

**1997 Annual Habitat Monitoring Report
Former Fort Ord
Monterey, California**

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DISTRIBUTION

1.0 INTRODUCTION

To maintain compliance with habitat management and monitoring requirements presented in the *Installation-Wide Multi-Species Habitat Management Plan for Former Fort Ord, California* (HMP) (USACE, 1997a), biological resources are monitored before and after ordnance and explosive (OE) removal activities have been completed. The HMP identifies species and habitats of concern on the installation and outlines mitigation measures intended to document baseline conditions, and monitor the successful regeneration of species and habitat following removal of OE. Mitigation efforts include collecting baseline data prior to OE removal and conducting follow-up monitoring for a period of 5 years following OE removal to document effects of remediation.

This report was prepared to address the Army's habitat monitoring requirements as identified in the HMP for OE removal actions. As data accumulate for OE sites that have similar characteristics (successional stage, aspect, slope and soil type), these data may be used to refine the vegetation removal methods (mechanical or burning) and OE removal methods to minimize adverse effects on the chaparral community in general and HMP species in particular.

1.1 Habitats and Species Considered for Habitat Monitoring

Sensitive habitats occurring on OE removal sites include central maritime chaparral and wetland habitats. These communities provide habitat for many of the special-status plants and animals identified in the HMP. Baseline and follow-up surveys are conducted to characterize central maritime chaparral in terms of shrub species composition and cover dominance, and to characterize the location and extent of special-status animal and herbaceous plant populations. Similarly, surveys in wetland habitats are conducted to characterize vernal pools and ponds in terms of size, and environmental parameters such as water depth, pH, and turbidity, the occurrence of special-status animals, and percent

vegetative cover. Follow-up surveys and monitoring are required to document habitat and HMP species regeneration in order to meet HMP success criteria. Success criteria for central maritime chaparral are defined in the HMP as follows "restored habitat will consist of naturally regenerating maritime chaparral that is managed using controlled burning and other techniques that maximize habitat value for HMP species." The success of restored or regenerated wetlands affected by OE removal will be gauged by comparing the functioning value of the habitat defined in terms of the percentage of native species and occurrence of special-status species before and after remediation.

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HMP species

HMP species associated with terrestrial OE removal sites are identified on Table 1 and include sand gilia (*Gilia tenuiflora arenaria*), Monterey spineflower (*Chorizanthe pungens*), coast wallflower (*Erysimum amphilum*), seaside bird's beak (*Cordylanthus rigidus littoralis*), Monterey manzanita (*Arctostaphylos montereyensis*), Monterey ceanothus (*Ceanothus cuneatus rigidus*), Hooker's manzanita (*Arctostaphylos h. hookeri*), Eastwood's ericameria (*Ericameria fasciculata*), sandmat manzanita (*Arctostaphylos pumila*), and California black legless lizard (*Anniella pulchra nigra*). HMP species associated with wetlands include California red-legged frog (*Rana aurora draytoni*), California tiger salamander (*Ambystoma tigrinum californiense*), and California linderiella (*Linderiella occidentalis*). Although California linderiella currently has no state or federal status, surveys are being continued in the event other listed species are encountered, and because linderiella has not been removed from the HMP.

2.0 BA KGROUND

The locations of OE removal sites where baseline studies and monitoring have been conducted are shown on Plate 1. All these sites are in areas proposed as habitat reserves and either support maritime chaparral and/or wetland habitats known to contain or potentially containing HMP species. Following is a summary of monitoring activities conducted from 1994 through 1997.

2.1 Previous Baseline Studies and Monitoring at Unexploded Ordnance Removal Sites 1994-1996

2.1.1 1994

Initial baseline studies were conducted by Jones & Stokes Associates (JSA) for habitat potentially affected by OE removal activities under contract to the U.S. Army Corps of Engineers (USACE). Baseline data were collected and the results were presented in the *Fort Ord 1994 Annual Monitoring Report for Biological Baseline Studies at Unexploded Ordnance Sites (USACE, 1994a)*. Monitoring was initiated as part of a five-year plan required by the HMP to monitor the regeneration of vegetation and special-status species populations. Chaparral sites surveyed in 1994 included OE Sites 10 West, Blackline, and 19. Herbaceous monitoring was initiated at Site 12. Water bodies investigated in 1994 include 01, 02, 04, 05, 16, 17, 35, 36, 37, Mudhen Lake West, and Mudhen Lake East.

