Results of 2006 Monterey Spineflower and Sand Gilia Surveys

OU-1, Fort Ord Natural Reserve, California

December 2006

prepared for HydroGeoLogic, Inc.

Contract No. DACA 45-03-D-0029
Delivery Order CM01

prepared by

Denise Duffy & Associates, Inc.
947 Cass Street, Suite 5
Monterey, CA 93940
(831) 373-4341
facsimile (831) 373-1417

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Acronym List

ACL	Aquifer Cleanup Level
Cal-IPC	California Invasive Plant Council
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CNDDB	California Natural Diversity Database
FDA	Fire Drill Area
FONR	Fort Ord Natural Reserve
GIS	Geographic Information System
GPS	Global Positioning System
GWETS	Groundwater Extraction and Treatment System
HGL	HydroGeoLogic, Inc.
OU	Operable Unit
TCE	trichloroethene
UCNRS	University of California Natural Reserve System
USCAE	U.S. Army Corps of Engineers
VOC	volatile organic compound

A1.0 Introduction

HydroGeoLogic, Inc. (HGL) is executing a groundwater remediation project at Operable Unit (OU)-1 at the former Fort Ord U.S. Army Base located in Monterey County, California. This work was awarded in December 2003 by the U.S. Army Corps of Engineers (USACE)-Sacramento District under Contract Number DACA45-03-D-0029; it is being administered by the USACE-Sacramento District.

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 FONR was established in June 1996. The former Fort Ord is located near Monterey Bay approximately 80 miles south of San Francisco (Figure A1.1). 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.

Activities conducted at the former Fort Ord Fritzsche Army Airfield Fire Drill Area (FDA) (i.e., OU-1) between 1962 and 1985 resulted in the release of contaminants to soils and groundwater. Although 10 separate volatile organic compounds (VOCs) were identified as contaminants of concern in groundwater underlying OU-1, trichloroethene (TCE) is the contaminant that was detected at the highest concentrations and across the greatest extent of the affected aquifer. A groundwater extraction and treatment system (GWETS) was constructed in 1988 to remediate TCE and other groundwater contaminants.

The components of the remediation project include wells, pipelines, infiltration trenches, and treatment facilities (Figure A1.2). A key factor affecting the design and implementation of the groundwater cleanup is the fact the groundwater plume lies beneath a part of the University of California Natural Reserve System (UCNRS) designated as the Fort Ord Natural Reserve (FONR). The FONR area potentially impacted by the construction of OU-1 remediation facilities is approximately 130 acres. Therefore, the project has the additional constraint that activities undertaken to achieve the OU-1 cleanup adequately protect and maintain the special-status species found within the FONR, specifically two federally listed plant species, Monterey spineflower (*Chorizanthe pungens* var. *pungens*) and sand gilia (*Gilia tenuiflora ssp. arenaria*).

OU-1 occupies a portion of the FONR in the southwestern corner of the former Fritzsche Army Airfield, west of Imjin Road and north of Reservation Road. The remediation project illustrated in Figure A1.2 is designed to avoid, mitigate, or minimize environmental impacts in the OU-1 area. To that end, the locations, extent, and populations of sand gilia and Monterey spineflower that are present in the footprint of proposed construction activities were identified through a rare plant survey conducted at specified sites. An inventory of the existing plant species in the areas of proposed or

potential new construction was also performed to support habitat management decisions during and after operation of the groundwater remediation project.

A1.1 Survey Objectives

The objectives of the 2006 rare plant survey and habitat inventory were to: 1) identify locations and estimate rare plant populations at each site for Monterey spineflower and sand gilia within the proposed construction areas for the remediation system; 2) to map Monterey spineflower and sand gilia populations so that future activities could avoid or reduce impacts to those populations; and 3) conduct a habitat assessment within each site to provide data on species composition, including the presence of non-native and invasive species. A total of 14 potential construction sites and 3 previously used staging areas were surveyed for the presence of rare plants (Figure A1.3). A habitat inventory was also conducted at nine of the 14 sites.

A1.2 Site Location and Description

The dominant habitats in this area include coast live oak woodland, maritime chaparral, coastal scrub, and annual grassland. Several special-status plant and wildlife species occur within the FONR, including sand gilia and Monterey spineflower. 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 seeds south and into the OU-1 area (Fusari 2004). Non-native grasses and weedy forbs are already present throughout much of the OU-1 area. The spread of non-native, invasive species into newly disturbed areas might result in population declines of Monterey spineflower and, especially, sand gilia, which is less tolerant of plant cover than Monterey spineflower.

A1.1.1 Sand Gilia

Sand gilia is a small annual in the phlox family (Polemonaceae). 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. 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. 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 2006). It is likely that some of these occurrences are no longer present and the exact number of extant (still in existence) occurrences are unknown.

