Results of 2004 Monterey Spineflower and Sand Gilia Surveys

OU-1, Former Ft. Ord, California

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SECTION 1

Introduction

Rare plant surveys were conducted in April, 2004 to identify the locations of two federally-listed plant species in the trichloroethene (TCE) remediation area in Operable Unit-1 (OU-1) of the former Fort Ord military base in Monterey County, California. The location of OU-1 is shown in Figures 1 through 6, contained at the back of this report.

1.1 Property History and Location

Fort Ord was established in 1917 as a military training base for infantry troops. In January 1991, the Secretary of Defense announced the downsizing/closure of the base. In August 1994, portions of the property were transferred to the University of California and the 605-acre Fort Ord Natural Reserve (FONR) was established in June 1996.

The former Fort Ord is located near Monterey Bay approximately 80 miles south of San Francisco. The base consists of approximately 28,000 acres near the cities of Seaside, Sand City, Monterey, Del Rey Oaks, and Marina. Monterey Bay marks the western boundary, Toro Regional Park borders the base to the southeast and land use east is primarily agricultural.

OU-1 occupies approximately 590 acres of the FONR in the southwestern corner of the former Fritzsche Army Airfield and a parcel of land west of Imjin Road and south of Reservation Road (Harding Lawson and Associates, 1998). The dominant habitats in this area include coast live oak woodland, maritime chaparral, and annual grassland. The history of the use at this site is presented in the *Draft Operable Unit 1 Project Management Plan, Fritzsche Army Airfield Fire Drill Area, Former Fort Ord, California* (HydroGeoLogic, 2004).

Two federally-listed plant species, sand gilia (*Gilia tenuiflora* ssp. *arenaria*) and Monterey spineflower (*Chorizanthe pungens* var. *pungens*), as well as several other special-status-species occur at the FONR. Special-status species is a broad category that includes plants and animals with different status codes based on the degree of rarity for each species. For example, the term special-status include species that have been federally-listed as threatened or endangered as well as those that are not federally-listed, but may meet the qualifications of listing under the state and/or federal Endangered Species Acts, those that are a state or federal species of concern, naturally rare or restricted in their distribution, or associated with limited or declining habitats.

Species that are federally-listed as endangered are those plant species, subspecies, or varieties in danger of extinction throughout all or a significant portion of their range. Federally-threatened species are those plant species, subspecies, or varieties likely to become endangered within the foreseeable future throughout all or a significant portion of their range. These plants are considered “federally-listed” or “listed” because a final rule has been published in the Federal Register.

In addition to the federally-listed sand gilia and Monterey spineflower, special-status plants occurring at FONR include Monterey manzanita (*Arctostaphylos montereyensis*), sandmat manzanita (*Arctostaphylos pumila*), Monterey ceanothus (*Ceanothus cuneatus* var. *rigidus*), Eastwood's goldenbush (*Ericameria fasciculata*), and coast wallflower (*Erysimum ammophilum*) (CH2M HILL, 2004). None of these additional special-status species are federally-listed (CDFG, 2004).

The objectives of this survey were to map the location of the federally-listed sand gilia and Monterey spineflower and obtain information on noxious weeds within OU-1. Information on other special-status plants was not collected, and they are therefore not mentioned further in this report. Detailed species descriptions for the sand gilia and Monterey spineflower are provided below.

1.1.1 Sand Gilia

Sand gilia is a small annual in the phlox family (Polemonaceae) (see Figure A-1, contained in Appendix A). Plants range in height from two to six inches with a small, basal rosette of leaves. The lower branches of the stem are generally densely glandular, and they often have a cobwebby base. Plants typically bloom from April through June and have funnel-shaped flowers with narrow, purple to pinkish petal lobes and a purple throat. This species occurs in open sandy soils in dune scrub, coastal sage scrub, and maritime chaparral habitats. The sand gilia is a seral species that has adapted to periodic disturbance and shifting sands (HLA, 1998). Sand gilia is endemic to Monterey Bay and the peninsular dune complexes. A search of the California Natural Diversity Database (CNDDB) revealed that there are 29 occurrences within Monterey County, including the occurrences at Fort Ord (CDFG, 2004). It is likely that some of these occurrences have been extirpated (no longer present) and the exact number of extant (still in existence) occurrences is unknown.