2.1.2 1995

In 1995 JSA monitored sites disturbed by OE removal after the initial baseline studies of 1994 in the winter of 1995. Wetlands wildlife surveys were also conducted. Results are summarized in the *1995 Annual Biological Monitoring Report for Unexploded Ordnance Removal Sites at Former Fort Ord (USACE, 1995b)*. All water bodies included in the 1994 baseline study were surveyed for wetland wildlife species in accordance with United States Fish and Wildlife Service

(USFWS) fairy shrimp survey protocol. Areas monitored or surveyed included:

- Follow-up monitoring at Site 12 (sand gilia population identified in 1994)
- Follow-up monitoring Site 10 East (to relocate and flag the existing sand gilia population)
- * Follow-up monitoring at Water Bodies 5, 16, 17, and Mudhen Lakes East and West (Site 21)
- Baseline monitoring at Water Bodies 11, 36, and 37.

2.1.3 1996

In 1996, Harding and Lawson Associates (HLA) conducted terrestrial monitoring and JSA performed wetlands monitoring. JSA continued to monitor wetland vegetation and to conduct surveys for fairy shrimp and any special-status species in water bodies initially surveyed in the 1994 baseline study. HLA conducted herbaceous surveys and monitoring of maritime chaparral habitats. In July 1996, the USACE exercised an option for additional monitoring sites and HLA began follow-up monitoring efforts at Site 10 West. Areas monitored and surveyed included:

- HLA conducted baseline surveys at Sites 10 East, 11, and 16
- HLA conducted follow-up monitoring Site 10 West *partial monitoring*
- HLA conducted third year follow-up monitoring for herbaceous HMP species at Site 12
- JSA conducted the third year of monitoring at 12 water bodies including 1, 2, 4, 5, 11, 16, 17, 35, 36, and 37.

2.2 1997 Vegetation Monitoring and Surveys

In spring 1997, a focused baseline survey for sand gilia and spineflower was conducted at Site 10 West to complete the collection of baseline information for this site. No follow up monitoring was conducted at this time at other OE sites, because no OE removal actions had occurred.

In March 1997, the USACE contracted HLA to conduct wetlands monitoring. Three water bodies were identified at this time as requiring baseline monitoring. Baseline herbaceous surveys were conducted at water bodies located at Sites 10 East (Machine Gun Flats) and at Range 37 of the Natural Resource Management Area (NRMA). A third water body, at Range 40A, was scheduled for baseline monitoring but not included because it was dry at the time of the surveys. The locations of the ponds included in the wetland monitoring are shown on Plate 1. Wetland monitoring conducted in 1997 focused on assessing the potential occurrence of California red-legged frog, characterizing wetland vegetation, and describing the physical and biological characteristics of each pond surveyed.

In July 1997 Chaparral Monitoring Polygon (CMP) was identified for baseline monitoring. The area encompasses 670.3 acres and is located on the western edge of habitat reserve lands in the NMRA. The CMP is adjacent to development parcels to the west; southwest and south. This polygon is indicated on Plate 1 and includes portions of HMP parcel numbers F1.4, F1.5 and the State route (SR) 68 Corridor. These parcels and the development parcels are subject to burning to remove shrub cover and facilitate OE removal (HLA 1997c). In advance of the prescribed burns and subsequent OE removal, line-intercept sampling was conducted at this site in August 1997. Herbaceous surveys were not conducted in August 1997 because the growth and flowering periods of annual HMP species such as sand gilia and spineflower were too far past for definitive population surveys. Data presented in this report represent the first year of line-intercept monitoring at the CMP as described above and the first year of baseline monitoring for water bodies at Machine Gun Flats and Range 37.