A1.1.2 Monterey Spineflower

Monterey spineflower is a small, prostrate annual in the buckwheat family (Polygonaceae) that blooms from April to June. 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. There are 19 records of Monterey spineflower within

Monterey County in the CNDDB (CDFG 2006); however, it is not known how many of these are extant.

A2.0 Methods

The survey area consisted of selected existing and proposed well sites and discrete segments of the existing and proposed roads within OU-1. The well sites surveyed are located either adjacent to the roadway or at the terminus of access paths constructed to reach the well site. A total of 14 sites were identified for surveys. In addition, three staging areas that were used during the 2004 drilling effort to stage equipment and materials were included as survey sites. Figure A1.3 shows the survey sites.

Two separate surveys were conducted. The first survey was the rare plant survey, which was conducted between April 24 and May 4, 2006. The second survey was the habitat inventory in areas of proposed new construction, which was conducted between June 8 and June 26, 2006.

A2.1 Rare Plant Surveys

Surveys for sand gilia and Monterey spineflower were conducted by a DD&A biologist and a DD&A GPS technician between April 24 and May 4, 2006. The peak blooming period, late April and early May 2006, was determined through communications with FONR botanist and by observing a known occurrence of sand gilia in the vicinity of FONR. The rare plant survey area included the sites and staging areas shown in Figure A1.3.

Each of the surveys was conducted along existing or proposed roadways/access routes. In the absence of rare plants, the width of the survey area was approximately 10 feet beyond the edge of the roadway on either side. If a rare plant was identified, the survey in that area was extended to the boundary of the population encountered.

When surveying areas for new access routes (Sites 4 through 10), the survey area was expanded as needed to identify alternative routes to bypass rare plant populations encountered during the survey effort. If terrain or the extent of native vegetation negated the possibility of an alternative route, the surveyed area included the route with minimal impact to the rare plant population.

Mapping of rare plant species was done using a Trimble Pathfinder ProXH GPS unit with an additional Zephyr antenna system to boost reliability and accuracy of GPS data collection. Large areas of Monterey spineflower and sand gilia were mapped as polygons; smaller groups and individuals were mapped as points with attributes to identify the number of individuals at each location.

Individual counts were made for all sand gilia populations whether they were mapped using points (population < 10) or polygons (population ≥ 10). However, Monterey spineflower were only counted as individuals when groups of less than five were mapped.

Monterey spineflower mapped as polygons were characterized according to the percent of cover. The categories ranged from Very Sparse (corresponding to an absolute cover of less than 3 percent), Sparse (3-25 percent), Medium Low (26-50 percent), Medium (51-76 percent), and Medium High (76-97 percent) to Very High (>97-100 percent). GPS data was exported to shapefile format for use in a Geographic Information System (ESRI ArcGIS) and mapped on high resolution aerial photography. These maps are represented in Figures A3.1 through A3.4 in the section below.

A2.2 Habitat Inventory

DD&A was also contracted to conduct a habitat inventory within eight of the 14 sites located on FONR in areas of proposed new construction – sites 4, 6, 7, 8, 9, 11 (which was split into sites: 11A and 11B), 12, and 13. The inventory included identification of the type and distribution of native and invasive, non-native plant species. Invasive species include any plant species which is listed as a noxious weed by the California Department of Food and Agriculture (CDFA), included on any of the invasive plant lists maintained by the California Invasive Plant Council (Cal-IPC), or considered to be a species of concern by the FONR natural resource staff.

The habitat inventory was taken by placing 100-foot consecutive transects along the centerline of the surveyed area through the entire length of each site. A 1-m^2 quadrat was placed at ten foot intervals along each transect. Placement of the quadrat was sequentially staggered (i.e., center of site alignment, right edge of adjacent habitat, center of site alignment, and left edge of adjacent habitat) to create a more accurate representation of the entire area along each FONR site alignment. Therefore, two data sets were compiled: one along the "center" of the alignment, and one along the "edge" of adjacent habitat. A Trimble GPS Pathfinder ProXH was used to map each quadrat along the alignment, as well as take data points representing the photo positions that were taken at the beginning and ending of each 100-foot transect.

The percentage of total ground cover by vegetation (specifying type and species, where possible), soil crust, litter, and bare ground within each 1-m^2 quadrat was visually estimated by a DD&A botanist and recorded on data sheets in the field. Descriptions of the surrounding habitat was also described and recorded by a DD&A botanist.

A2.3 Photo Inventory

A photo inventory was taken to illustrate conditions at each site. Photographs were taken at each site location during the rare plant survey and at the beginning and end of each 100-foot transect during the habitat inventory survey. A Trimble GPS Pathfinder ProXH as used to record all photo positions. Photos, a photo index table, and a map of photo positions are presented in Attachment A-1.

