus	0.4%	0.5%	0.4%	1.4%	66.7%
<i>Heterotheca grandifolia</i>	telegraph weed	0.2%	0.4%	0.3%	0.6%	33.3%
<i>Cryptantha micromeres</i>	small-flowered cryptantha	0.1%	0.2%	0.2%	0.3%	33.3%
<i>Cryptantha microstachys</i>	Tejon cryptantha	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Plantago erecta</i>	California plantain	0.2%	0.2%	0.2%	0.6%	50.0%
<i>Crassula connata</i>	pygmy weed	0.0%	--	--	0.0%	0.0%
<i>Trifolium ciliolatum</i>	foothill clover	0.0%	--	--	0.0%	0.0%
<i>Trifolium gracilentum</i>	pinpoint clover	0.5%	0.8%	0.7%	1.6%	33.3%
<i>Trifolium microcephalum</i>	hairy clover, small-headed clover	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Eriastrum virgatum</i>	wand woollystar	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Festuca octoflora</i>	six-weeks fescue	0.2%	0.4%	0.3%	0.5%	16.7%
<i>Nuttallanthus texanus</i>	blue toad-flax	0.1%	0.2%	0.2%	0.4%	50.0%
<i>Croton californicus</i>	California croton	0.0%	--	--	0.0%	0.0%
<i>Erigeron canadensis</i>	horseweed	0.0%	--	--	0.0%	0.0%
<i>Logfia filaginoides</i>	California filago	0.1%	0.2%	0.2%	0.3%	16.7%
<i>Galium californicum</i>	California bedstraw	0.0%	--	--	0.0%	0.0%
<b>Total Cover by Native Herbaceous Species</b>		20.0%			67.3%	
<b>Non-native Herbaceous Species</b>						
<i>Hypochaeris glabra</i> *	smooth cat's-ear	0.8%	0.7%	0.6%	2.5%	83.3%
<i>Aira caryophylla</i>	common silver-hair grass	0.1%	0.2%	0.2%	0.3%	16.7%
<i>Erodium cicutarium</i> *	red-stemmed filaree	0.2%	0.2%	0.1%	0.5%	83.3%
<i>Centaurea melitensis</i> *	toalote	0.4%	0.8%	0.7%	1.3%	66.7%
<i>Avena barbata</i> *	slender wild oat	1.8%	2.5%	2.1%	5.8%	66.7%
<i>Bromus diandrus</i> *	ripgut brome	5.3%	7.7%	6.3%	17.4%	66.7%
<i>Bromus hordeaceus</i> *	soft chess	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Silene gallica</i> *	windmill pink	0.0%	0.1%	0.0%	0.1%	33.3%
<i>Petrorhagia dubia</i> *	hairypink	0.6%	0.5%	0.4%	2.0%	83.3%
<i>Logfia gallica</i> *	narrowleaf cottonrose	0.0%	0.0%	0.0%	0.1%	16.7%
<i>Rumex acetosella</i> *	sheep sorrel	0.0%	--	--	0.0%	0.0%
<i>Festuca myuros</i> *	rattail fescue	0.4%	0.8%	0.7%	1.2%	50.0%
<b>Total Cover by Non-native Herbaceous Species</b>		9.5%			32.1%	
<b>Total Mean Non-native Grass Species Cover</b>		7.5%				
<b>Total Cover by All Herbaceous Species</b>		<b>29.5%</b>				
<b>Total Mean All Vegetative Cover</b>		<b>29.7%</b>				
<b>Total Mean Native Vegetative Cover</b>		<b>20.2%</b>			<b>68.1%</b>	
<b>Total Mean Bare ground</b>		<b>70.4%</b>				

\*non-native species

**HMP species in bold**

Note: Not all species observed along transects listed in this table

**Table 6-13  
Interim Action Ranges MRA 2016 Performance Criteria Status**

ESCA RP 2016 Annual Natural Resource Report – Appendix A

Activity Category	Location	Performance Category	Performance Metric	Performance Target for Post-activity Area by Monitoring Year							2016 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 <sup>1</sup>	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%	South Range 44 (Year 5): 57.5% native cover	Year 7
		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 6-13  
Interim Action Ranges MRA 2016 Performance Criteria Status**

ESCA RP 2016 Annual Natural Resource Report – Appendix A

Activity Category	Location	Performance Category	Performance Metric	Performance Target for Post-activity Area by Monitoring Year							2016 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: 23.8 % native cover (meets Year 4 target); South Range 44: 18.6% native cover (meets Year 3 target)	Year 4 - North Range 44; Year 3 - South Range 44
		HMP shrub species richness (max. value =3 HMP species, or 100%)	% of total present	0%	0%	33%	33%	33%	66%	66%		--
		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%	Year 7 Targets met in 2015	--
		Seaside bird's beak presence	% focus species baseline (baseline = 3.3 seaside bird's beak/plot in North Range 44; no seaside bird's-beak found in baseline conditions where small-scale excavation performed in South Range 44 or Range 47 Subarea C)	0%	0%	0%	5%	5%	5%	5%		--
		Pampas grass, iceplant, and French broom recruits	% total area	<5%	<5%	<5%	<5%	<5%	<5%	<5%		
	Grassland grid cell in South Range 44 SCA	Total Species Richness	% baseline (baseline = 18 species)	10%	20%	30%	40%	45%	50%	50%	Year 7 Target met in 2015	--
		Native vegetation cover	% cover	8%	12%	20%	25%	30%	35%	40%	South Range 44 grassland: 20.2% Year 5 native cover slightly exceeds 19% baseline native cover, but is lower than 40% performance target <sup>2</sup>	Year 3*
		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%		--

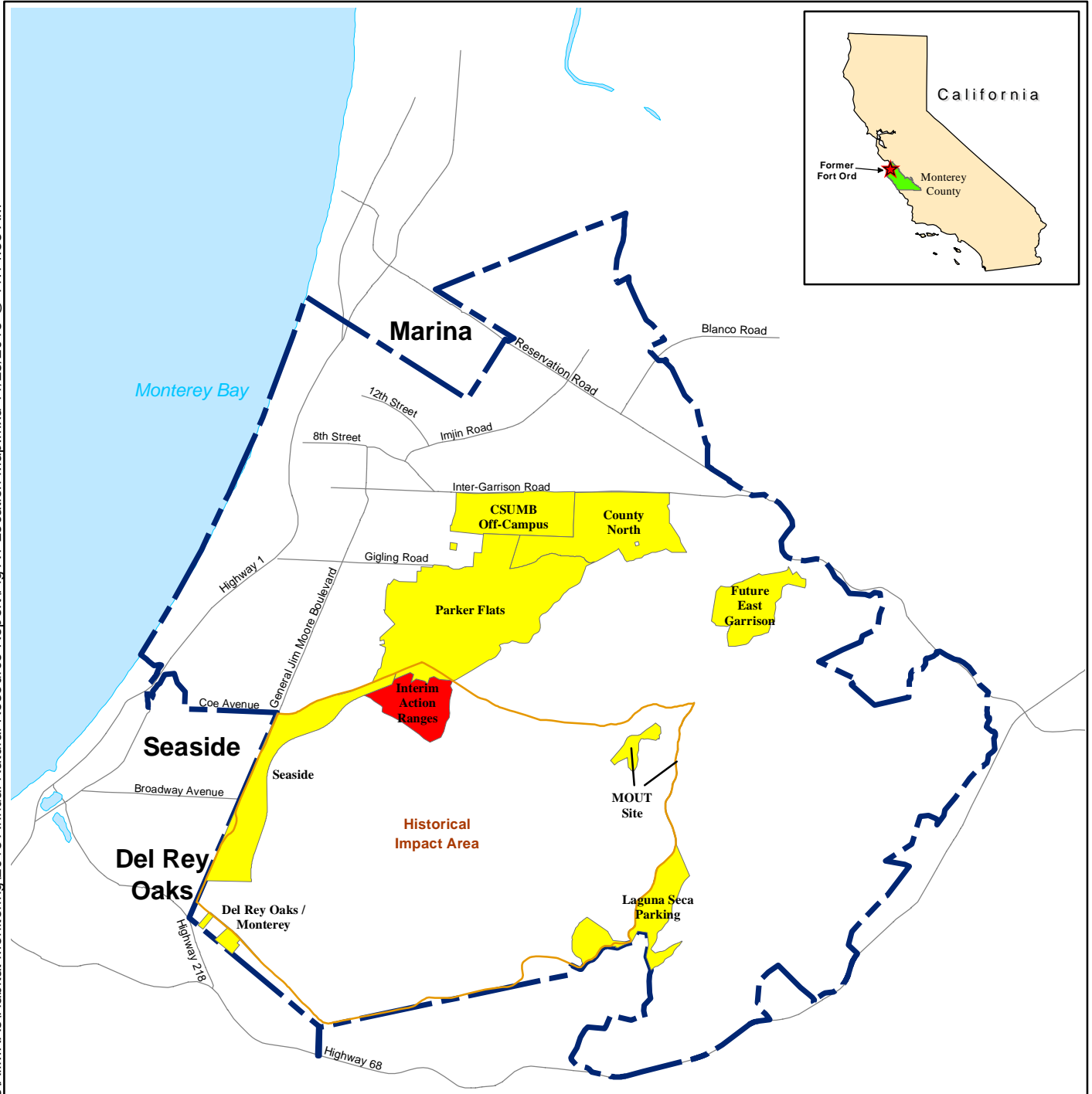
**Table 6-13  
Interim Action Ranges MRA 2016 Performance Criteria Status**

ESCA RP 2016 Annual Natural Resource Report – Appendix A

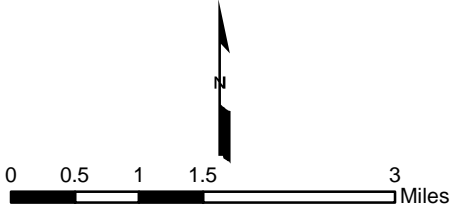
Activity Category	Location	Performance Category	Performance Metric	Performance Target for Post-activity Area by Monitoring Year							2016 Status	Monitoring Year Status
				Monitoring Years								
				1	2	3	4	5	6	7		
Large-scale soil excavation (Activity D)	Range 47 Subarea A (low recruitment area)	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%		--

<sup>1</sup> Please refer to Section 6 of Appendix A, where each performance category and target are explained in more detail.