No herbaceous surveys done

3.0 METHODS

Methods used to collect data on HMP species and habitat in the 1997 monitoring year are described in *Protocol for Conducting Vegetation Sampling at Fort Ord in Compliance with the Installation-Wide Multispecies Habitat Management Plan (USACE, 1995a)*. Reports from previous monitoring years (*USACE, 1994, 1995b, 1996a, and 1996b*) and the wetland restoration plan (*USACE, 1997b*) were reviewed to maintain consistency in sampling methods. Methods include line-intercept sampling along permanent transects to characterize chaparral shrub cover, quadrat sampling in areas with a high percentage of herbaceous vegetation (areas visually estimated at greater than 30 percent cover), and focused surveys in suitable habitat to map the distribution of herbaceous HMP plant species. Surveys at wetland sites involved collecting cover by species data in transitional and emergent habitats, and conducting surveys for red-legged frog. Monitoring sites addressed during the 1997 biological monitoring surveys are shown on Plate 1. All biological monitoring work was accomplished with escort by an OE avoidance specialist.

3.1 Central Maritime Chaparral Habitat Monitoring

Field surveys in central maritime chaparral habitat at the CMP were conducted between August 6 and August 28 1997. The line-intercept method was used along marked transects to characterize areas of chaparral habitat. Herbaceous sampling in chaparral habitat was not warranted in the CMP, because no areas with greater than 30 percent cover by herbaceous plant species were observed. Aerial photographs were examined for indications of variations in seral stage and/or age structure, exposure, slope aspect, etc. Areas of identifiable variation were verified in the field and those areas confirmed to have significantly different species compositions were sampled and analyzed separately. Examination of aerial photographs and field surveys revealed three associations, or successional stages, in the chaparral habitat

that could be differentiated based on fire or disturbance history. These stages include mature chaparral, intermediate aged chaparral and disturbed chaparral. Characteristics of these stages are described in the Section 4.0. A total of 65 line-intercept baseline transects were placed to incorporate the range of observed variation, with forty-six transects placed in mature chaparral, thirteen transects placed in intermediate-age chaparral and 6 transects placed in disturbed chaparral.

3.1.1 Line-Intercept Sampling

The CMP was subdivided for sampling purposes into 28 smaller areas identified by physical features such as roads and fire breaks. Transects were placed to incorporate areas of varying slope, aspect, and species composition in these subdivisions of the CMP. Transect locations were field mapped on color copies of 1:12,000 aerial photographs and then located using Global Positioning System (GPS) equipment. Transect locations are indicated on Plate 2. Transect endpoints were generally placed near features easily identifiable on the aerial photography (e.g. roads, footpaths). Five-foot, lightweight t-posts were installed at endpoints and photographs were taken to record location and condition of the sampling transect. Transect numbers were etched into aluminum tags that were attached to the starting endpoint (endpoint closest to a road or path). Most transects were 50 meters (approximately 164 feet) in length. In some cases, transect length was limited by tall, impenetrable brush.

To determine the shrub composition, cover, and abundance, a measuring tape was extended the length of the transect over or through (in chaparral areas taller than 8 feet) the woody canopy. Cover was recorded for the distance that each species intercepted the tape. Intercept distance for each species was recorded separately to include foliar overlap. Additional species observed within 10 meters of the transect were also noted. Intercept distances of each species were combined and this total was divided by the length of the

transect, multiplied by 100 to obtain percent cover. Cumulative intercept distances for all cover types (i.e., shrubs, bare ground, and vegetated ground) were combined and divided by the total length of transects sampled and multiplied by 100 to provide a numerical estimate of cover by species or cover type.

3.1.2 Sample Size

Adequate sample size was calculated by using the running total of the average cover for each HMP species and dominant species (contributing greater than 1.2 percent cover) divided by combined transect lengths. Sample size was considered adequate when incorporating an additional transect to the combined data caused a change in the combined average cover of less than 10 percent.