A3.0 Results and Discussion

A3.1 Rare Plant Survey Results

A3.1.1 Sand Gilia

Sand gilia was observed and mapped in 37 locations within the 14 potential construction sites and the three staging areas surveyed for rare plants (Table A3.1 and Figures A3.1 through A3.4). Population size estimates range from a single plant to approximately 375 plants, with an average of 25 plants per population. The total estimate of plants observed and mapped during the survey effort was 962 individuals. Twenty-five occurrences of sand gilia were mapped as points while 12 populations were mapped as polygons. Twelve of the 37 total populations of sand gilia (32%) contained 10 or more plants with eight locations exceeding the 25 plants.

Sand gilia was found in open, sandy areas and along access roads in the coast live oak woodland, coastal scrub, and maritime chaparral habitats, but was not observed in areas with dense woody vegetation. At one site, Staging Area 2, sand gilia was found within a dense area of non-native annual grasses. Sand gilia was typically found growing in large open areas with coarse, sandy soil and relatively sparse vegetative cover within the coast live oak woodland and coastal scrub habitats. In the maritime chaparral habitat, sand gilia was observed primarily in openings and at the edges of manzanita shrubs in sandy coarse soils. Common associated species include filaree (*Erodium spp.*), sandmat (*Cardionema ramosissimum*), annual fescue, rip-gut brome, deerweed (*Lotus* sp.), and occasionally sandmat manzanita (*Arctostaphylos pumila*), but total plant cover associated with sand gilia observations was generally low.

A3.1.2 Monterey Spineflower

A total of 56 populations (50 polygons and six points) of Monterey spineflower were mapped along the 14 rare plant survey areas and three staging areas within FONR (Table A3.2 and Figures A3.1 through A3.4). A total of nine individual plants were identified at the six mapped GIS points. Because population size estimates are not as easily quantified as the sand gilia populations, individual Monterey spineflower plants were not counted within the GIS polygons. As mentioned in the methods section of this document, populations of Monterey spineflower were given a percentage of cover using visual estimation. Of the 50 populations of Monterey spineflower mapped, one population had a Medium cover class (51-76 percent cover), five populations had a Medium Low cover class (26-50 percent), 34 populations had a Sparse cover class (3-25 percent) and 10 populations had a Very Sparse cover class (<3 percent). None of the Monterey spineflower populations observed and mapped exceeded the Medium cover class.

Plant density estimates in the polygon areas were typically Very Sparse or Sparse. Approximately 90% (44 of the 50 populations) fell into these two categories. Sparse populations outnumbered Very Sparse populations by nearly 3:1 (64% of the total versus 24%).

Monterey spineflower was observed in all habitat types and was usually restricted to open sandy areas with sparse vegetative cover. 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 most often restricted to relatively open areas around the perimeter of shrubs, small areas of disturbance, and along existing access roads. Common associated species include stork's bill geranium (*Erodium botrys*), sandmat, annual fescue, rip-gut brome, and catchfly (*Silene gallica*). 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 sand gilia.

A3.2 Habitat Inventory Results

A habitat inventory (see Section A2.2) was also conducted in nine of the rare plant survey areas. The observed habitat types fell into five categories: Coast Live Oak Woodland; Central Maritime Chaparral; Coastal Scrub; Annual Grassland; and Disturbed/Developed. The latter category consists of dirt roadways, staging areas, well sites and groundwater treatment facilities. Non-native grasses including rip-gut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), red brome (*Bromus madritensis ssp. rubens*), wild oat (*Avena fatua*), and rattail fescue (*Vulpia myuros*) are common and widespread in all habitats throughout OU-1. Distinguishing characteristics of the individual habitats observed in the nine FONR areas inventoried are summarized in Table A3.3 and discussed in the following sections.

A3.2.1 Habitat Descriptions

Coast Live Oak Woodland

Coast live oak woodland within the FONR is characterized by a mosaic of coast live oak trees (Quercus agrifolia), intermixed with chaparral, grassy and sandy openings. The oak woodland within the FONR ranges from high canopy cover to low canopy cover. The areas with high canopy cover generally do not permit the existence of shrubs in the understory, and, therefore, the understory is limited to poison oak and the common annual grasses, such as rip-gut brome, wild oat, and annual fescue. In areas with a low to moderate canopy cover, the oak woodland is intermixed with chaparral shrub species such as California sagebrush (*Artemisia californica*), coyote brush (*Baccharis pilularis*), shaggy bark manzanita (*Arctostaphylos tomentosa ssp. tomentosa*), and sandmat manzanita. Common herbaceous species in these areas include native species such as miner's lettuce (*Claytonia perfoliata*), and non-native species such as rip-gut brome, and annual fescue.

