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Appendix F. Geology and Soils of the San Diego NWR

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Geology and Soils of the San Diego NWR

Appendix F: Geology and Soils of the San Diego NWR

Understanding the types of soils present within the San Diego NWR and where they occur is important when making management decisions related to the siting of facilities, as well as the protection, enhancement, and restoration of sensitive plant species. Soils influence the type of vegetation present in a given area and, in some cases, the presence of a particular soil (e.g., gabbro soils, Linne clay) indicates a potential for rare plants. Soil properties such as erodibility and runoff potential are also important to consider when laying out sustainable trails or siting facilities such as a trail bridge, parking lot, or visitor contact station. Presented in this appendix are the geological formations and soil conditions present within the various management areas of the Refuge.

A. Otay-Sweetwater Unit

The majority of the lands within the Otay-Sweetwater Unit occur within the Peninsular Ranges geomorphic region of San Diego County, which is underlain by granitic rocks formed during the cooling of magmas generated between 140 and 90 million years ago (Deméré no date). Specific details regarding the geology and soils within the five distinct areas of the Otay-Sweetwater Unit are presented here.

McGinty Mountain Area

Within the McGinty Mountain area, the majority of the land is underlain by Mesozoic granitic rock of the Southern California Batholith. A number of different soil types have been identified in this area (Figure F-1), with the majority of the area overlain with soils of the Cieneba series. This soil series is characterized as excessively drained, very shallow to shallow coarse sandy loam that has been formed in place from granitic rock (Bowman et al. 1973). The steeper mountain slopes and ridges that occur in the southern and central portions of this area are overlain with Cieneba very rocky course sandy loam, 30 to 75 percent slopes (CmrG). In areas overlain with this soil type, an estimated 20 percent of the area includes rock outcrops, of which 30 percent consist of very large granodioritic boulders. The erosion hazard for this soil type is high to very high.

A small portion of the Sweetwater River floodplain is included along the western border of the McGinty Mountain area. Here the soils include Tujunga sand, 0 to 5 percent slopes (TuB) (described in greater detail in the discussion of the Sweetwater River Area). Ramona sandy loam, 9 to 15 percent slopes, eroded (RaD2) is present just upslope of the floodplain (Bowman et al. 1973). These Ramona series soils, which have a slight to moderate erosion hazard, are formed in granitic alluvium.

Vista series soils, which are weathered from granodiorite or quartz diorite, occur throughout the site. Specific soil types include Vista coarse sandy loam, 9 to 15 percent slopes (VsD); Vista coarse sandy loam, 15 to 30 percent slopes (VsE); Vista coarse sandy loam, 30 to 65 percent slopes (VsG); Vista rocky coarse sandy loam, 15 to 30 percent slopes (VvE); and Vista rocky coarse sandy loam, 30 to 65 percent slopes (VvG) (Bowman et al. 1973). The erosion hazard for these soils ranges from moderate for the flatter areas to very high in steep areas.