3.2 Herbaceous Species Monitoring

HLA biologists conducted spring field surveys for sand gilia and Monterey spineflower to identify the location and extent of populations on Site 10 West. Before surveys were conducted, aerial photographs of the site were inspected to identify potentially suitable habitat. Biologists surveyed areas of potential habitat by traversing suitable habitat along transects of opportunity (approximately 25-foot intervals) to ensure adequate coverage. Identified populations were mapped on copies of 1:12,000-scale aerial photographs, population size was estimated, surrounding habitat was characterized, and data were collected on phenology, health, vigor, and plant associates. At the CMP, focused surveys for sand gilia, Monterey spineflower, seaside bird's beak, and coast wallflower were not conducted because monitoring at this site was initiated in August, beyond the appropriate survey period.

3.3 Wetland Monitoring

Baseline wetland monitoring was conducted at the pond at Range 37 and Machine Gun Flats. Both sites may be described as pond/marsh habitat. Range 37 was surveyed on June 17 and 18, 1997, and Machine Gun Flats was surveyed on July 23, 1997. No monitoring data had been collected at these sites prior to the

1997 surveys. The purpose of the wetland monitoring was to collect baseline data on wetland-associated HMP wildlife species and wetland vegetation. Monitoring focused on determining the presence or absence of California red-legged frog, characterizing wetland vegetation, and describing the physical and biological characteristics of each pond surveyed. Methods used to gather baseline data on wetland-associated HMP wildlife species and wetland vegetation were developed in accordance with guidelines specified in the HMP and are described briefly in the sections below.

3.3.1 Fauna

Wetland-associated HMP wildlife species that could be affected by OE removal activities and that currently require post-OE removal monitoring include California tiger salamander, California red-legged frog and fairy shrimp species. Baseline monitoring at Range 37 and Machine Gun Flats focused on evaluating the potential presence of California red-legged frog. Surveys for California tiger salamander and fairy shrimp were not conducted during this monitoring period; surveys for these species must be conducted during the wet season (from fall through early spring).

Surveys for red-legged frog were conducted by slowly walking the perimeter of the pond, moving back and forth between open water and wetland vegetation at the edge of the pond. All vertebrate species observed during the survey were recorded in field logs. Surveys were conducted on 2 consecutive days at Range 37, and on 1 day at Machine Gun Flats. USFWS protocols for red-legged frog surveys indicate that potential habitat should be surveyed four times (twice during the day and twice at night). Hazards associated with the potential presence of OE precluded night surveys.

3.3.2 Wetland Vegetation Sampling

Wetland vegetation sampling was conducted at Range 37 and Machine Gun Flats. Herbaceous sampling was conducted using a modified quadrat method identified in *Protocol for Conducting Vegetation Sampling at Fort Ord in*

Compliance With the Installation-Wide Multispecies Habitat Management Plan (USACE, 1995). The primary modification of the sampling protocol presented in Protocol for Conducting Vegetation Sampling at Fort Ord is the interval between quadrats. The original protocols were developed for vegetation sampling in chaparral habitat. Due to high variability of herbaceous species composition and cover over short distances at Range 37 and Machine Gun Flats, quadrats were placed at shorter intervals (every 10 feet instead of every 10 meters) to capture abrupt vegetation changes that were evident in the field.

The number, location, and length of transects were selected to provide data representative of the transitional and emergent habitats at each site. Five-foot lightweight t-posts were installed at endpoints and photographs were taken to record location and condition of the sampling transect. Transect locations were recorded on color copies of 1:12,000 aerial photographs. Transect endpoints at Range 37 were also located using a real-time, differentially-corrected GPS unit. Sampling was conducted along the transects by placing a 0.25-meter square quadrat at the starting point and at 10-foot intervals alternating from the right to left side of the transect. Plant species present within the quadrat were identified, percent cover was estimated for each species, and data were recorded.

3.3.3 Physical Characteristics

Physical data collected at wetland sites included water pH and turbidity measurements, the estimated area of each wetland (measured using GPS), and a general description of flora and fauna observed. Turbidity and pH data were collected during vegetation surveys in June and GPS data were collected on August 26, 1997. Turbidity was measured using a Secchi disc, and pH was measured using a portable field pH meter. The wetland area was measured only for Range 37. GPS data could not be collected at Machine Gun Flats during the August 26 and 27 mobilization, due to restricted access associated with a nearby uncontrolled fire. The wetland acreage of Range 37 was measured by walking the perimeter of the pond, at the estimated upland extent of wetland vegetation, with the GPS unit. The perimeter was walked at a relatively constant rate, and the GPS unit was set to collect data points at a continuous rate.