Z:\GISPROJECTS\ENVI\FortOrd\0959516\_GIS\Projects\AIMRAs\Habitat Monitoring\2015 Annual Natural Resource Report\Fig A1\_Location Map.mxd 11/23/2015 @ 11:14:33 AM



- Interim Action Ranges MRA
- Other ESCA MRAs
- Impact Area Boundary
- Former Fort Ord Boundary
- Major Road

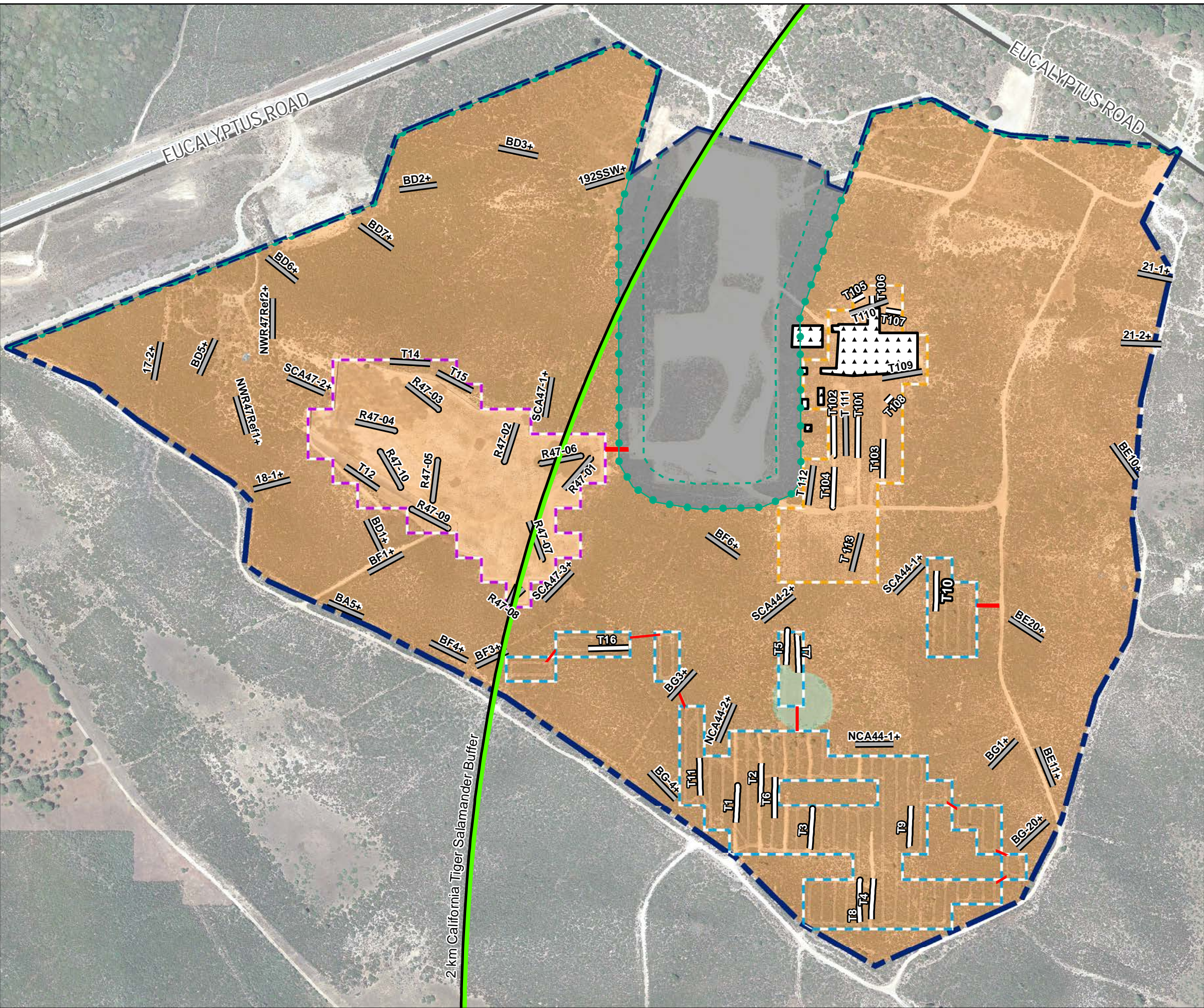


2016 Annual Natural Resource Report  
 Appendix A  
 Interim Action Ranges MRA  
**Location Map**  
 FORA ESCA RP  
 Monterey County, California

**Figure A1**



Document Path: Z:\GIS\Projects\ENV\FortOrd\095956\_GIS\Projects\AllMRA\Habitat Monitoring\2016 Annual Natural Resource Report\Fig A2 IAR Monitoring Locations and Veg Comm.mxd



### Legend

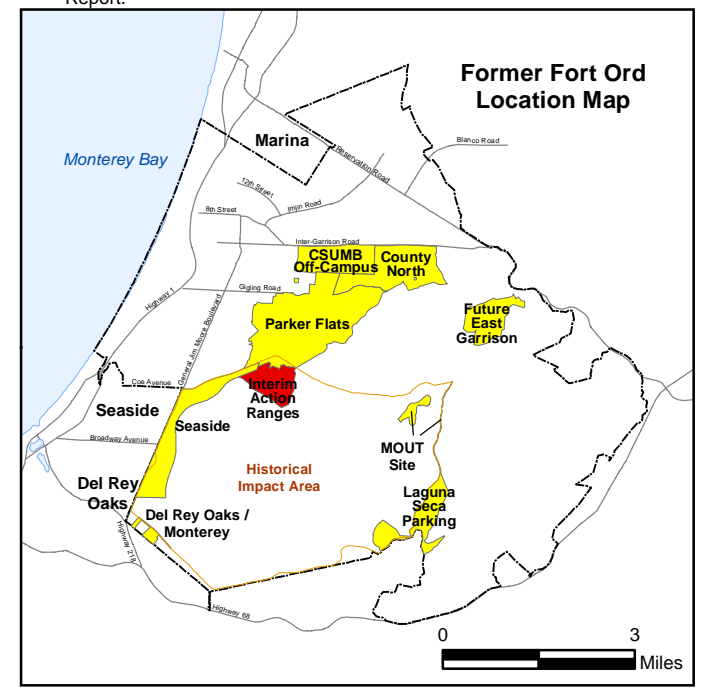
- Munitions Response Area
- Major Road
- Development Parcel
- Improved Ingress/Egress Established by ESCA RP Team
- Site 39 (HA44) US Army Action
- North Range 44 SCA
- South Range 44 SCA/Central Area NCA
- Range 47 SCA
- 23 2016 Vegetation Transects
- 24 Areas Met Performance Target in 2015 or Baseline 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

0 400 800 Feet

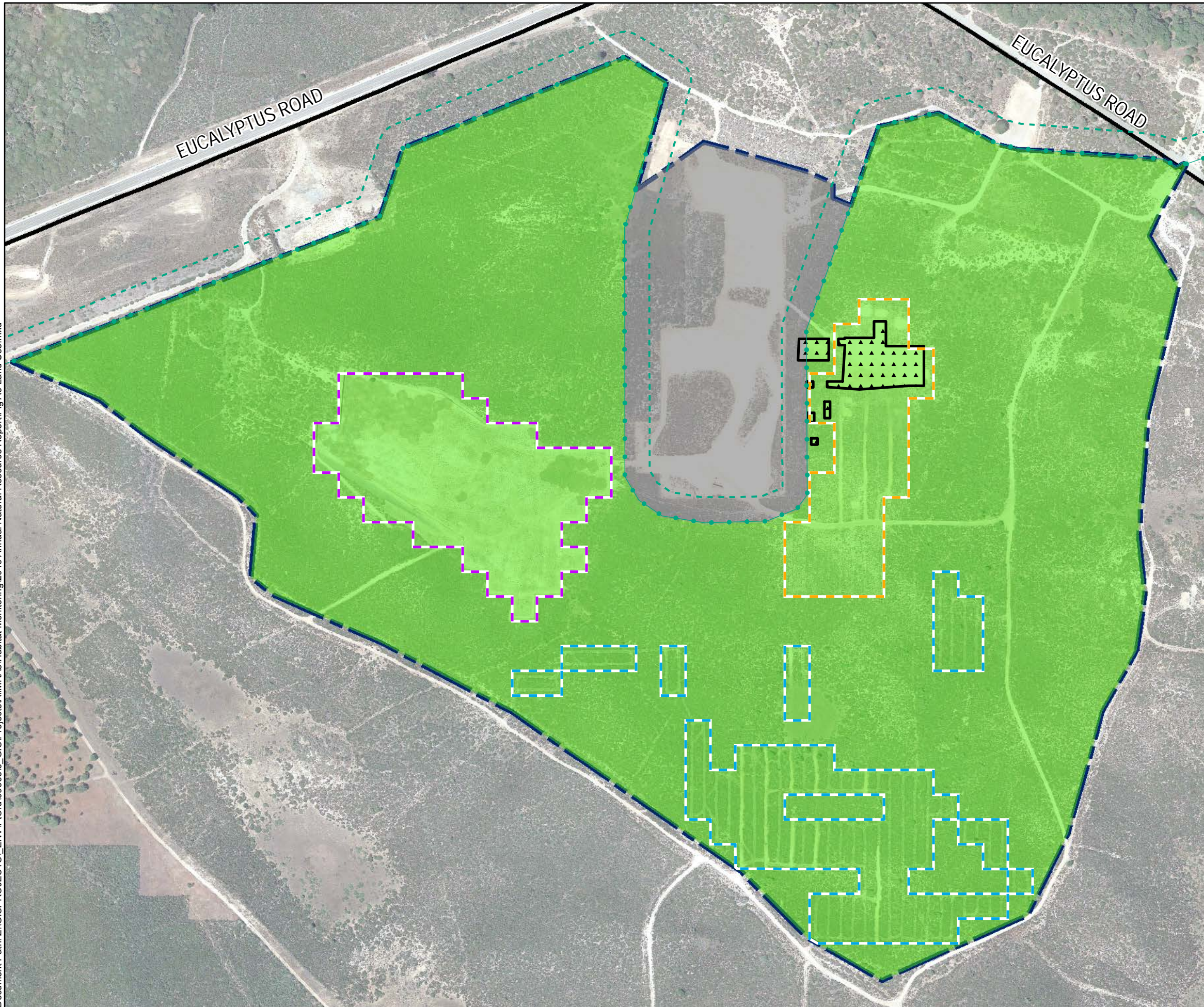


**2016 Annual Natural Resource Report**  
**Appendix A**  
**Interim Action Ranges MRA**  
**Vegetation Monitoring and HMP**  
**Herbaceous Survey Locations**  
 FORA ESCA RP  
 Monterey County, California