Grassy openings in the woodland habitat contain scattered coast live oak trees and shrubs with dense growth of annual grasses such as rip-gut brome, annual fescue, red brome, and wild oat. Open, sandy areas within coast live oak woodland can support special-status species such as Monterey spineflower and sand gilia. Coast live oak woodland is widespread throughout the FONR property, and was observed at or surrounding all sites

surveyed except sites 1, 2, and 5, which are completely dominated by annual grassland and disturbed habitat types.

Central Maritime Chaparral

Central maritime chaparral habitat within the FONR is dominated by hard-leaved shrubs such as shaggy bark manzanita, sandmat manzanita, and Monterey manzanita. Other shrubs that are common throughout this habitat types include coyote brush and California sagebrush. In areas where soils maintain a higher moisture content, poison oak can also be a dominant species in the maritime chaparral. The central maritime chaparral on FONR is often mixed with coast live oak trees and several annual grass species including rip-gut brome, red brome, and annual fescue. Central maritime chaparral was observed at sites 4, 12, and 13.

Coastal Scrub

Coastal scrub occurs near the coast on sandy soils and on inland hills with shallow topsoils. Within the FONR, this habitat type is characterized by sparse to dense cover of soft-leaved, low stature shrubs about three to seven feet in height, such as coyote brush (*Baccharis pilularis*), California sagebrush (*Artemisia californica*), sticky monkeyflower (*Mimulus aurantiacus*), poison oak, mock heather (*Ericameria ericoides*), and black sage (*Salvia mellifera*). The herbaceous layer in the coastal scrub is sparse where shrub cover is dense but is more developed in areas where there is less shrub cover. Species typically occurring in this layer include Monterey spineflower, sandmat, and everlasting (*Gnaphalium* sp.). Coastal scrub was observed at sites 4, 6, 7, 8, 9, 11B, and 12.

Annual Grasslands

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, Italian ryegrass (*Lolium multiflorum*), and annual fescue. Other species that are common in the annual grassland habitat include sky lupine (*Lupinus nanus*), a native species, and weedy forbs (non-native plants that are not woody and are not grasses), such as filaree (*Erodium* sp.) and cat's ears (*Hypochaeris* sp.). Cat's ears is a non-native, invasive species of particular concern to the UC staff managing the FONR. Shrubs species, such as coyote brush, California sagebrush, and coffee berry (*Rhamnus californica*), occur scattered throughout the annual grassland. Annual grassland was present in patches within sites 4, 6, and 12.

Disturbed/Developed

The disturbed habitat is characterized by the roadways and staging areas currently and historically in use on the FONR property. Most disturbed areas are dominated by bare ground and non-native grasses, such as wild oat, rip-gut brome, and red brome. All of the sites surveyed contained disturbed/developed habitat in the forms of trails and/or roads.

A3.2.2 Plant Species Composition

The habitat inventory resulted in the collection of plant species identification and percent cover data within 259 quadrats. Plant species were categorized as either "native," "non-native," or "non-native, invasive." "Native" refers to a plant species that normally lives and thrives in a particular ecosystem. "Non-native" refers to a plant species that has been

introduced to California as a direct or indirect result of human activity. The "non-native, invasive" category refers to plant species that 1) are not native to, yet can spread into, ecosystems, 2) can displace native species, hybridize with native species, alter biological communities, or alter ecosystem processes, and 3) are included on the Cal-IPC list and identified as being of particular concern to the FONR. These species are mostly comprised of annual grasses. This concern is based on the observation that non-native, invasive species generally compete for space and nutrients directly with and more effectively than native plants, including the protected Monterey spineflower and sand gilia. Consequently, significant growth of non-native, invasive species has the potential to diminish or eliminate the native population within a given area. Non-native species, in contrast, are of less concern because they are able to co-exist with native plants with minimal impact on the native population.

Ground cover was categorized as "bare ground," "leaf litter," or as one of the three plant categories defined above. "Leaf litter" refers to an area where the ground is covered by a layer of leaves and other debris that has accumulated from the surrounding vegetation. "Bare ground" refers to an area with no vegetation present.

Overall, annual grasses (considered non-native, invasive species) comprised 30% of the vegetative cover within the 259 quadrats and native species comprised 41%. The remaining ground cover consisted of non-native species, bare ground, or leaf litter. There were significant differences, however, in the plant populations observed in the quadrats along the centerline of the roadways as opposed to those along the edge of the roadway.