4.0 RESULTS

4.1 Central Maritime Chaparral Habitat Monitoring

HMP shrub species observed during monitoring at the CMP include Eastwood's ericameria, Monterey ceanothus, and sandmat manzanita. As described in the Baseline Biological Report for Fort Ord (USACE, 1992), Former Fort Ord supports two weakly differentiated chaparral types that occur on different soils (Sand Hill Formation versus Aromas Formation). These types can be further differentiated by shrub species composition. In general, Hooker's and Monterey manzanita occur more frequently on soils derived from the Aromas Formation. Chaparral in the CMP occurs primarily on the Sand Hill Formation. Sampling transects did not intercept these two species. However, a few individuals of Monterey manzanita were observed at the extreme south eastern portion of the polygon.

Results of line-intercept and quadrat sampling of central maritime chaparral habitat are described below. Figures 1 through 5 display typical habitat sampled during monitoring. Intercept distances and percent cover for shrub species in mature, disturbed, and intermediate-age chaparral are presented in Tables 2, 3, and 4. The average percent cover by cover types is graphically represented in Figures 6, 7, and 8. The three associations occupy different proportions of the CMP. Mature chaparral occupies the largest area at 436.6 acres. Intermediate-age chaparral occupies 140.6 acres and disturbed occupies 93. The intermediate-age chaparral association had greater cover by HMP species, more open areas, larger herbaceous component, and less cover by weed species than the disturbed and mature chaparral associations.

Mature chaparral is composed of fully mature to senescent stands of shrubs that are of an estimated age greater than 15 years and are generally between 6 and 15 feet in height. Mature stands have very little open ground and almost no herbaceous layer. Intermediate-age stands are estimated to be 5

to 15 years old and generally ranged from 3 to 6 feet in height. Intermediate-age stands generally exhibit more open ground and herbaceous plant cover. Disturbed chaparral as defined in this report is located in range fans that have cleared rows in firing lines that are interspersed with strips of chaparral. These strips of chaparral have a high percentage (greater than 40 percent) of cover contributed by chaparral shrub species. Disturbed stands were observed to be transitional in species composition and cover between intermediate-age chaparral and mature chaparral.

Cover by herbaceous vegetation (vegetated ground) and open spaces (bare ground) was greatest in intermediate-age chaparral and at comparable levels in mature and disturbed chaparral. Cover contributed by herbaceous vegetation was 0.6 percent in mature chaparral, 3.9 percent in intermediate-age chaparral and 0.5 percent in disturbed chaparral. Bare ground, which included dead vegetation was determined to be 10.1 percent in mature chaparral, 30.7 percent in intermediate-age chaparral, and 9 percent in disturbed chaparral.

Cover by HMP shrub species was higher in intermediate-age stands than in mature or disturbed chaparral stands. HMP shrub species were at comparable cover levels in mature and disturbed chaparral. HMP shrub species encountered in the CMP and their combined average cover in the monitoring polygon are as follows:

- Mature chaparral sandmat manzanita (9.4 percent), Monterey ceanothus (3.0 percent), and Eastwood's goldenbush (0.2 percent)
- Intermediate-age chaparral sandmat manzanita (12.6), Monterey ceanothus (1.5 percent) and, Eastwood's goldenbush (0.04 percent)
- Disturbed chaparral: sandmat manzanita (8.8 percent), Monterey ceanothus

(3.4 percent), and Eastwood's goldenbush (0.02 percent).

Noxious weed species observed on the site include Pampas grass (*Cortaderia jubata*) and Hottentot fig (*Carpobrotus edulis*). Average cover by Pampas grass was measured at 0.9 percent in mature chaparral, 0 percent in intermediate-age chaparral, and 1.1 percent in disturbed chaparral.