**Figure A2**

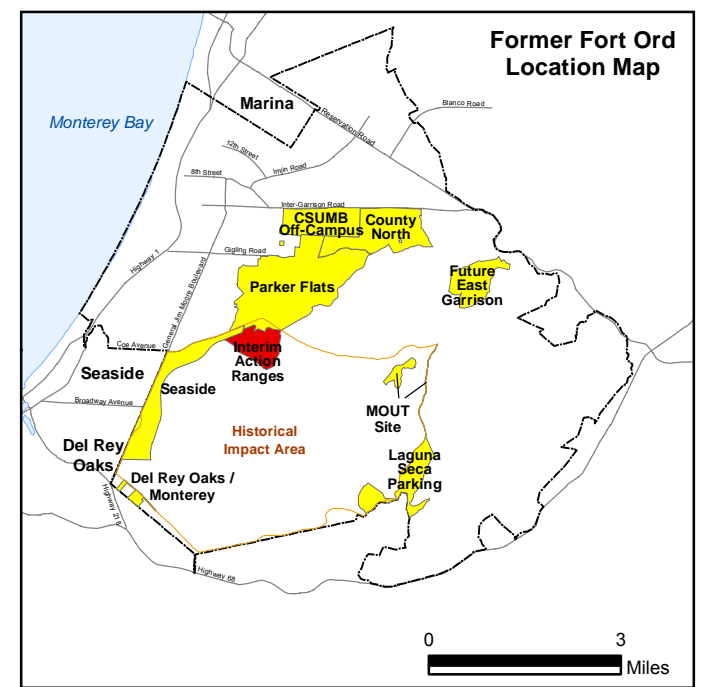


Document Path: Z:\GIS\PROJECTS\ENV\F\ORD\095956\_GIS\Projects\AIM\MRAs\Habitat Monitoring\2015 Annual Natural Resource Report\Fig A3 Land Use.mxd



### Legend

- Munitions Response Area
- Major Road
- Site 39 (HA44) US Army Action
- North Range 44 SCA
- South Range 44 SCA/Central Area NCAs
- Range 47 SCA
- Borderland Interface
- 100-Foot Buffer from Borderland Interface
- Habitat Reserve
- Development Parcel



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

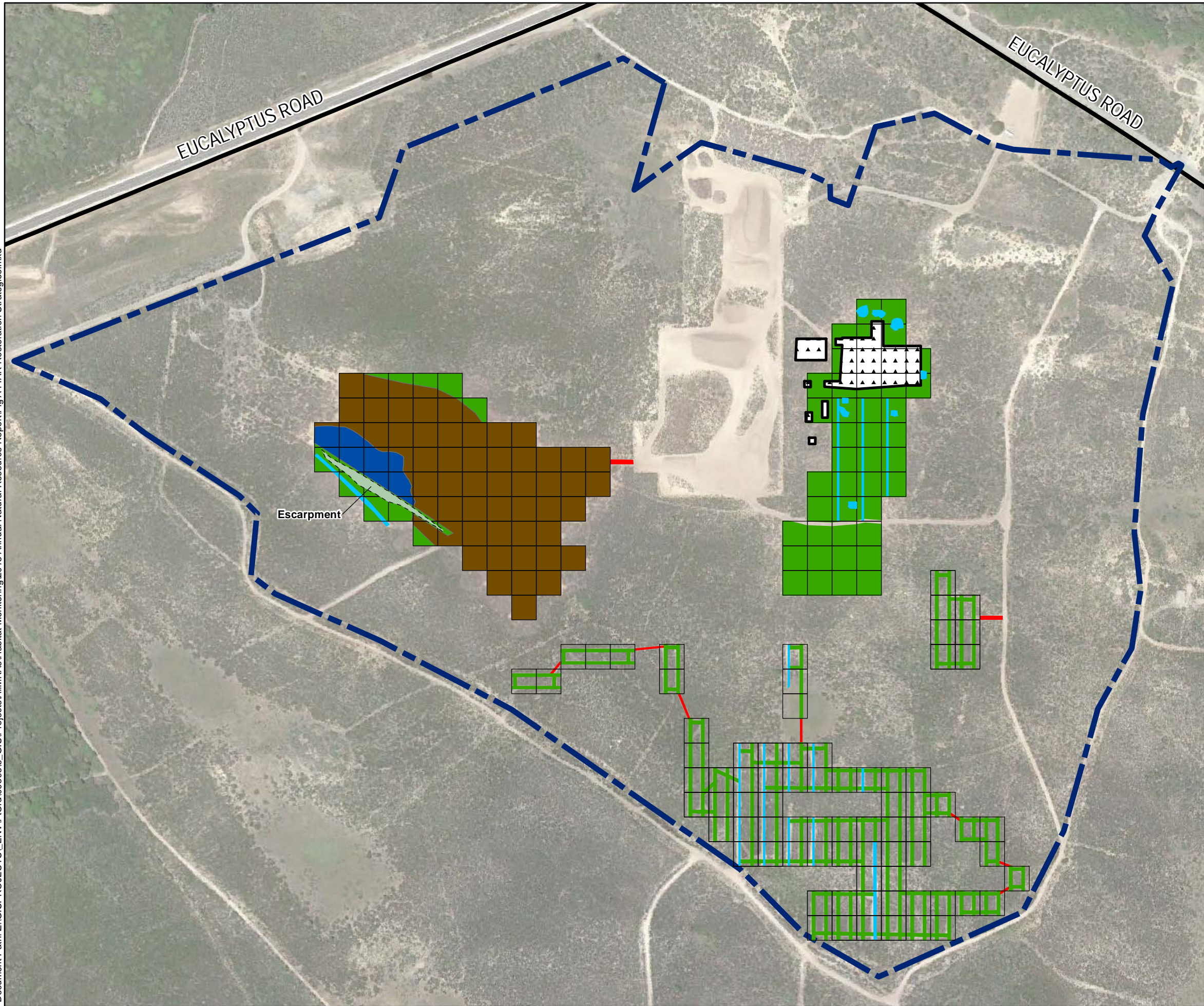
0 400 800 Feet



2016 Annual Natural Resource Report  
 Appendix A  
 Interim Action Ranges MRA  
**Designated Future Land Use**  
 FORA ESCA RP  
 Monterey County, California

**Figure A3**

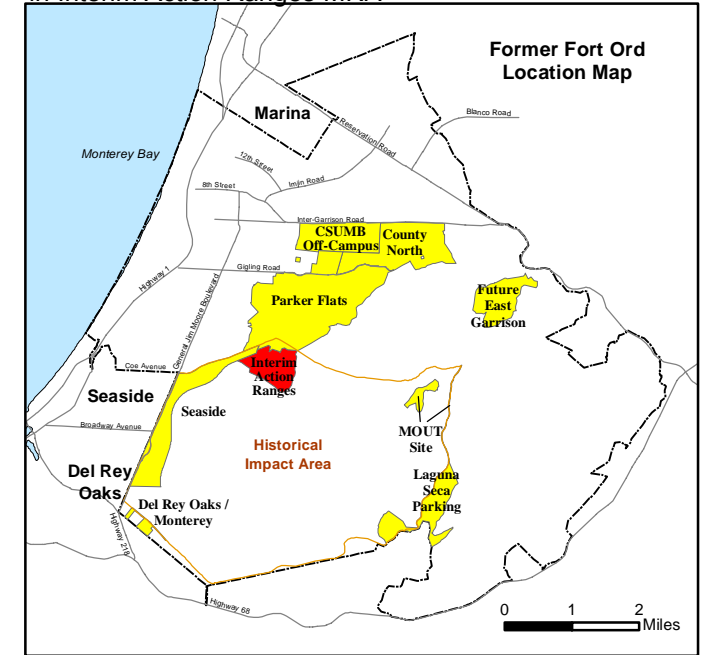




### Legend

- 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

NOTE: Schematic representation of restoration activities in Interim Action Ranges MRA