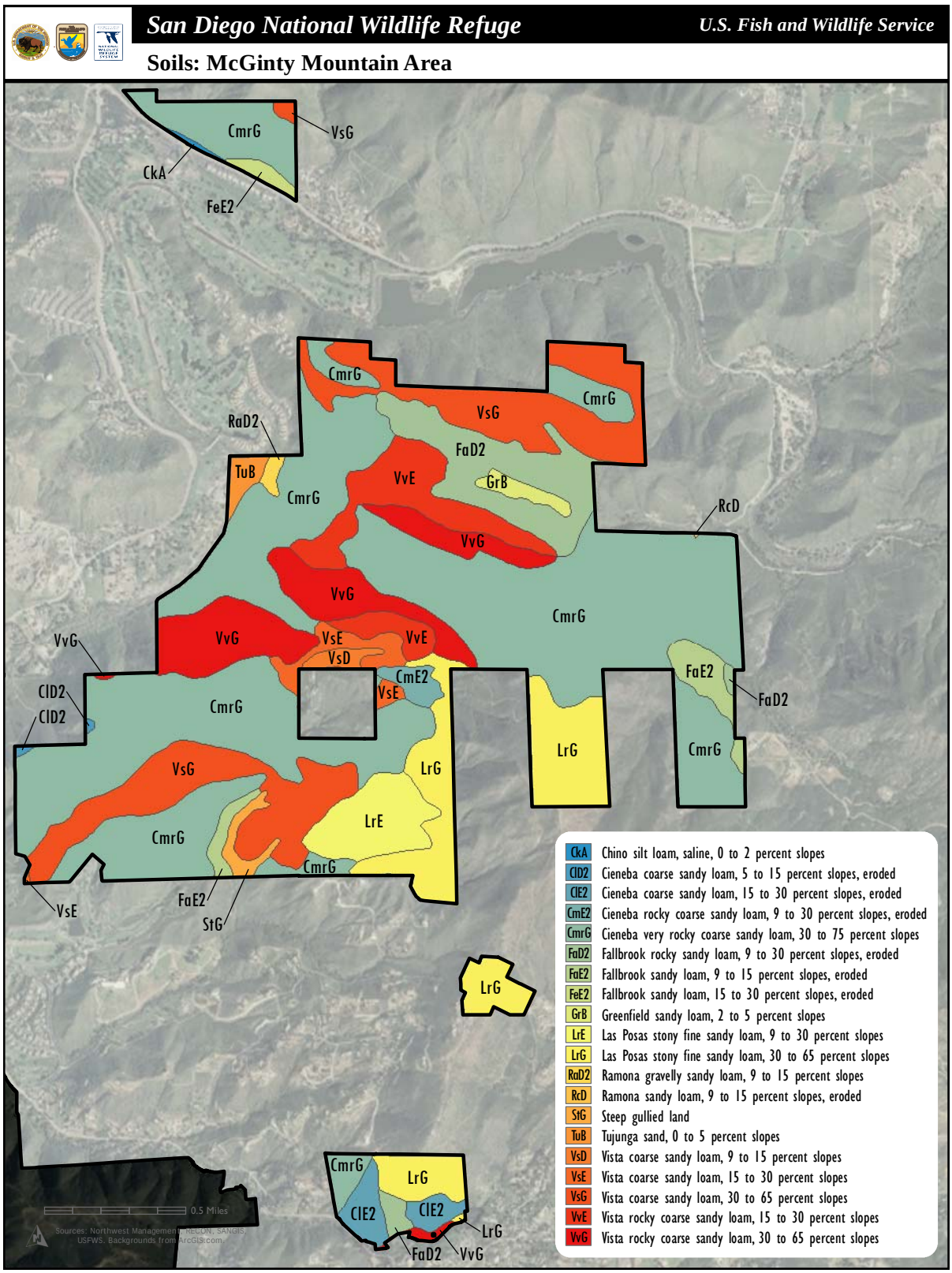

Figure F-1. Soils that Overlay the McGinty Mountain Area, Otay-Sweetwater Unit

A small area of Greenfield sandy loam, 2 to 9 percent slopes (GrB) surrounded by Fallbrook sandy loam, 9 to 15 percent eroded (FaD2), occurs in the northern portion of the site. The erosion hazard in this area is slight to moderate. Smaller areas of Fallbrook sandy loam, 15 to 30 percent eroded (FaE2) occur at the eastern and southern boundaries of this area. The Fallbrook series soils are well-drained, sandy loams formed in place from weathered granodiorite (Bowman et al. 1973), and the erosion hazard of these soils is moderate to high. Greenfield sandy loam, derived from granitic alluvium, is a very deep, well-drained soil found on alluvial plains.

In the southeast end of the McGinty Mountain Area there are areas overlain by Las Posas stony fine sandy loam, 9 to 30 percent (LrE) and Las Posas stony fine sandy loam, 30 to 65 percent slopes (LrG). These soils, which have a moderate to very high erosion hazard, are formed in place from weathered igneous (gabbro) rocks (Bowman et al. 1973) and usually have a clay subsoil.

The parcel north of Dehesa Road is overlain primarily with Cieneba very rocky course sandy loam, 30 to 75 percent slopes (CmrG), which has a high to very high erosion hazard. A small area of Vista course sandy loam, 30 to 65 percent slopes (VsG), is present in the northeast corner of the parcel. Fallbrook rocky sandy loam, 9 to 30 percent slopes, eroded (FeE2), and a small area of Tujunga sand, 0 to 5 percent slopes (TuB), occurs in the southeastern portion of the parcel, while Chino silt loam, saline, 0 to 2 percent slopes (CkA), occurs along the northern edge of Dehesa Road in the southwestern portion of the parcel.

The Refuge parcel in the southeastern portion of this area, located to the north of Jamul Drive, appears to be underlain by slightly metamorphosed granodiorite, which is only found on the north side of Highway 94. The soils on this parcel consist primarily of a combination of Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes (CmrG), and Cieneba coarse sandy loam, 15 to 30 percent slopes, eroded (ClE2), both derived from weathered granitic rock, as well as Vista (VvG) and Fallbrook (FaD2) series soils. Las Posas stony fine sandy loam, 30 to 65 percent slopes (LrG), which has a clay subsoil derived from weathered gabbro, is also present in the northeastern portion of the parcel. The erosion hazard for these soils is moderate for FaD2, moderate to high for ClE2, and high to very high for LrG and VvG.