4.2 Herbaceous Species Monitoring

Herbaceous species considered in the HMP and observed at sampling sites during 1997 surveys include sand gilia and Monterey spineflower. Two populations of sand gilia not previously recorded were observed on Site 10 West. Plate 3 indicates populations identified during 1997 surveys. Monterey spineflower was observed at low densities over the southern portion of Site 10 West.

4.2.1 Sand Gilia

Sand gilia observations on Site 10 West included one population consisting of six individuals and a second consisting of 249 individuals in flowering condition. No plants had been identified on this site in the 1994 or 1995 Annual Monitoring Reports (USACE, 1994 and 1995b). Plate 3 indicates the location and number of individuals in sand gilia populations observed on Site 10 West.

The larger sand gilia population occurred in sandy areas edging a dirt road and along a nearby footpath in the south central portion of the site. The population occurred on a hillside at the base of a south east facing bluff of consolidated sandstone on an approximately 45 degree slope. The population was surrounded by chaparral habitat which graded into coast live oak (*Quercus agrifolia*) woodland toward the bottom of the hill. Of the observed individuals, all were in anthesis (full bloom). Shrub associates included Monterey manzanita, shaggy bark manzanita (*Arctostaphylos t. tomentosa*), chamise (*Adenostoma fasciculatum*), sticky monkey flower (*Mimulus aurantiacus*), and black sage (*Salvia mellifera*). Herbaceous or suffrutescent associates include rush rose (*Helianthemum scoparium*) wedge-leaved horkelia (*Horkelia c.*

cuneata), golden yarrow (*Eriophyllum confertiflorum*), virgate eriastrum (*Eriastrum virgatum*), rough navarretia, and junegrass (*Koeleria macrantha*). Closely associated herbaceous species include Monterey spineflower, valley lessingia (*Lessingia glandulifera pectinata*), virgate eriastrum, rough navarretia (*Navarretia atractyloides*), smooth cat's-ear (*Hypochaeris glabra*), and woolly filago (*Filago gallica*).

The smaller sand gilia population was observed along a dirt road approximately 800 feet to the east, in a grassy opening with scattered coast live oak trees and chaparral shrub species. The area had been burned prior to ordnance removal sampling in 1995. Soils were depositional. Adjacent habitat consisted of coast live oak woodland/grassland grading into central maritime chaparral. Associates occurring within the boundaries of the sand gilia population include shrubs such as, chamise, deerbrush (*Lotus scoparius*), and herbaceous species such as red brome (*Bromus madritensis rubens*), ripgut grass (*Bromus diandrus*), Monterey spineflower, California croton (*Croton californica*), wedge-leaved horkelia, valley lessingia, and filaree (*Erodium* spp.).

4.2.2 Monterey Spineflower

Monterey spineflower was typically observed at low densities on Site 10 West in most areas with loose sand at the edges of coast live oak woodland and grassland or in openings in coastal scrub and chaparral. Common associates observed with Monterey spineflower include virgate eriastrum, needle-leaved navarretia (*Navarretia intertexta*), smooth cat's-ear, ripgut grass, slender wild oat (*Avena barbata*), California croton, filaree, valley lessingia, rough navarretia, and woolly filago.

4.3 Wetland Monitoring

Results of the wetland monitoring are discussed below.

4.3.1 Fauna

Red-legged frog was not observed at either Range 37 or Machine Gun Flats. Pacific treefrog (*Hyla regilla*) adults and larvae were observed in both ponds, and bullfrog (*Rana*

catesbeiana) adults were observed in Machine Gun Flats. Other vertebrate fauna observed during the surveys are listed in Table 5.

4.3.2 Wetland Vegetation Sampling

Six transects were placed at Range 37, and nine transects were placed at Machine Gun Flats. Transects ranged from 50 to 100 feet long. Because species composition in transitional habitat was significantly different from that in emergent habitat, data for these two habitat types were considered separately. Transect lengths, number of quadrats and habitat types are summarized in Table 6. The relative percent cover by species, for each pond and habitat type, are summarized in Tables 7 through 10. Figures 9 through 13 display typical wetland habitat sampled during monitoring.