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

0 400 800 Feet

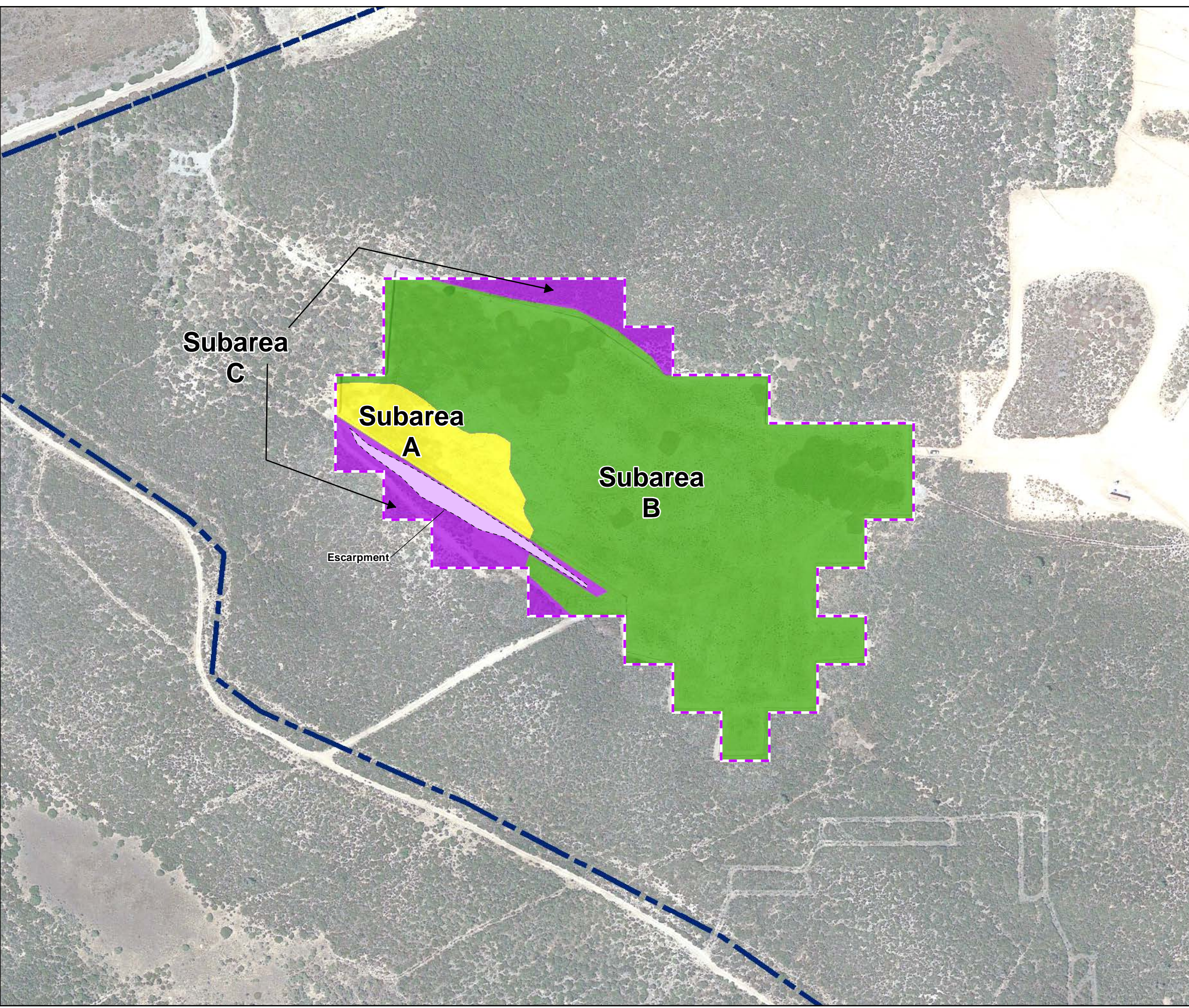


2016 Annual Natural Resource Report  
 Appendix A  
 Interim Action Ranges MRA  
**Restoration Activities**  
 FORA ESCA RP  
 Monterey County, California







**Figure A4**

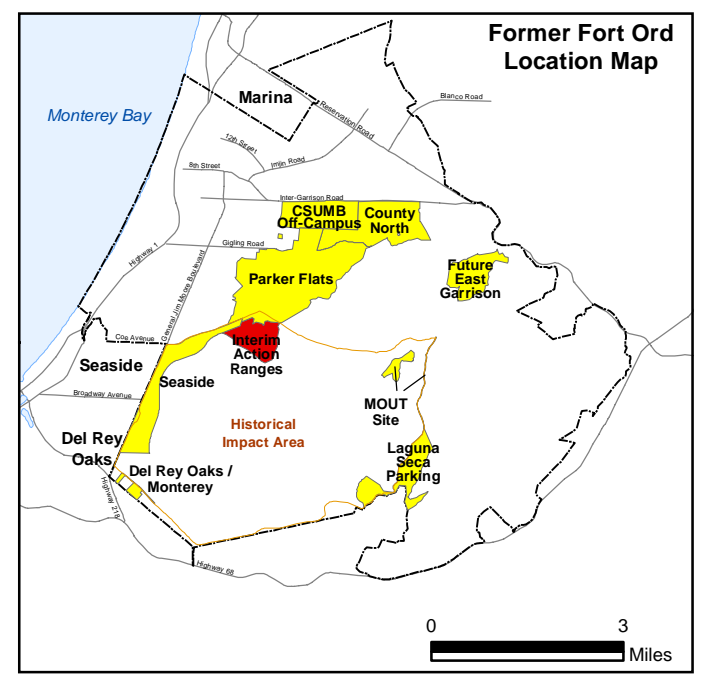


Document Path: Z:\GIS\PROJECTS\ ENV\FORd\095956\_GIS\PROJECTS\Habitat\_Monitoring\2015 Annual Natural Resource Report\Fig A5 IAR\_R47\_Detail\_and\_Subareas.mxd

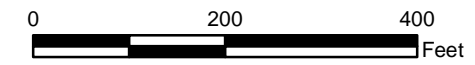


### Legend

-  Munitions Response Area
-  Range 47 SCA
-  Subarea A - Topsoil Replacement and Seeding of Large-scale Soil Excavation Area
-  Subarea B - Topsoil Replacement, Seeding, and Container Planting of Large-scale Soil Excavation Area
-  Subarea C - Vegetation Cutting and Target-specific Areas, and Seeding of Small-scale Excavation Areas
-  Subarea C - Low-recruitment Escarpment Subject to Small-scale and Target-specific Excavation Areas



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

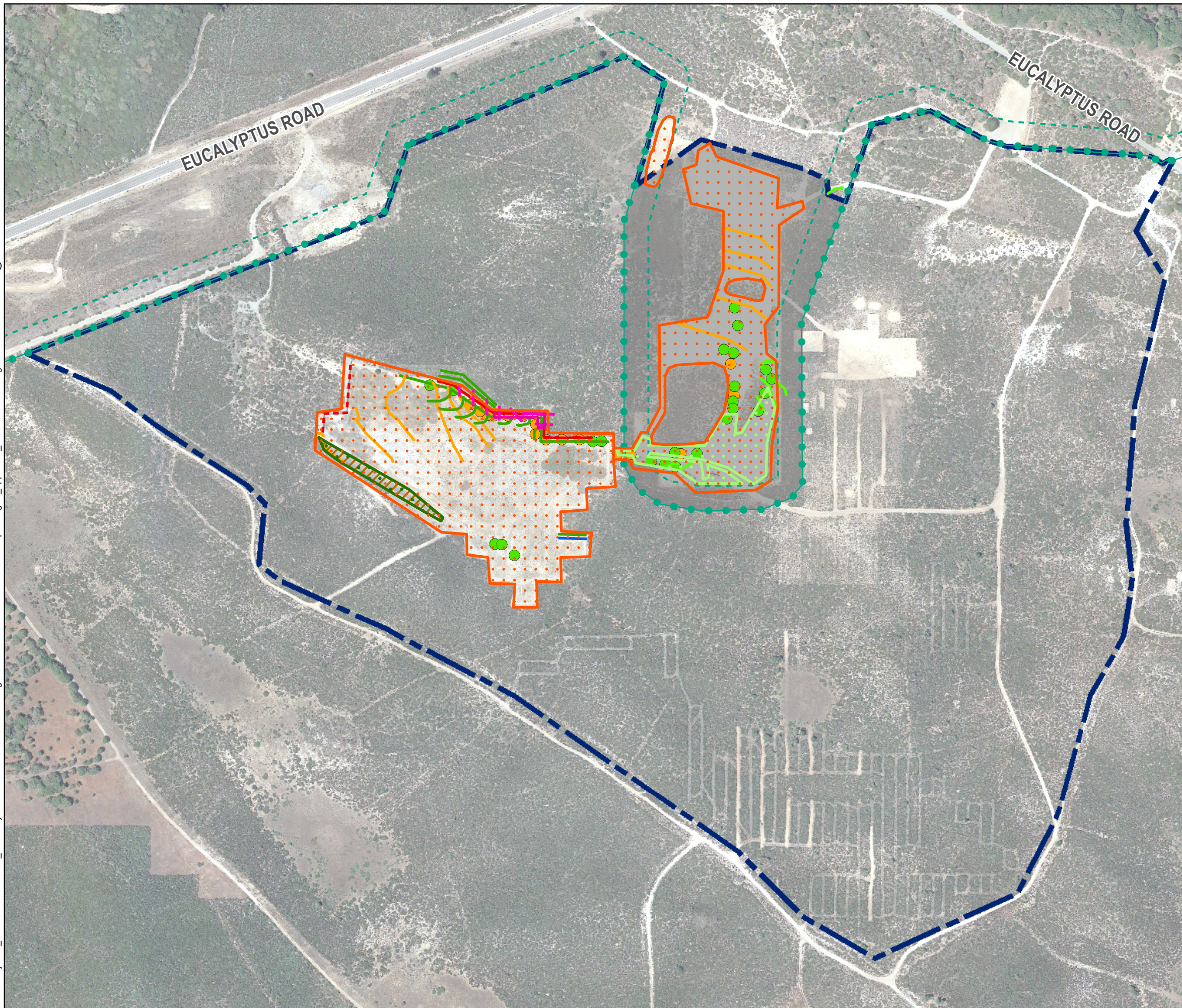


2016 Annual Natural Resource Report  
 Appendix A  
 Interim Action Ranges MRA  
**Range 47 SCA Subareas**  
 FORA ESCA RP  
 Monterey County, California