Las Montañas Area

The majority of the Las Montañas area is also underlain by Mesozoic granitic rocks of the Southern California Batholith. The soils in the northern portion of this area (Figure F-2) generally consist of silty sands ranging in texture from medium to coarse. The majority of this area is overlain with Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes (CmrG). Most of the remaining areas are overlain with Vista series soils, including Vista coarse sandy loam, 15 to 30 percent slopes (VsE); Vista coarse sandy loam, 30 to 65 percent slopes (VsG); and Vista rocky coarse sandy loam, 30 to 65 percent slopes (VvG) (Bowman et al. 1973). The erosion hazard associated with these soil types ranges from moderate for 15 percent slopes to very high for slopes exceeding 50 percent. A small area adjacent to Jamul Drive in the north is overlain with Placentia sandy loam, 9 to 15 percent slopes, eroded (PeD2), a sandy loam with a sandy clay subsoil derived from granitic alluvium. The erosion hazard for this soil type is moderate. Deposits of alluvial soils, Ramona sandy loam, 5 to 9 percent slopes (RaC), occur in the western portion of the Las Montañas area along Steele Canyon. The erosion hazard of this soil is slight to moderate. To the east, along both sides of Highway 94, soil in the Fallbrook series (Fallbrook sandy loam, 15 to 30 percent eroded [FaE2]) is present. The erosion hazard is moderate.