1.1.2 Monterey Spineflower

Monterey spineflower is a small, prostrate annual in the buckwheat family (Polygonaceae) that blooms from April to June (see Figure A-1 in Appendix A). The white to rose floral tube of Monterey spineflower distinguishes it from the more common, but closely related diffuse spineflower (*Chorizanthe diffusa*), which has a lemon-yellow floral tube. This species typically occurs on open sandy or gravelly soils in coastal dune, coastal scrub, and maritime chaparral habitats. Similar to the sand gilia, the Monterey spineflower has adapted to periodic disturbance (HLA, 1998). There are 19 records of Monterey spineflower within Monterey County in the CNDDB (CDFG, 2004); however, it is not known how many of these are extant. The largest known population occurs on lands associated with the former Fort Ord military base where the plants typically occur along roads, in sandy openings between shrubs and other areas of disturbance (USFWS, 1998).

SECTION 2

Methods

Surveys for sand gilia and Monterey spineflower were conducted by two CH2M HILL botanists between April 6 and April 9, 2004. The survey area included approximately 68 acres overlying the maximum extent of the TCE plume in OU-1 (Figure 1). Prior to initiating the surveys, known populations of sand gilia and Monterey spineflower were examined in the field with Sean McStay, the FONR Steward for the University of California, to determine phenological status and ensure proper identification of the species. Areas of dense woody vegetation that lacked openings in the vegetative cover were excluded from the survey because they lacked suitable habitat. Rare plant locations were mapped in the field using either high-resolution aerial photographs (resolution of 0.5-meter) at a scale of 1 inch = 100 feet, or using a sub-meter accuracy global positioning system (GPS) unit.

The objective of the surveys was to map the extent of the sand gilia and Monterey spineflower in the project area and estimate the population size. Population numbers were broadly estimated (using general categories corresponding to orders of magnitude) to the nearest 10, 100 or 1000, to provide a general idea of the population size for each of the mapped polygons (Tables 1 and 2, provided at the back of this report). This method is commonly used to assess general population trends for species in large areas. For the purposes of this survey, each distinctive cluster of Monterey Spineflower was considered to be one individual plant.

All data was digitized or input into a Geographic Information System (GIS) database and mapped on high resolution aerial photograph base maps (Figures 2 through 6, also provided at back). Photographs were obtained to document rare plant locations as well as the general habitat conditions of the remediation area. Photographs of two special-status wildlife species observed during the surveys, the California black legless lizard (*Anniella pulchra nigra*) and the California coast horned lizard (*Phrynosoma coronatum*), were also obtained. Representative photographs are included in Appendix A of this report.

Thirty-four photographs of the project area were taken at permanent photostation locations established using GPS. The GPS coordinates and pertinent map datum information is contained in Table 3, at the back of this report. Photostation photographs are provided in Appendix B.

SECTION 3

Results and Discussion

Sand gilia was identified at 92 locations, primarily along the western and southern part of the OU-1 survey area (see Figures 2 through 6). Monterey spineflower was observed scattered throughout most of the project area at 206 locations (Figures 2 through 6 and Table 1). Often these two species co-occur, but in these areas Monterey spineflower is more common and widespread. Natural habitats observed in the study area included coast live oak woodland, central maritime chaparral, and annual grassland. Boundaries between habitat types are relatively diffuse, with elements of the three habitats often intermixed. Several invasive species were also identified during the surveys, in particular, non-native annual grasses. General descriptions of the Monterey spineflower and sand gilia plant populations and habitats within the remediation area are provided below. A brief summary of the invasive species noted during the surveys is also included in this section. A discussion of incidental special- status wildlife species sightings is also provided.