Thirty-eight plant species were recorded in transitional habitat at Range 37. Dominants, present at greater than 10 percent of the combined average cover, include needle spikerush (*Eleocharis a. acicularis*), Baltic rush (*Juncus balticus*), common spikerush (*Eleocharis macrostachya*), and mosquito fern (*Azolla filiculoides*). Most of the other 35 plant species were present at 1 percent or less of the combined average cover. Emergent habitat at Range 37 is dominated by common spikerush and mosquito fern, which comprise 42 and 12 percent, respectively, of the combined average cover. Twelve other plant species were recorded in emergent habitat at the site.

Non-native plant species are indicated in Table 7-10 by an asterisk. Non-native plant species contributed greater cover in transitional habitat than in emergent habitat at Range 37. The total cover contributed by non-native species at Range 37 was measured to be 15 percent of the combined average cover in transitional habitat, and 0.29 percent in emergent habitat.

At Machine Gun Flats, transitional habitat is dominated by 3 of the 44 species recorded including: brown-headed rush (*Juncus phaeocephalus*), 20 percent; creeping wild rye (*Leymus triticoides*), 17 percent; and coyote thistle (*Eryngium aristulatum*), 12 percent. *E. vaseyi* Emergent habitat at the site is dominated by common spikerush (66 percent of the combined average cover), brown-headed rush (7.1 percent), and needle spikerush (6.6 percent).

At Machine Gun Flats, non-native species comprised proportionately greater cover in transitional habitat than in emergent habitat. Cover by non-native species was calculated to be 6.8 percent of the total combined average cover in transitional habitat, and 0.37 percent in emergent habitat.

4.3.3 Physical Characteristics

Physical characteristics recorded at each site included pH and turbidity. Total area was also measured at Range 37. The average pH of the pond at Range 37 was 7.45, and the Secchi disc was visible to a depth of 3.5 inches. At Machine Gun Flats, the average pH in the pond was 6.97. A smaller depression west of the main pool contained water and was sampled separately. The pH in the smaller pool was 7.38. The Secchi disc was visible to 7 inches in both water bodies. The area of the pond at Range 37 was calculated to be 5.6 acres using GPS data. The area for Machine Gun Flats was not calculated.

Turbidity is being measured w/ a meter - can be compared

5.0 DISCUSSION AND RECOMMENDATIONS

This Section discusses the findings of the 1997 monitoring and biological baseline studies conducted in chaparral and wetland habitat and recommends future monitoring actions.

5.1 Central Maritime Chaparral Habitat Monitoring

The CMP was subdivided into three associations: mature, intermediate-age, and disturbed. Mature chaparral was characterized by the predominance of a relatively dense growth of shaggy-bark manzanita and chamise shrubs greater than 15 years old with a few individuals of Monterey ceanothus or crop leaf ceanothus, and black sage. Cover by sandmat manzanita may have been overestimated at 9.4 percent. The overestimation results from installing transect end points near roadsides. Sandmat manzanita commonly occurred at the road edge but frequency dropped off sharply in the interior of mature chaparral areas. Intermediate-age chaparral areas had a similar species composition but exhibited reduced cover by shaggy-bark manzanita and chamise; had larger areas of bare ground; and, exhibited greater cover by seed reproducers including sandmat manzanita, black sage, and *Ceanothus* spp.

Herbaceous sampling was not conducted in chaparral habitat in the CMP. Observations during reconnaissance of the site indicated that the chaparral at the CMP is estimated to be between 5 and 30+ years old, and largely past the successional stage where herbaceous species contribute significantly to overall cover. Sampling data support this conclusion because, of the 65 sampling transects all but one from the intermediate-age association (18A-1) had vegetated ground with greater than 10 percent cover. These results are related to the developmental stage of the community.