Figures A3.5 and A3.6 illustrate the results of the habitat surveys for the center quadrats and the edge quadrats, respectively. Native species comprised 17% of the vegetative cover within the center quadrats, while non-native species and bare ground comprised 11% and 44%, respectively. Non-native, invasive species comprised 28% of the vegetative cover within the center quadrats. Within the edge quadrats, native species composed 64% of the cover and, on a percentage basis, were four times more common than the next largest category. Leaf litter (0.3%), bare ground (12%), and non-native species (8%) comprised 20% of the edge quadrat areas. Non-native, invasive species comprised only 16% of the ground cover in the edge quadrats in contrast to the 44% value in the center quadrats.

Table A3.4 provides a summary of the vegetative cover estimates for each of the non-native, invasive species observed during the habitat survey. Ten of the 66 non-native, invasive species of particular concern to FONR [see Appendix D of the 2005 Rare Plant Survey Report (CH2M Hill, 2005)] were observed in the quadrat surveys. The presence of these species in the center quadrats ranged from only two of the quadrats (poison hemlock) to 88 quadrats (rattail fescue). In the edge quadrats, cut-leaved plantain was not observed but rattail fescue was found in 62 quadrats. Where present, the average percentage cover for any given species in a center quadrat ranged from <1% (cut-leaved plantain) to 20% (soft chess and wild oat) and from "not present" (cut-leaved plantain) to 70% (rattlesnake grass) for the edge quadrats. Rattlesnake grass was the only species with an average percentage cover that exceeded 25% in an edge quadrat. The average

percentage cover of any quadrat did not exceed 10% for sheep sorrel, poison hemlock, cat's ears, or cut-leaved plantain.

No iceplant, pampas grass, or invasive thistle species were observed within any of the sites.

A4.0 Conclusions

As illustrated in Figure A3.5, bare ground is the dominant characteristic of the center quadrats and covers, on average, 44% of each center quadrat. Non-native, invasive species (primarily annual grass species) were the second most widespread species with an average coverage of 28% of the center plots. Native species averaged 17% coverage in the center plots.

Within the edge quadrats, native species were clearly dominant, with an average percentage of cover of 64%. As a result, the average percent coverage of all other categories was less in comparison to the coverage of the center quadrats.

These results could be expected due to the history of disturbance along the centerline of each site and are consistent with the use of these roadways on a routine basis. The dominance of the native species along the edge plots may suggest that non-native, invasive species have not made significant population gains within the undisturbed habitat since these roadways were constructed. Because GPS was used to map each plot, data can be taken in the same plots over time to determine whether the percent cover of non-native, invasive species increases in the future within the adjacent, primarily native, habitat.

Monterey spineflower populations were observed in more locations than sand gilia populations (56 locations to 37 locations of sand gilia). 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 sand gilia.

A5.0 References

CH2M Hill, 2005. 2005 Monterey Spineflower and Sand Gilia Survey Results, Fort Ord Operable Unit 1, Former Fort Ord, California. Prepared for HGL. December 2005.