3.1 Special-Status Plants

3.1.1 Sand Gilia

A total of 92 populations of sand gilia were observed in the OU-1 survey area (Table 1). Population size estimates ranged from single isolated individuals up to approximately 100 plants. Sand gilia was found in open sandy areas and along access roads in the coast live oak woodland and maritime chaparral habitats, but was not observed in the areas with dense woody or other vegetation. Sand gilia was typically observed growing in large open areas with coarse, sandy soil and relatively sparse vegetative cover in the coast live oak woodland habitat. In the maritime chaparral habitat, sand gilia was primarily observed in openings and at the edges of manzanita shrubs in sandy coarse soils. Approximately 30 percent of the populations were found in areas that also contained Monterey spineflower (Figures 2 through 6). Common associated species include filaree (*Erodium* spp.), sandmat (*Cardionema ramosissimum*), annual fescue (*Vulpia myuros*), rip-gut brome (*Bromus diandrus*), lotus (*Lotus* sp.), and occasionally, sandmat manzanita, but total plant cover was generally sparse.

3.1.2 Monterey Spineflower

A total of 206 populations of Monterey spineflower were observed within the survey area. Plant numbers generally ranged from small clusters of approximately 10 plants to large populations with more than a thousand plants (Table 2). Population numbers may be slightly inflated because in some areas, diffuse spineflower may also have been present. Morphological features (e.g., floral tube color) of some individuals were examined more closely in the field to differentiate between the two species, but survey time limitations precluded the close examination of all individuals.

Monterey spineflower was observed in all habitat types but was restricted to openings in the vegetation. In the live oak woodland and maritime chaparral habitats, this species was often found along access roads and other disturbed areas such as existing well locations, and in naturally occurring sandy or grassy open areas. In the annual grassland habitat, Monterey spineflower was restricted to relatively open microsites around the perimeter of shrubs, small areas of disturbance, and along existing access roads. Common associated species include filaree, annual fescue, red brome (*Bromus madritensis* ssp. *rubens*), rip-gut brome, wild oats (*Avena* spp.), sandmat, and lotus. Populations of Monterey spineflower were often observed in areas with sparse to moderately abundant non-native annual grass cover, suggesting that this species may be somewhat more tolerant of annual grass cover than the sand gilia.

3.2 Habitat Types

3.2.1 Coast Live Oak Woodland

The coast live oak woodland habitat is characterized by a mosaic of dense coast live oaks (*Quercus agrifolia*), intermixed with chaparral, grassy openings, and open sandy areas. Areas with a dense canopy cover of coast live oaks generally lack shrubs and have a near continuous herbaceous layer of non-native annual grasses such as rip-gut brome, wild oats and annual fescue. Chaparral areas intermixed within the coast live oak woodland habitat contain scattered coast live oaks with patches of dense poison oak (*Toxicodendron diversilobum*), California sagebrush (*Artemisia californica*), coyote brush (*Baccharis pilularis*), and manzanita (*Arctostaphylos* spp.). Common herbaceous species in these areas include miner's lettuce (*Claytonia perfoliata*), goose-grass (*Galium aparine*), rip-gut brome and annual fescue. Grassy openings in the woodland habitat contain scattered coast live oaks and shrubs with generally dense growth of annual grasses such as rip-gut brome, annual fescue, red brome, and wild oats, often with small open sandy areas that support rare plant species. The open sandy areas are more sparsely vegetated and contain species such as Monterey spineflower, sand gilia, sandmat manzanita, rush rose (*Helianthemum scoparium*), sandmat, filaree, rip-gut brome and annual fescue.

3.2.2 Central Maritime Chaparral

Sclerophylous (thick-leaved, evergreen) shrubs such as shaggy bark manzanita (*Arctostaphylos tomentosa*), Monterey manzanita, and sandmat manzanita characterize the central maritime chaparral habitat. Coyote brush, poison oak, and California sagebrush are also common throughout this community. Other species include coast live oak, black sage (*Salvia mellifera*), sticky monkey flower (*Mimulus aurantiacus*) and silver bush lupine (*Lupinus albifrons*). Common herbaceous species include rush rose, sandmat, filaree, rip-gut brome, annual fescue, and red brome.