Young chaparral (chaparral regenerated within 1 to 5 years of a fire) has been observed on the installation at other chaparral monitoring sites to have a high proportion of herbaceous

vegetation. As the shrub species mature between 5 to 15 years, increased cover and allelopathic interactions begin to suppress the growth of annual and herbaceous species. Additionally, shrub species that reproduce from seed tend to decline in dominance as the burl-forming species such as chamise and shaggy-bark manzanita grow taller and eventually shade out the lower growing seed sprouters such as sandmat manzanita and *Ceanothus* spp. (Griffin, 1978). The dense brush provides little or no new habitat for seeds to germinate and become established.

All of the HMP shrub species sampled at the CMP regenerate following fire or other disturbance primarily from seed. Results from sampling show a trend toward higher cover by HMP shrub species in intermediate-age chaparral. These data suggest that the HMP plant species are generally members of early successional stages of central maritime chaparral. This observation strengthens the approach to managing chaparral habitat using fire to develop a mosaic of successional stages that will in turn provide suitable habitat for HMP species.

5.2 Herbaceous Species Monitoring

Previously unrecorded sand gilias and Monterey spineflower populations were documented at Site 10 West. HMP herbaceous species sampling was not conducted at the CMP because the growth and flowering periods of annual HMP species were past in August when monitoring was conducted. Seasonal sampling would be warranted to adequately characterize the occurrence of HMP herbaceous species on the site.

5.3 Wetland Monitoring

The findings presented here represent the first year of wetland monitoring (i.e., baseline data) at Range 37 and Machine Gun Flats. Additional baseline data are anticipated to be needed for these sites including the following:

- Monitoring for California tiger salamander. California Department of Fish Game survey protocols recommend nighttime monitoring for adults between January and March, and larval surveys in March and April. Because of the presence of OE, it is unlikely that nighttime surveys will be possible at these sites; therefore, daytime larval surveys are recommended.
- Monitoring for federally listed fairy shrimp species. USFWS Interim Survey Guidelines to Permittees (April 19, 1996) require surveys for federally listed fairy shrimp to be conducted every 2 weeks beginning no later than 2 weeks after initial inundation and continuing until either fairy shrimp are found, the area is no longer inundated, or the area is inundated for 120 continuous days. GPS data needs to be collected for transect locations and wetland boundary needs to be defined at Machine Gun Flats.

Additional baseline data requirements vary based on HMP considerations requirements, planned OE removal activities, and other available information. Collection of baseline data at Machine Gun Flats may not be possible if the recent fire affected aquatic habitat at the site.

5.4 Weed Species

Weed species including Hottentot fig (*Carpobrotus edulis*) and Pampas grass (*Cortaderia jubata*) were observed along several fire roads, in firebreaks, and in range fans on the CMP. Only areas occupied by chaparral supporting HMP species were considered during monitoring. As a result, areas supporting large weed populations were not sampled. Information concerning the baseline conditions of these areas is not known. A large portion of Range 26 and outlying areas adjacent to cleared lands on Range 25 and 27 support large tracts of Pampas grass and Hottentot fig. These areas will probably act as refugia and provide the seed source for colonization by these weeds in disturbed areas following ordnance removal. Pampas grass was recorded along monitoring transects in mature and disturbed chaparral habitat. Hottentot fig was observed along roads and adjacent to many of the sampling

transects. Future monitoring will document the extent of weed colonization following prescribed fires and OE removal and vegetation clearing through burning or clipping.

5.5 Additional Monitoring Recommendations

Additional monitoring activities are recommended for several current OE sites. These recommendations are based on meeting monitoring objectives presented in the HMP. The sites and the recommended actions are presented below:

- Site 10 West: continue monitoring in the sampled grids to gauge chaparral regeneration in both the burned and clipped sample grids if no additional OE removal actions are planned
- Site 12: continue monitoring of the sand gilia population identified in 1994 to meet the 5 year monitoring requirement in the HMP
- 1997 Chaparral Monitoring Polygon: conduct seasonal surveys for HMP herbaceous species to complete baseline studies
- Machine Gun Flats, Range 40 Alpha, and Range 37: continue surveys at these water bodies to meet baseline HMP monitoring requirements as described in Section 5.3.

6.0 REFERENCES

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