FIGURES

Figure A3.5 Average Percent Cover within Center Quadrats

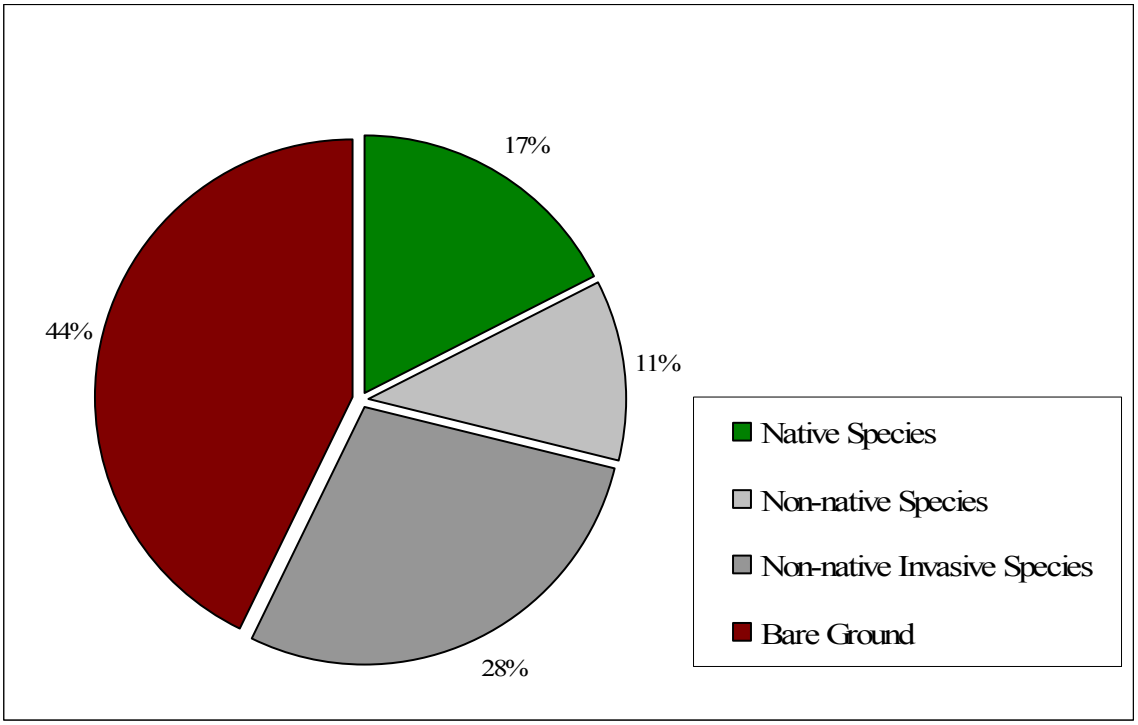
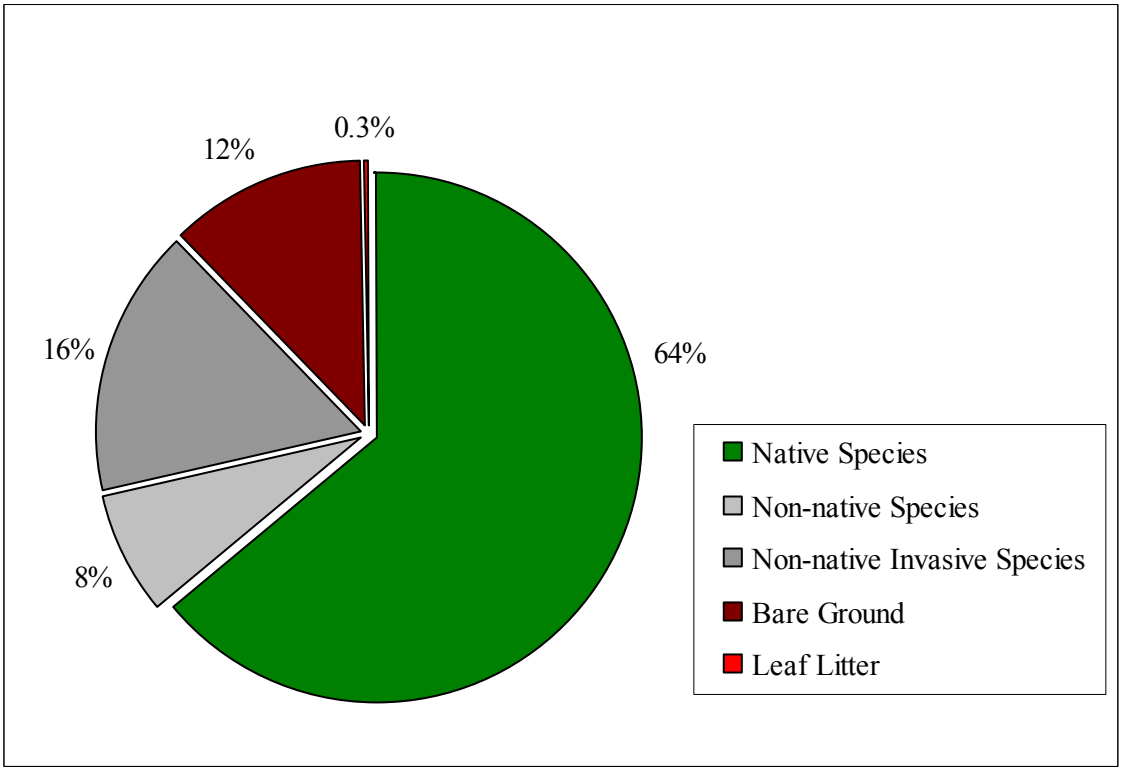