3.2.3 Annual Grassland

The annual grassland habitat is characterized by a dense cover of rip-gut brome with other non-native annual grasses such as wild oat, soft chess (*Bromus hordeaceus),* Italian ryegrass (*Lolium multiflorum*), and annual fescue. Sky lupine (*Lupinus nanus*), and weedy forbs (plants that are not woody and are not grasses) such as filaree, and cat's ears (*Hypochaeris* spp.) are

also common in this habitat. Shrubs species such as coyote brush, California sagebrush, and coffee berry (*Rhamnus californica*) occur scattered throughout.

3.3 Invasive Species

3.3.1 Non-Native Annual Grasses

A preliminary list of invasive species was prepared prior to the field survey. This list was modified based on comments received from FONR Steward Sean McStay. The table of species considered invasive at FONR is provided in Table 4, at the back of this report. Non-native grasses are considered invasive weeds in this report because of their deleterious effects to sand gilia and Monterey spineflower habitat. Several of the non-native grasses including rip-gut brome, soft chess, red brome, wild oat, and annual fescue are common and widespread in all habitats throughout the study area in which vegetative cover is not limiting. Some non-native species would be expected to have greater impacts than others. Non-native grasses that are smaller in stature and that senesce early in the season (e.g., annual fescue (*Vulpia* spp)). would likely pose less of a threat than those that are taller, more dense, and persist longer in the season (e.g., Italian ryegrass (*Lolium multiflorum)*).

Higher densities of non-native grasses were observed in the northern part of OU-1 compared to the south. However, a sparse (and occasionally moderate) cover of non-native grasses was identified adjacent to the roads throughout OU-1 and in disturbed areas such as well sites. Forbs such as cat's ears were also very common. Due to the widespread occurrence of these species in all habitat types, the exact location of these species was not mapped. Photographs taken during the survey document the general range of variation observed in non-native species cover within OU-1.

The northern boundary of OU-1 is adjacent to a large expanse of non-native grassland. Transmission of non-native grass species into OU-1 is accelerated by the prevailing winds, which blow the seeds south, and into the OU-1 area (M. Fusari, UCSC Natural Reserves, Pers. Comm.). Non-native grasses and weedy forbs are already present throughout much of the OU-1 area. The spread of invasive species into newly disturbed areas could result in population declines of the federally-listed plants, especially sand gilia, which is less tolerant of plant cover than the Monterey spineflower.

The Biological Opinion (HLA, 1998) considered invasion by non-native plant species such as ice plant (*Carpobrotus edulis*) and rip-gut brome among the principle threats to the long term survival of both sand gilia and Monterey spineflower (USFWS, 1998). Ice plant was noted to be of particular concern because it forms dense, continuous mats of vegetation with few or no open spaces, and once established can spread rapidly by vegetative means. A small amount of ice plant is present within the project area along the perimeter fence of the existing pumping station.

3.4 Special-Status Wildlife Species

During the 2004 surveys of OU-1, two special-status wildlife species were observed during the surveys: the California black legless lizard, and the California coast horned lizard. One California black legless lizard was observed in the northern part of OU-1. Four California

coast horned lizards were observed, in scattered locations throughout OU-1. Three of these incidental sightings were mapped using GPS (see Photos 2-6). The frequency of these incidental sightings suggest that the California coast horned lizard may be fairly common within OU-1, but this would need to be verified.

SECTION 4

Conclusions and Recommendations

Monterey spineflower is abundant and widespread throughout the remediation area in OU-1. Sand gilia is also common, but it is not as widely distributed as the Monterey spineflower, and population sizes observed in 2004 are much smaller compared to Monterey spineflower population estimates. Both of these annual species germinate and grow during the late fall and winter, then bloom and set seed during spring, persisting as a seedbank for the remainder of the year.