**Figure A5**



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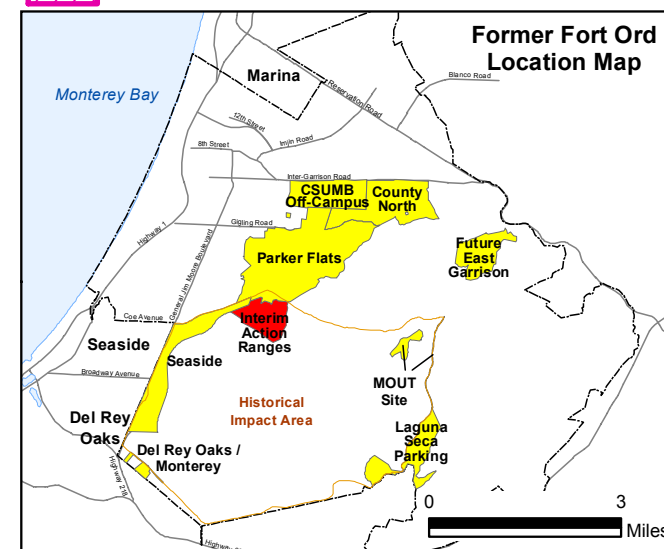


### Legend

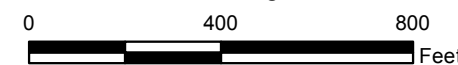
- Major Road
- Munitions Response Area
- Development Parcel
- Borderland Interface
- - - 100-Foot Buffer from Borderland Interface

### Erosion Control Measures

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



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

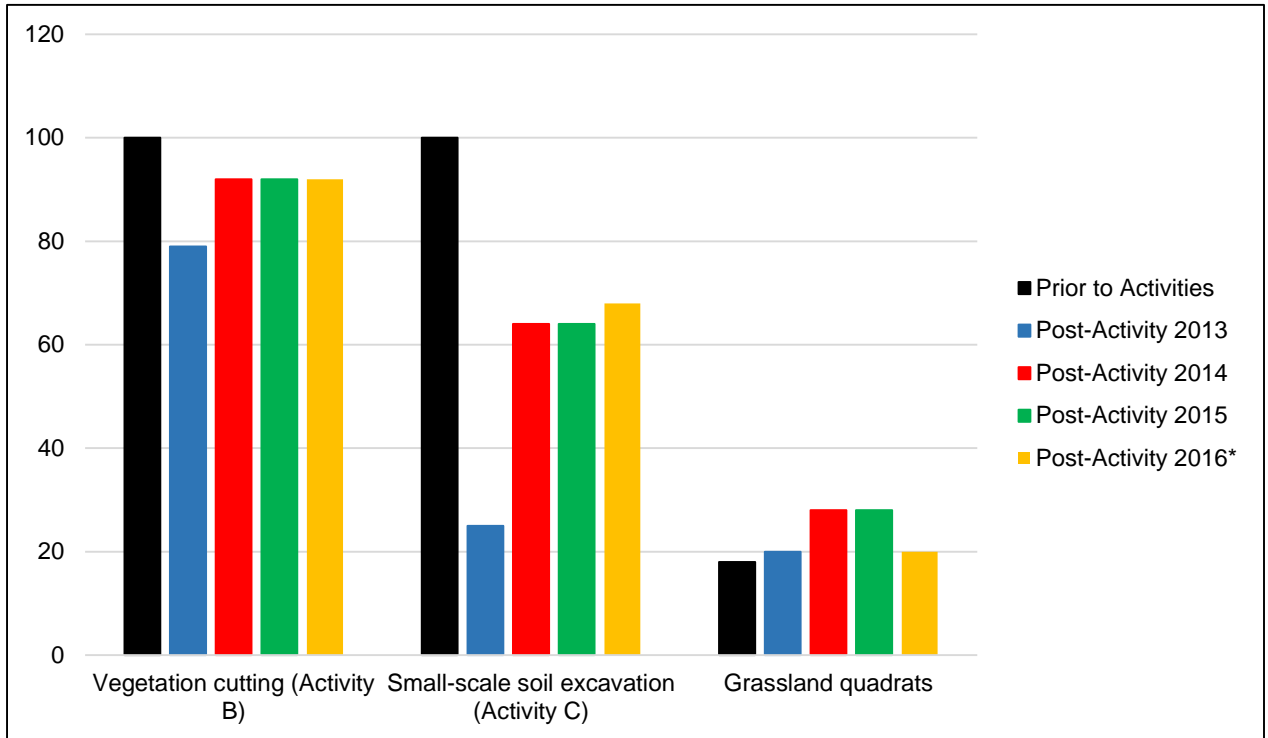


2016 Annual Natural Resource Report  
Appendix A  
Interim Action Ranges MRA  
Erosion Control BMPs in Interim  
Action Ranges MRA  
2013-2016  
FORA ESCA RP  
Monterey County, California

Figure A6

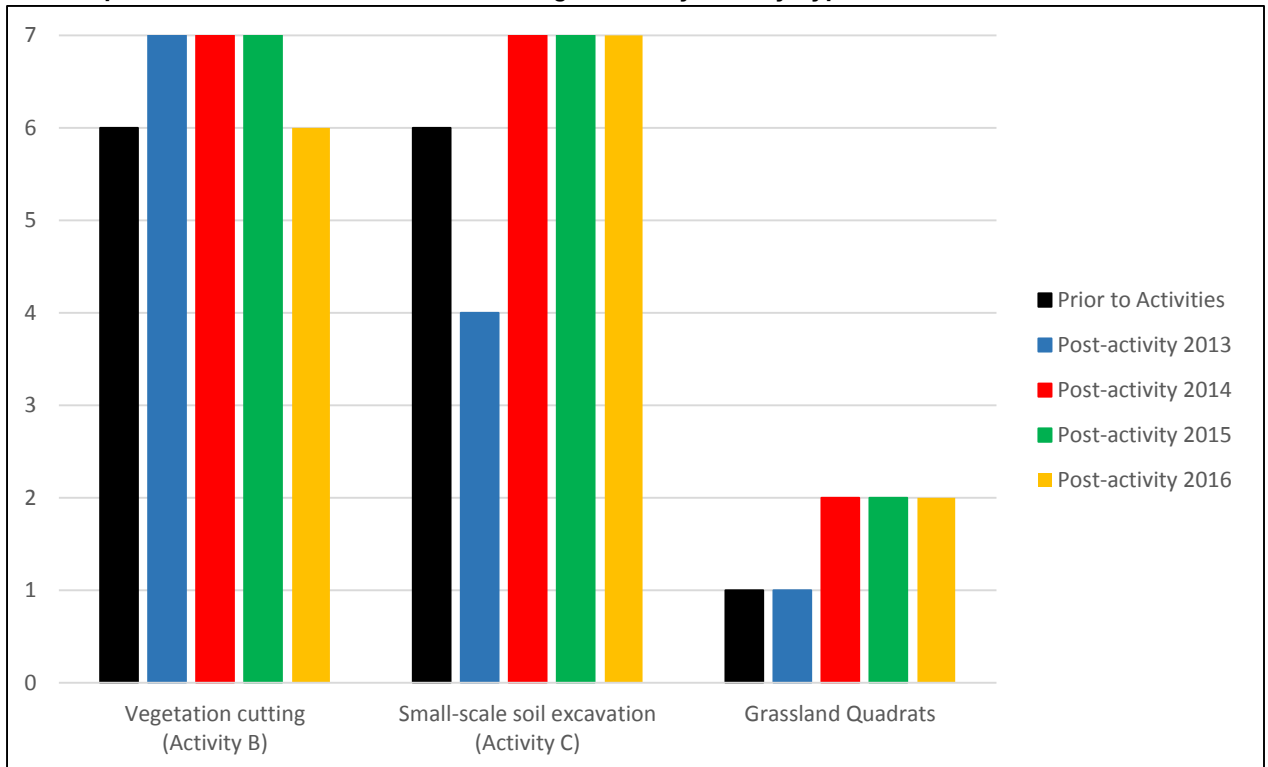


**Figure A7**  
**Native Species Richness in Interim Action Ranges MRA by Activity Type and Year 2010 – 2016**



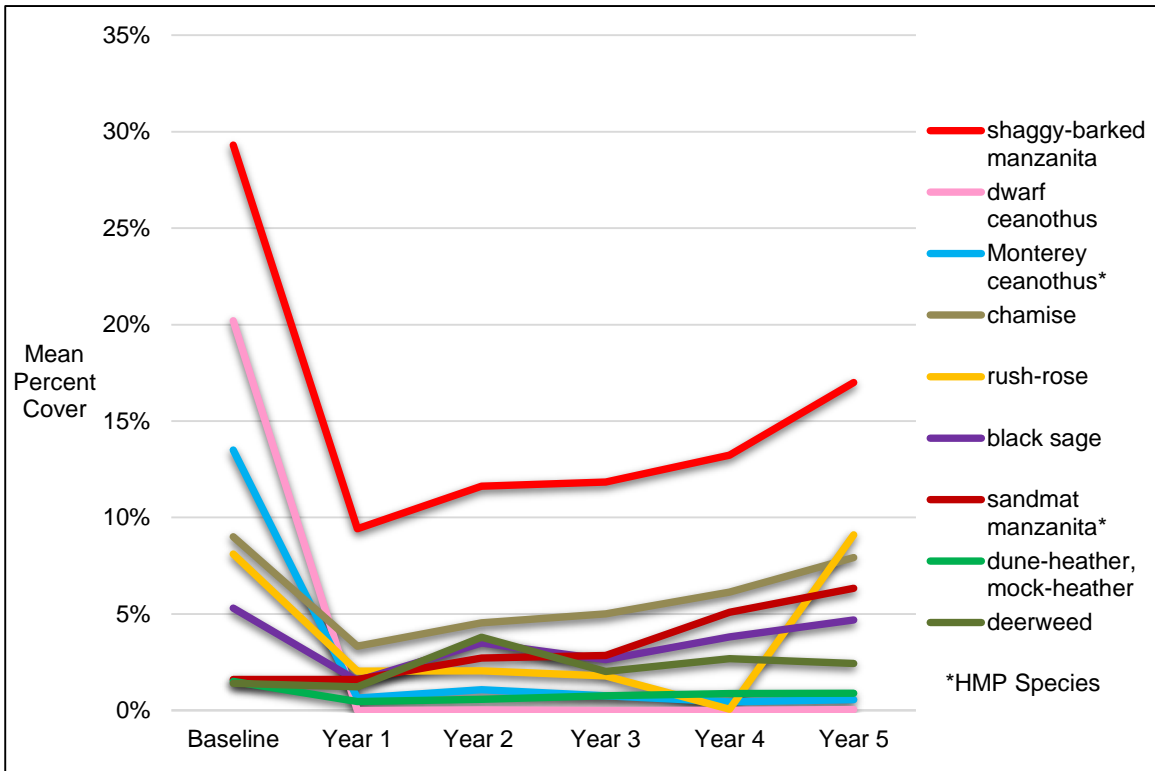
\*In 2016, Activity B transects were not monitored in North Range 44