Figure A3.6 Average Percent Cover within Edge Quadrats



TABLES

Table A3.1 Sand Gilia Populations Identified During 2006 Survey

FONR Location	Population #	Number of Plants	Survey Date	GIS Feature Type	Figure Number
SITE 6	12	5	5/1/2006	Point	A3.2
SITE 6	13	4	5/1/2006	Point	A3.2
SITE 6	14	3	5/1/2006	Point	A3.2
SITE 6	27	27	5/1/2006	Polygon	A3.2
SITE 6	11	1	5/1/2006	Point	A3.2
SITE 9	26	13	5/2/2006	Polygon	A3.1
SITE 10	9	2	5/3/2006	Point	A3.1
SITE 10	10	1	5/3/2006	Point	A3.1, A3.2
SITE 10	38	10	5/3/2006	Polygon	A3.1
SITE 11B	21	2	5/2/2006	Point	A3.3
SITE 11B	22	2	5/2/2006	Point	A3.3
SITE 11B	23	2	5/2/2006	Point	A3.3
SITE 11B	24	3	5/2/2006	Point	A3.3
SITE 11B	25	3	5/2/2006	Point	A3.3
SITE 11B	29	36	5/2/2006	Polygon	A3.3
SITE 11B	30	140	5/2/2006	Polygon	A3.3
SITE 11B	32	45	5/2/2006	Polygon	A3.3
SITE 12	1	1	5/3/2006	Point	A3.4
SITE 12	2	3	5/3/2006	Point	A3.4
SITE 12	3	1	5/3/2006	Point	A3.4
SITE 12	4	1	5/3/2006	Point	A3.4
SITE 12	5	4	5/3/2006	Point	A3.4
SITE 12	6	2	5/3/2006	Point	A3.4
SITE 12	33	375	5/3/2006	Polygon	A3.4
SITE 14	15	1	5/2/2006	Point	A3.3
SITE 14	16	1	5/2/2006	Point	A3.3
SITE 14	17	1	5/2/2006	Point	A3.3
SITE 14	18	1	5/2/2006	Point	A3.3
SITE 14	19	1	5/2/2006	Point	A3.3
SITE 14	20	1	5/2/2006	Point	A3.3
SITE 14	28	17	5/2/2006	Polygon	A3.3
STAGING AREA 1	7	1	5/3/2006	Point	A3.4
STAGING AREA 2	8	9	5/3/2006	Point	A3.4
STAGING AREA 2	34	31	5/3/2006	Polygon	A3.4
STAGING AREA 2	35	110	5/3/2006	Polygon	A3.4
STAGING AREA 2	36	22	5/3/2006	Polygon	A3.4
STAGING AREA 2	37	80	5/3/2006	Polygon	A3.4

Table A3.2 Monterey Spineflower Populations Identified During 2006 Survey

FONR Location	Population #	Number of Individuals or Percent Cover	Cover Class	Survey Date	Figure Number
SITE 1	44	1	NA	4/24/2006	A3.1
SITE 1	76	10	Sparse	4/24/2006	A3.2, A3.3
SITE 1	77	35	Medium-Low	4/24/2006	A3.2, A3.3
SITE 3	69	5	Sparse	5/1/2006	A3.1, A3.2
SITE 3	70	5	Sparse	5/1/2006	A3.1, A3.2
SITE 4	61	5	Sparse	5/3/2006	A3.1, A3.2
SITE 4	64	3	Very Sparse	5/1/2006	A3.1, A3.2
SITE 6	71	8	Sparse	5/1/2006	A3.2
SITE 6	72	15	Sparse	5/1/2006	A3.2
SITE 7	66	10	Sparse	5/1/2006	A3.1, A3.2
SITE 7	67	10	Sparse	5/1/2006	A3.1, A3.2
SITE 7	68	30	Medium-Low	5/1/2006	A3.1, A3.2
SITE 9	93	40	Medium-Low	5/2/2006	A3.1
SITE 9	94	10	Sparse	5/2/2006	A3.1
SITE 10	41	2	NA	5/3/2006	A3.2
SITE 10	62	5	Sparse	5/3/2006	A3.1, A3.2
SITE 10	63	70	Medium	5/3/2006	A3.1, A3.2
SITE 10	65	40	Medium-Low	5/1/2006	A3.2
SITE 11A	84	5	Sparse	5/2/2006	A3.3
SITE 11A	87	5	Sparse	5/2/2006	A3.3
SITE 11A	82	20	Sparse	5/2/2006	A3.3
SITE 11A	83	10	Sparse	5/2/2006	A3.3
SITE 11B	88	2	Very Sparse	5/2/2006	A3.3
SITE 11B	89	2	Very Sparse	5/2/2006	A3.3
SITE 11B	90	2	Very Sparse	5/2/2006	A3.3
SITE 11B	91	2	Very Sparse	5/2/2006	A3.3
SITE 11B	92	5	Sparse	5/2/2006	A3.3
SITE 12	45	15	Sparse	5/3/2006	A3.4
SITE 12	46	10	Sparse	5/3/2006	A3.4
SITE 12	47	5	Sparse	5/3/2006	A3.4
SITE 12	48	35	Medium-Low	5/3/2006	A3.4
SITE 13	49	1	Very Sparse	5/3/2006	A3.4
SITE 14	40	1	NA	5/3/2006	A3.2
SITE 14	42	3	NA	5/2/2006	A3.3
SITE 14	43	1	NA	5/2/2006	A3.3
SITE 14	59	1	Very Sparse	5/3/2006	A3.2
SITE 14	60	25	Sparse	5/3/2006	A3.2
SITE 14	73	20	Sparse	5/1/2006	A3.3