Guidelines to minimize adverse effects to these species were outlined in the Biological Opinion (HLA, 1998), and more recently, in the NRRP (CH2M HILL, 2004). The Biological Opinion did not consider driving on access roads during the dry-season to be a deleterious impact to sand gilia or Monterey spineflower, due to the habitat requirements of these species (seral species adapted to periodic disturbance and shifting sands) (HLA, 1998). Secondary impacts to sand gilia and Monterey spineflower could occur as a result of invasive species colonization into newly disturbed areas. Invasive species were identified as a threat to the plants and Measure 10 of the Biological Opinion requires implementation of invasive weed control (HLA, 1998).

Weed control in newly disturbed areas that support sand gilia and Monterey spineflower could include herbicide application or hand-removal. Methods of herbicide application are currently being investigated in a greenhouse setting by Maggie Fusari, University of California Natural Reserves Director, to determine if the use of herbicides adversely affects the federally-listed species. Depending on the outcome of the greenhouse trials, former Fort Ord Natural Resources Specialist William Collins may request permission from the USFWS to study herbicide application in the natural environment.

It is recommended that this herbicide research be reviewed to determine if the methods are appropriate for use in OU-1. If herbicide control of non-native species is considered deleterious to the federally-listed species, hand-removal of weeds may be required. Additionally, it is recommended that the small population of ice plant be eradicated to prevent further colonization and spread of this species.

Populations of sand gilia and Monterey spineflower have been avoided to the maximum degree possible during the remediation design process. However, complete avoidance of all the populations within OU-1 is not practicable given the large number of populations present and their broad distribution throughout the OU-1 area. With the implementation of the mitigation measures outlined in the Natural Resource Protection Plan (CH2M HILL, 2004) and the Biological Opinion (HLA, 1998), remedial actions should not result in the loss of any sand gilia and Monterey spineflower populations; however, the loss of some individual plants within affected populations may occur.

Disturbance by unauthorized visitors to accessible portions of the FONR is an additional threat to the sand gilia and Monterey spineflower in OU-1. One other possible mitigation

measure is the installation of permanent fencing and gates in strategic areas (e.g., main roadway entrance points) to restrict unauthorized access to OU-1.

One California black legless lizard and four California coast horned lizards were observed during the 2004 sand gilia and Monterey spineflower surveys. Mitigation measures as outlined in the Biological Opinion and the NRRP (e.g., construction monitoring and safe transport of these species to a location away from the activity) will be implemented in order to avoid impacts to these species to the maximum degree possible.

SECTION 5

References

CalPhotos. 2004. A database of photos of plants, animals, habitats and other natural history subjects [web application]. Digital Library Project, University of California, Berkeley. Available at: http://elib.cs.berkeley.edu/photos/. Accessed on May 14, 2004.

California Department of Fish and Game. 2004. California Natural Diversity Data Base. Database Program: "Rarefind". Natural Heritage Division, Sacramento, CA. April.

CH2M HILL. 2004. Draft Fort Ord OU-1 Natural Resource Protection Plan. Prepared for HydroGeoLogic Inc.

Harding Lawson Associates (HLA). 1998. Biological information for agency consultation related to groundwater remediation activities and quarterly groundwater sampling at FONR Fort Ord Natural Reserve. Biological and Conference Opinion on the Closure and Reuse of Fort Ord, Monterey County, California (1-8-99-F/C-39R), Enclosure 2. Letter to Ms. Jane Holte.

Hickman, James C., Editor. 1993. The Jepson Manual. Higher Plants of California. University of California Press. Berkeley, California. 1400 pp.

HydroGeoLogic (HGL). 2004. Draft Operable Unit 1 Project Management Plan, Fritzsche Army Airfield Fire Drill Area, Former Fort Ord, California. Prepared for the U.S. Army Corps of Engineers.

U.S. Fish and Wildlife Service (USFWS). 1998. Seven Coastal Plants and the Myrtle's Silverspot Butterfly Recovery Plan. Portland, Oregon.

SECTION 6

Personal Communication

Fusari, Maggie. 2004. Director, University of California Santa Cruz Natural Reserves. Conversations and email correspondence with Amy Hiss, Gary Santolo, and Roy Evans regarding the federally-listed species and noxious weeds. June.