**Figure A8**  
**HMP Species Presence in Interim Action Ranges MRA by Activity Type and Year 2010 - 2016**

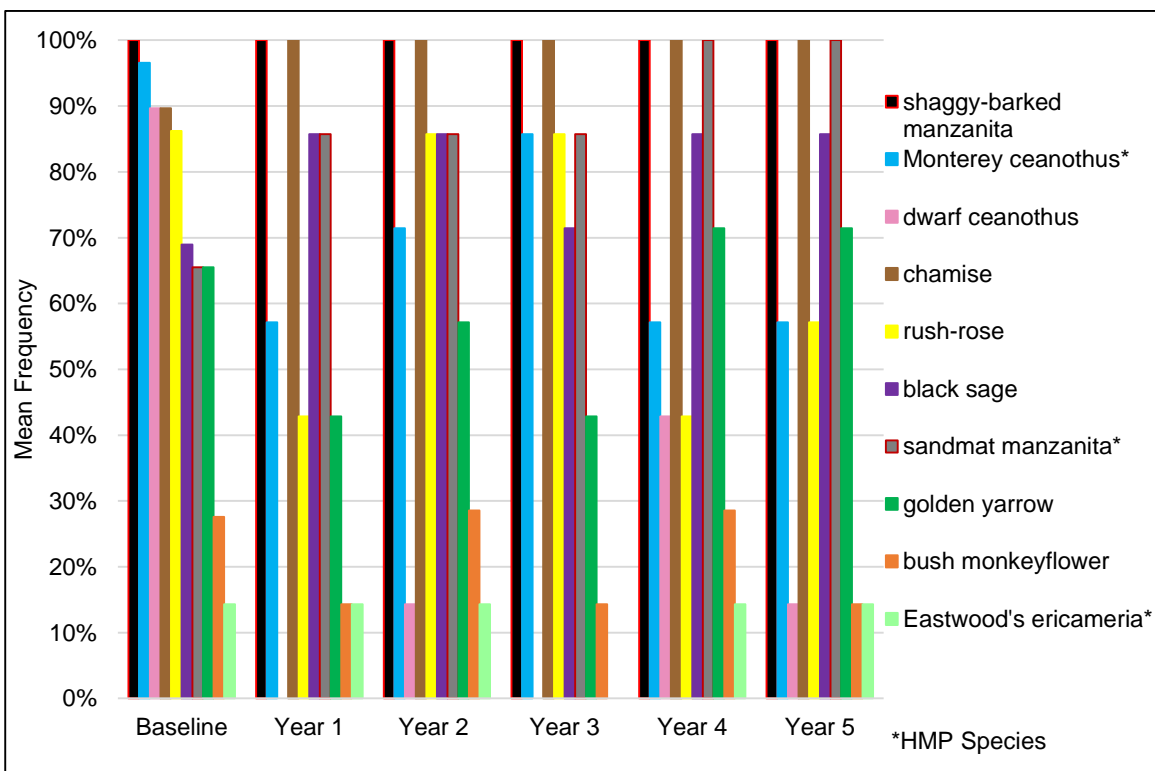


Maximum number of HMP species in Interim Action Ranges is seven.  
 Observed HMP species sandmat manzanita, Monterey ceanothus, Eastwood's ericameria, Monterey spineflower, seaside bird's-beak, coast wallflower, and sand (Monterey) gilia.

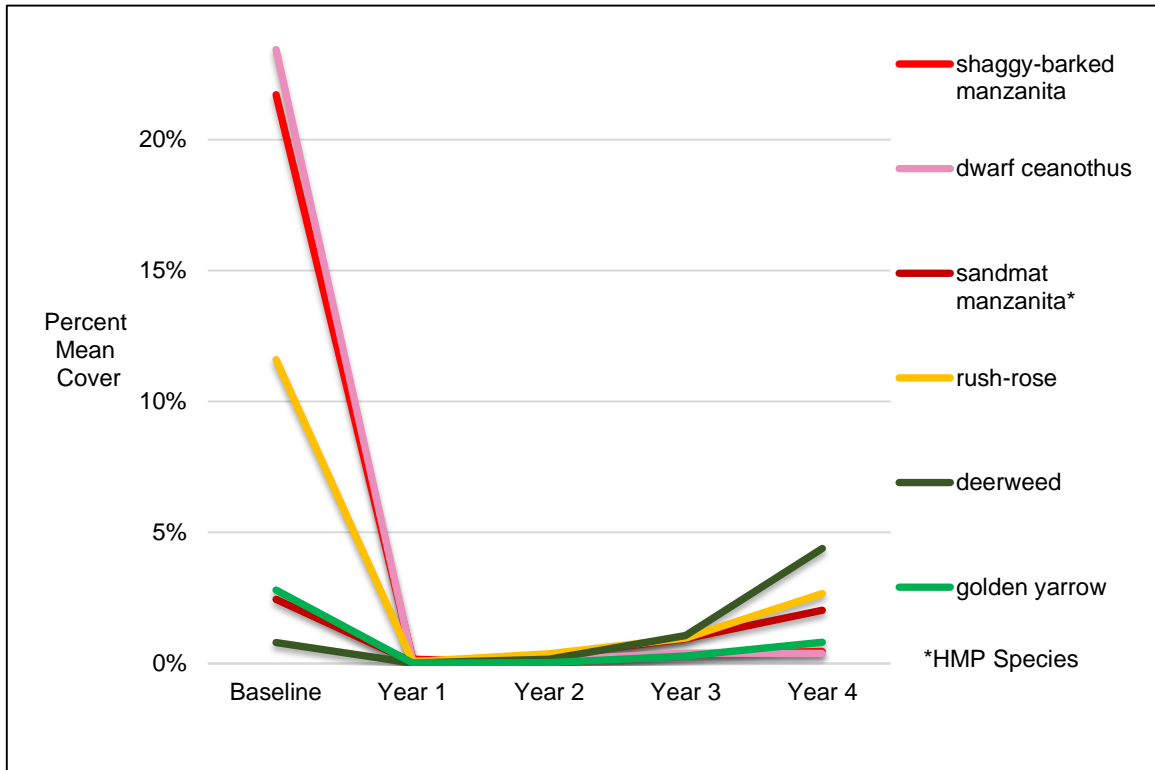
**Figure A9**  
**South Range 44 SCA and Central NCAs – Mean Shrub Cover after Vegetation Cutting**



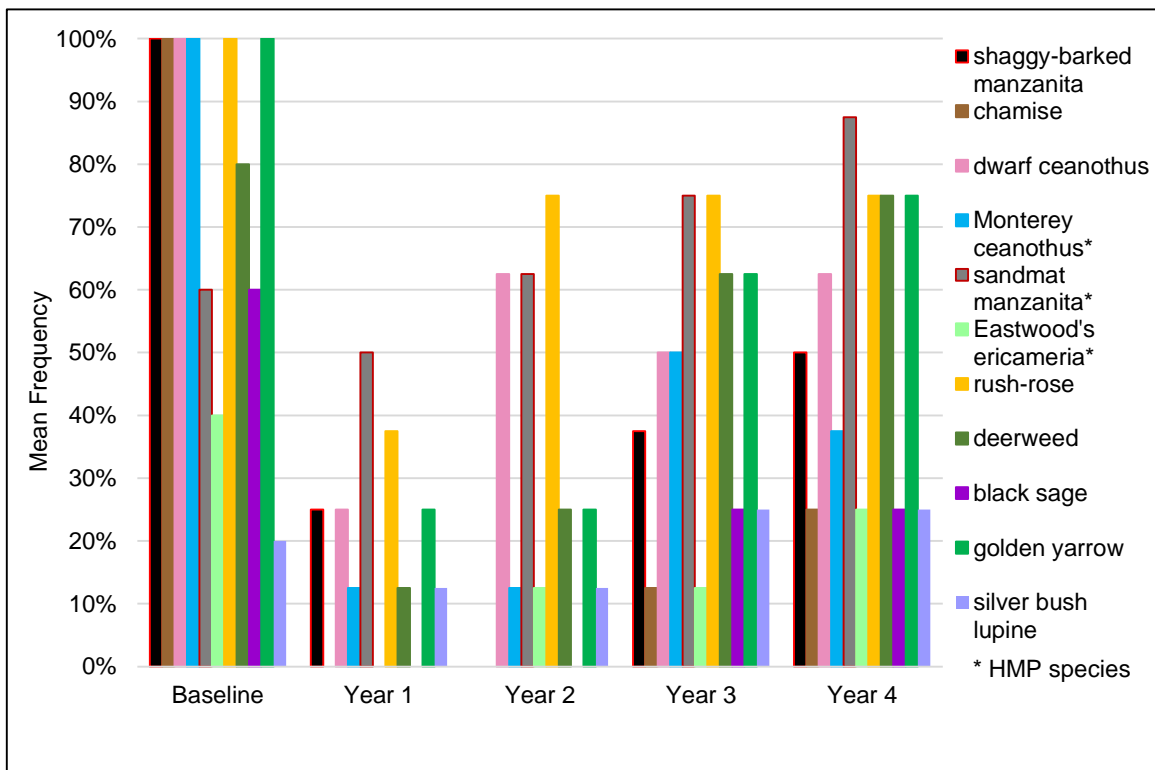
**Figure A10**  
**South Range 44 SCA and Central NCAs – Mean Frequency of Shrub Species after Vegetation Cutting**