FONR Location	Population #	Number of Individuals or Percent Cover	Cover Class	Survey Date	Figure Number
SITE 14	74	5	Sparse	5/1/2006	A3.3
SITE 14	75	10	Sparse	5/1/2006	A3.3
SITE 14	78	10	Sparse	5/2/2006	A3.3
SITE 14	79	5	Sparse	5/2/2006	A3.3
SITE 14	80	3	Very Sparse	5/2/2006	A3.3
SITE 14	81	2	Very Sparse	5/2/2006	A3.3
SITE 14	85	5	Sparse	5/2/2006	A3.3
SITE 14	86	5	Sparse	5/2/2006	A3.3
STAGING AREA 1	50	4	Sparse	5/3/2006	A3.4
STAGING AREA 1	51	15	Sparse	5/3/2006	A3.4
STAGING AREA 2	52	2	Very Sparse	5/3/2006	A3.4
STAGING AREA 2	53	15	Sparse	5/3/2006	A3.4
STAGING AREA 2	54	20	Sparse	5/3/2006	A3.4
STAGING AREA 2	55	15	Sparse	5/3/2006	A3.4
STAGING AREA 3	39	1	NA	5/3/2006	A3.4
STAGING AREA 3	56	2	Very Sparse	5/3/2006	A3.4
STAGING AREA 3	57	2	Very Sparse	5/3/2006	A3.4
STAGING AREA 3	58	20	Sparse	5/3/2006	A3.4

Table A3.3 Habitat Types Observed in Survey Areas

Survey Area[1]	Coast Live Oak Woodland	Central Maritime Chaparral	Coastal Scrub	Annual Grassland	Disturbed / Developed
1				*X*	*X*
2				*X*	*X*
3	X				*X*
4	X	X	X	X	X
5				*X*	*X*
6	X		X	X	X
7	X		X		X
8	X		X		X
9	X		X		X
10	*X*		*X*		*X*
11A	X				X
11B	X		X		X
12	X	X	X	X	X
13	X	X			X
14	*X*				*X*

[1] *Italics* indicate that a habitat inventory with a detailed quadrat survey was not conducted at the site – habitat attributes based on general observations made during rare plant surveys.

Table A3.4 Non-Native, Invasive Species Results

Species; Invasive List Status (CDFA/Cal-IPC/FONR)	Center Quadrat	Edge Quadrat
Red brome (*Bromus madritensis ssp. rubens*); (--/High/Concern)		
Number of Plots Present/Percentage of Total Plots	18/14%	13/10%
Range of Percent Cover	5-75%	5-35%
Average Percent Cover within Plots Present	15%	14%
Rip-gut brome (*Bromus diandrus*); (--/Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	10/7%	21/17%
Range of Percent Cover	5-15%	1-60%
Average Percent Cover within Plots Present	11%	17%
Wild oat (*Avena fatua*); (--/Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	16/12%	15/12%
Range of Percent Cover	5-50%	5-80%
Average Percent Cover within Plots Present	20%	25%
Sheep sorrel (*Rumex acetosella*) (--/Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	7/5.5%	7/5.5%
Range of Percent Cover	4-20%	3-10%
Average Percent Cover within Plots Present	10%	7%
Poison hemlock (*Conium maculatum*); (--/Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	2/<1%	2/<1%
Range of Percent Cover	2-3%	5%
Average Percent Cover within Plots Present	2.5%	5%
Rattail fescue (*Vulpia myuros*); (--/Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	88/67%	62/49%
Range of Percent Cover	5-90%	2-65%
Average Percent Cover within Plots Present	19%	18%
Rattlesnake grass (*Briza maxima*); (--/Limited/Concern)		
Number of Plots Present/Percentage of Total Plots	3/<1%	3/<1%
Range of Percent Cover	5-10%	40-100%
Average Percent Cover within Plots Present	7%	70%
Soft chess (*Bromus hordeaceus*); (--/Limited/Concern)		
Number of Plots Present/Percentage of Total Plots	30/23%	10/7.8%
Range of Percent Cover	1-75%	5-30%
Average Percent Cover within Plots Present	20%	15%
Cat's ears (*Hypochaeris* sp.); (--/Limited to Moderate/Concern)		
Number of Plots Present/Percentage of Total Plots	13/10%	4/3%
Range of Percent Cover	1-20%	1-5%
Average Percent Cover within Plots Present	9%	4%
Cut-leaved plantain (*Plantago coronopus*); (--/--/Concern)		
Number of Plots Present/Percentage of Total Plots	4/3%	0
Range of Percent Cover	5-10%	0
Average Percent Cover within Plots Present	<1%	0