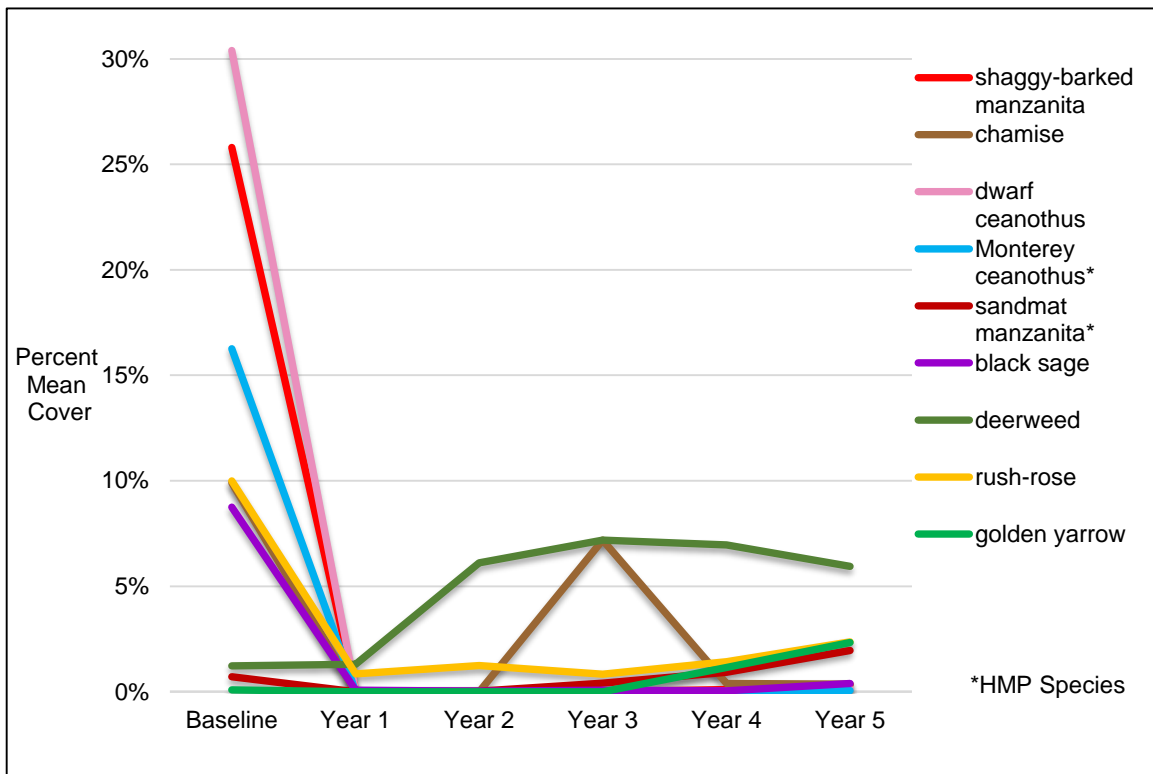
**Figure A11**  
**North Range 44 SCA– Mean Shrub Cover after Small-scale Excavation**



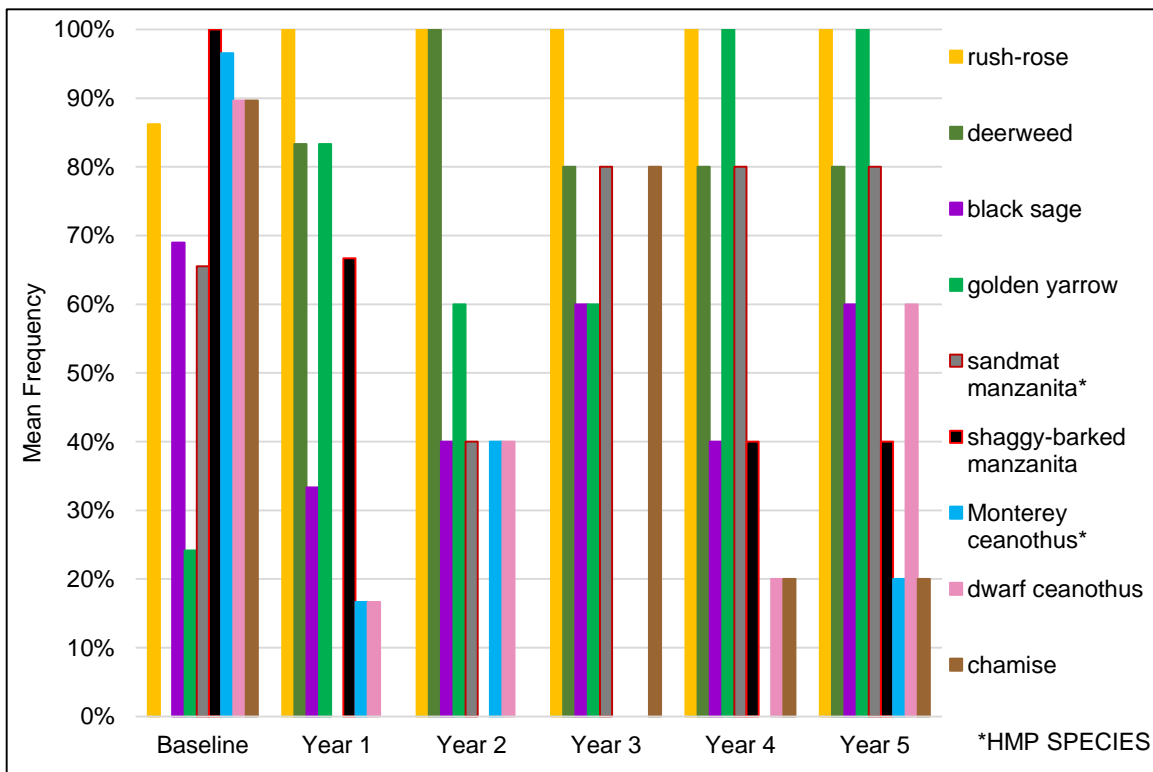
**Figure A12**  
**North Range 44 SCA – Mean Frequency of Shrub Species after Small-scale Excavation**



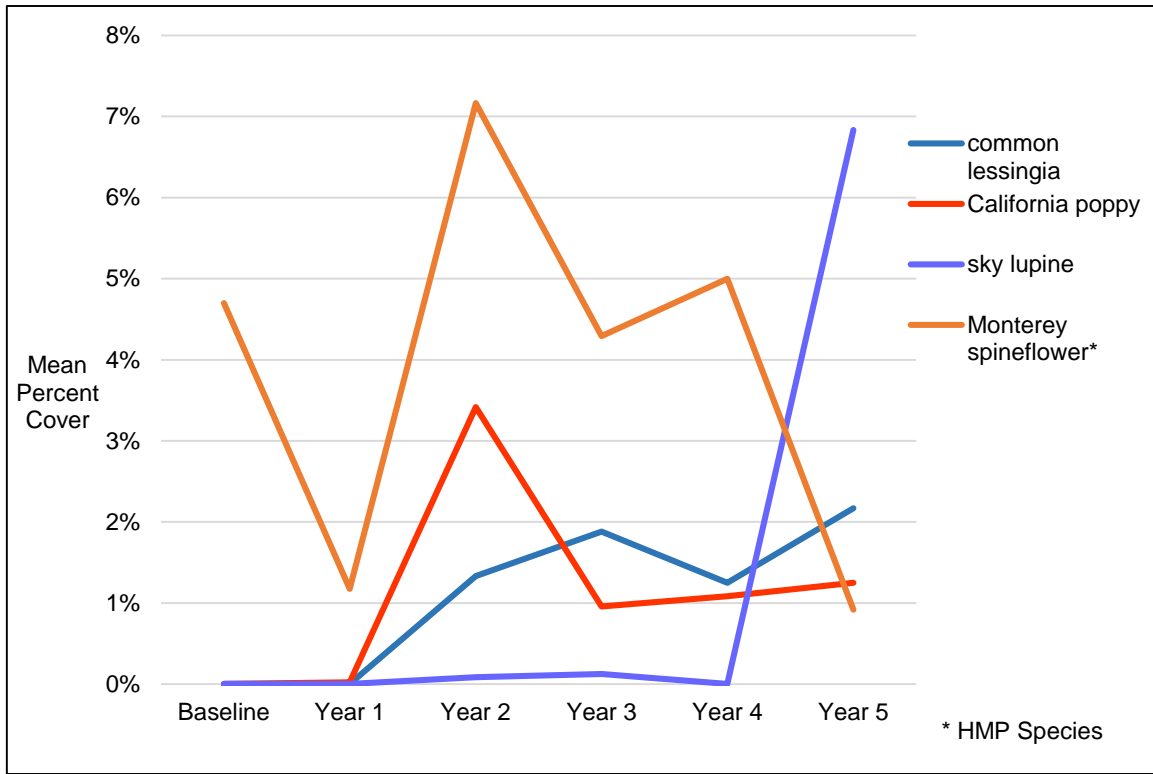
**Figure A13**  
**South Range 44 SCA and Central NCAs – Mean Shrub Cover after Small-scale Excavation**



**Figure A14**  
**South Range 44 SCA and Central NCAs– Mean Frequency of Shrub Species after Small-scale Excavation**



**Figure A15**  
**South Range 44 SCA and Central NCAs– Mean Herbaceous in Grassland Quadrats**





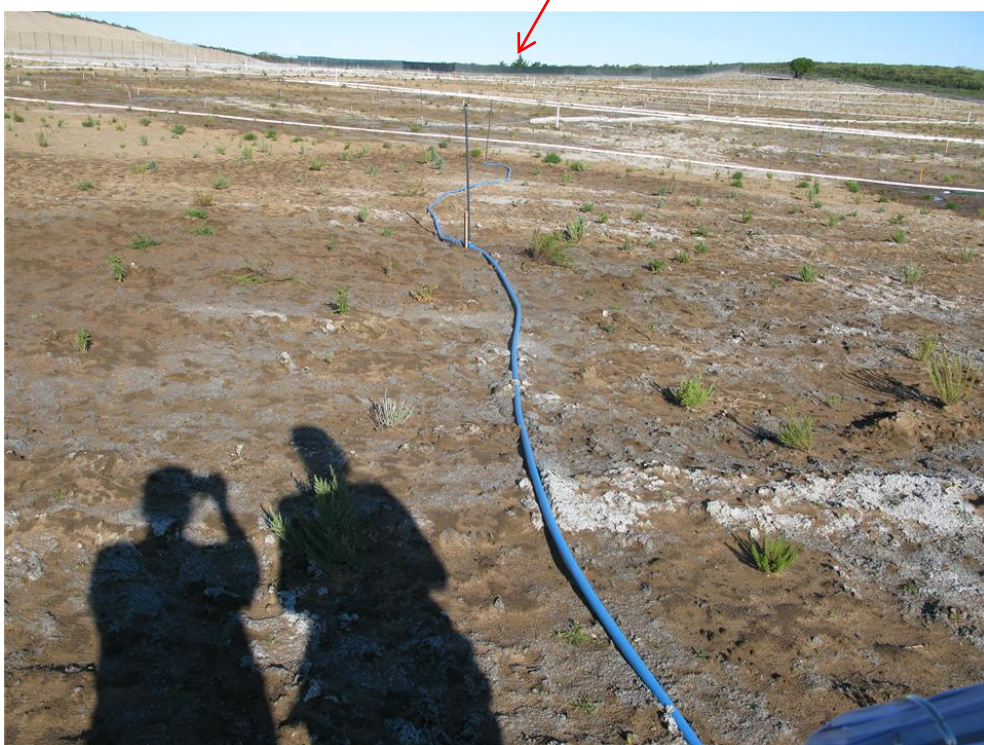


**Photograph 1**

Range 47  
Restoration Area.

Restoration area  
after soil  
backfilling; west  
facing photo  
point.

7 January 2013



**Photograph 2**

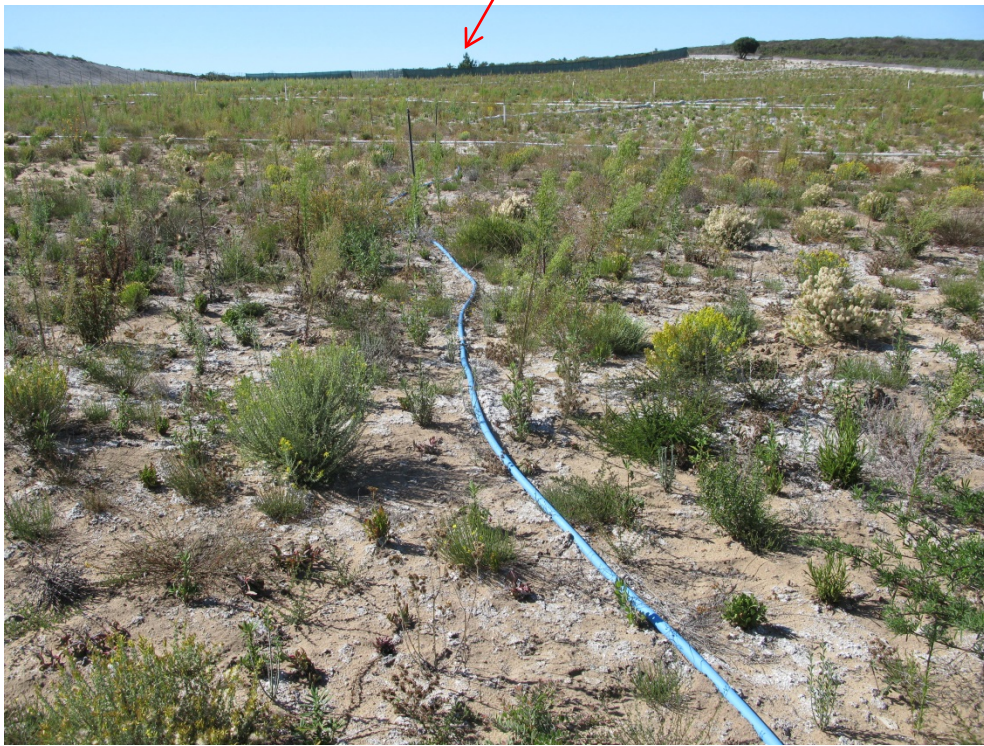
Range 47  
Restoration Area.

After installation of  
container plants,  
fencing, irrigation  
system and erosion  
control; west facing  
photo point.

11 April 2013

FORA ESCA Remediation Program





**Photograph 3**

Range 47  
Restoration Area.

First year early fall  
vegetation; west  
facing photo point.

25 September 2013



**Photograph 4**

Range 47  
Restoration Area.

Winter conditions;  
west facing photo  
point.

12 February 2014

FORA ESCA Remediation Program



**Photograph 5**

Range 47  
Restoration Area.

Late spring  
vegetation; west  
facing photo point.

13 June 2014



**Photograph 6**

Range 47  
Restoration Area.

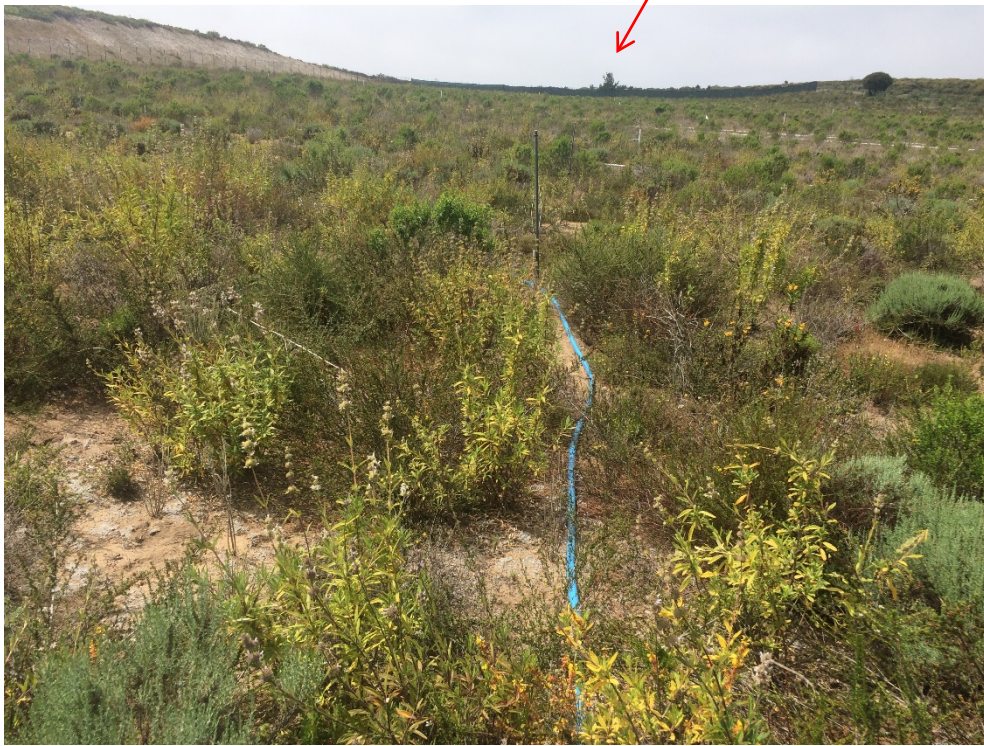
Spring 2015  
showing drought  
conditions; west  
facing photo point.

26 March 2015



FORA ESCA Remediation Program





**Photograph 7**

Range 47  
Restoration Area.

Late spring  
vegetation; west  
facing photo point.

28 April 2015



**Photograph 8**

Range 47  
Restoration Area.

Fall 2015; looking  
north from the top  
of the escarpment.  
The hydroseeded  
escarpment is in the  
foreground,  
followed by the  
deer fence, Subarea  
A, and Subarea B.

27 October 2015

FORA ESCA Remediation Program





**Photograph 9**

Range 47  
Restoration Area.

Spring vegetation;  
west facing photo  
point.

8 March 2016



**Photograph 10**

Range 47  
Restoration Area.

Spring 2016;  
looking north from  
the top of the  
escarpment. The  
hydroseeded  
escarpment is in the  
foreground,  
followed by the  
deer fence, Subarea  
A, and Subarea B.

8 March 2016

FORA ESCA Remediation Program





**Photograph 11**

Range 47  
Restoration Area.

Winter vegetation  
after removal of all  
infrastructure; west  
facing photo point.

12 December 2016



**Photograph 12**

Range 47  
Restoration Area.

Winter vegetation  
after removal of all  
infrastructure;  
panorama with  
center being west  
facing.

12 December 2016