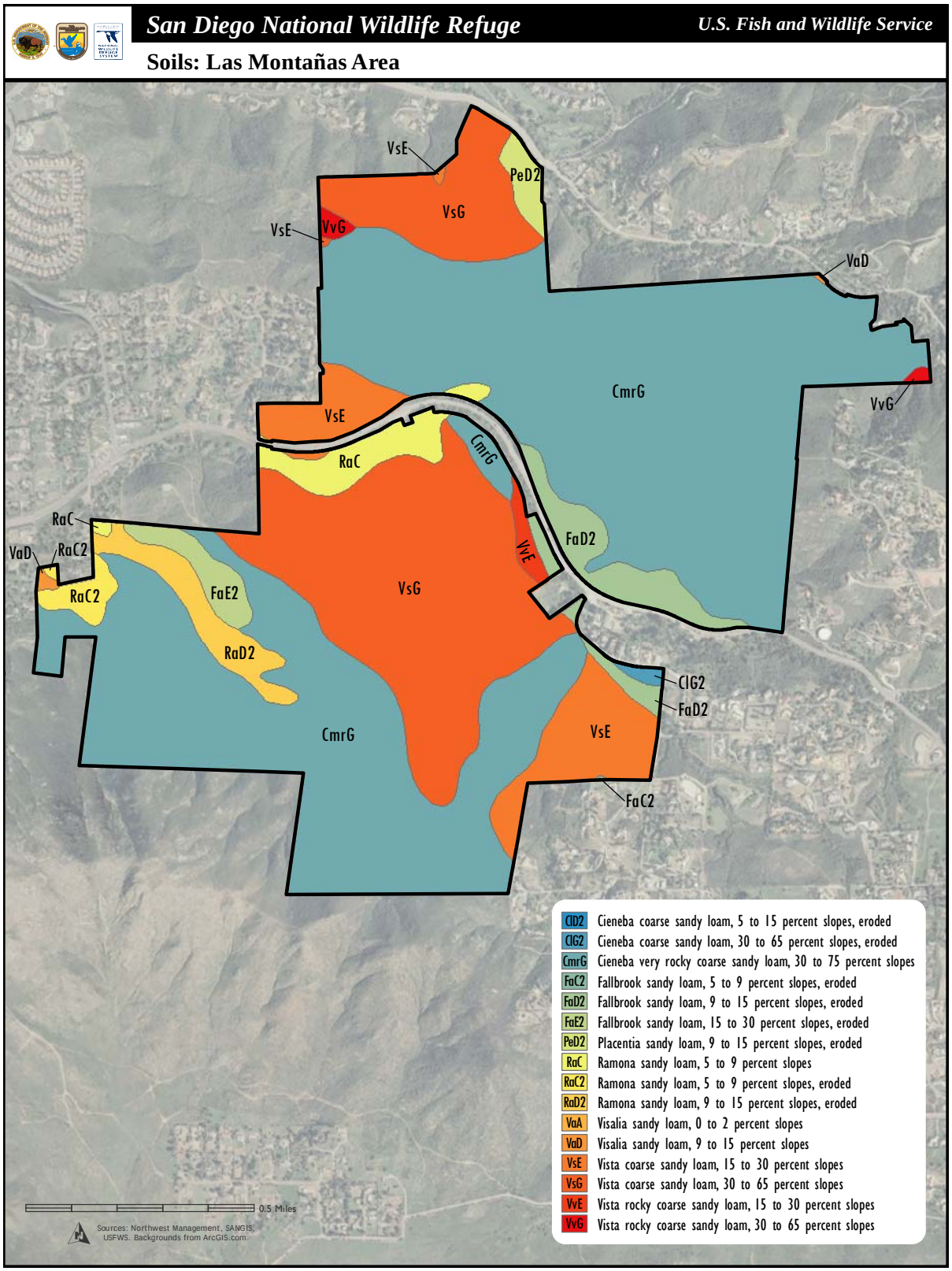

Figure F-2. Soils that Overlay the Las Montañas Area, Otay-Sweetwater Unit

The two primary soil types on the south side of Highway 94 include Vista coarse sandy loam, 30 to 65 percent slopes (VsG), and Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes (CmrG). The erosion hazard of both of these soil types is high to very high. Areas of Ramona sandy loam, 5 to 9 percent slopes, eroded (RaC2), and Ramona sandy loam, 9 to 15 percent slopes, eroded (RaD2), occur in the western portion of the site and have a slight to moderate erosion hazard. Areas of Vista coarse sandy loam, 15 to 30 percent slopes (VsE), and Fallbrook sandy loam, 5 to 9 percent eroded (FaC2), occur along the eastern edge of this area. The erosion hazard in these areas is slight to high, with the hazard increasing as the slope gradient increases.

Sweetwater River Area

The portion of the Sweetwater River area to the north of the Highway 94 is dominated by Mesozoic granite rocks of the Southern California Batholith, while the majority of the area to the south of Highway 94 is underlain with Santiago Peak metavolcanic rocks. The latter geologic formation consists of a collection of mildly metamorphosed (altered by heat and pressure) volcanic and volcanoclastic rocks (sedimentary units derived from volcanic rocks) with minor amounts of sedimentary material (Ogden 1992). Santiago Peak volcanics are generally hard and extremely resistant to erosion. The Jamacha parcel located to the west of Jamacha Boulevard is underlain by Santiago Peak volcanic rock in the northern end of the parcel and Pleistocene non-marine sediments to the south. Both sides of Highway 94 within and adjacent to the floodplain of the Sweetwater River and its tributaries are underlain by Quaternary alluvium and colluvium.

The Sweetwater River area is overlain with a variety of soil types (Figure F-3). The majority of the floodway of the Sweetwater River, which extends north/south through the Sweetwater River area, is overlain with Tujunga sand, 0 to 5 percent slopes (TuB). The Tujunga soil series consists of excessively drained sands derived from granitic alluvium (Bowman et al. 1973). Riverwash (Rm) has also been mapped within the streambed near the northern end of the Sweetwater River area. The material in this area is expected to consist of sandy, gravelly, or cobbly material.

On the north side of Highway 94, there are two small areas in the north that are overlain by Visalia sandy loam, 2 to 5 percent slopes (VaB), a very deep sandy loam derived from granitic alluvium. Also in the northern portion of this area are soils in the Vista series (VsD, VsE, and VsG). The erosion hazard is moderate to high with the steeper slopes having the greater potential for erosion. Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes (CmrG), which overlays the steeper portions of the site, has a high to very high potential for erosion. Friant fine sandy loam, 30 to 50 percent slopes (FwF), and Friant rocky fine sandy loam, 30 to 70 percent slopes (FxG), are present on the slopes in the southwestern end of this portion of the Sweetwater River area. These soils, which are derived from weathered metasedimentary rock (Bowman et al. 1973), are highly erodible. Small areas of Fallbrook sandy loam, 15 to 30 percent slopes, eroded (FaE2), and Ramona sandy loam, 9 to 15 percent slopes, eroded (RaD2), occur along the southern edge of this area, where the potential for erosion is moderate to high.

The small parcel located to the northwest of Jamacha Boulevard is overlain primarily with soils in the Vista series, including Vista coarse sandy loam, 5 to 9 percent slopes (VsC); Vista coarse sandy loam, 30 to 65 percent slopes (VsG); and Vista coarse sandy loam, 15 to 30 percent slopes, eroded (VsE2). The erosion characteristics of these soil types range from moderate to high, with steeper slopes having the higher potential for erosion. A smaller area of Visalia sandy loam, 0 to 2 percent slopes (VaA), occurs along the northeast edge of this parcel. This soil type presents only a slight potential for erosion.

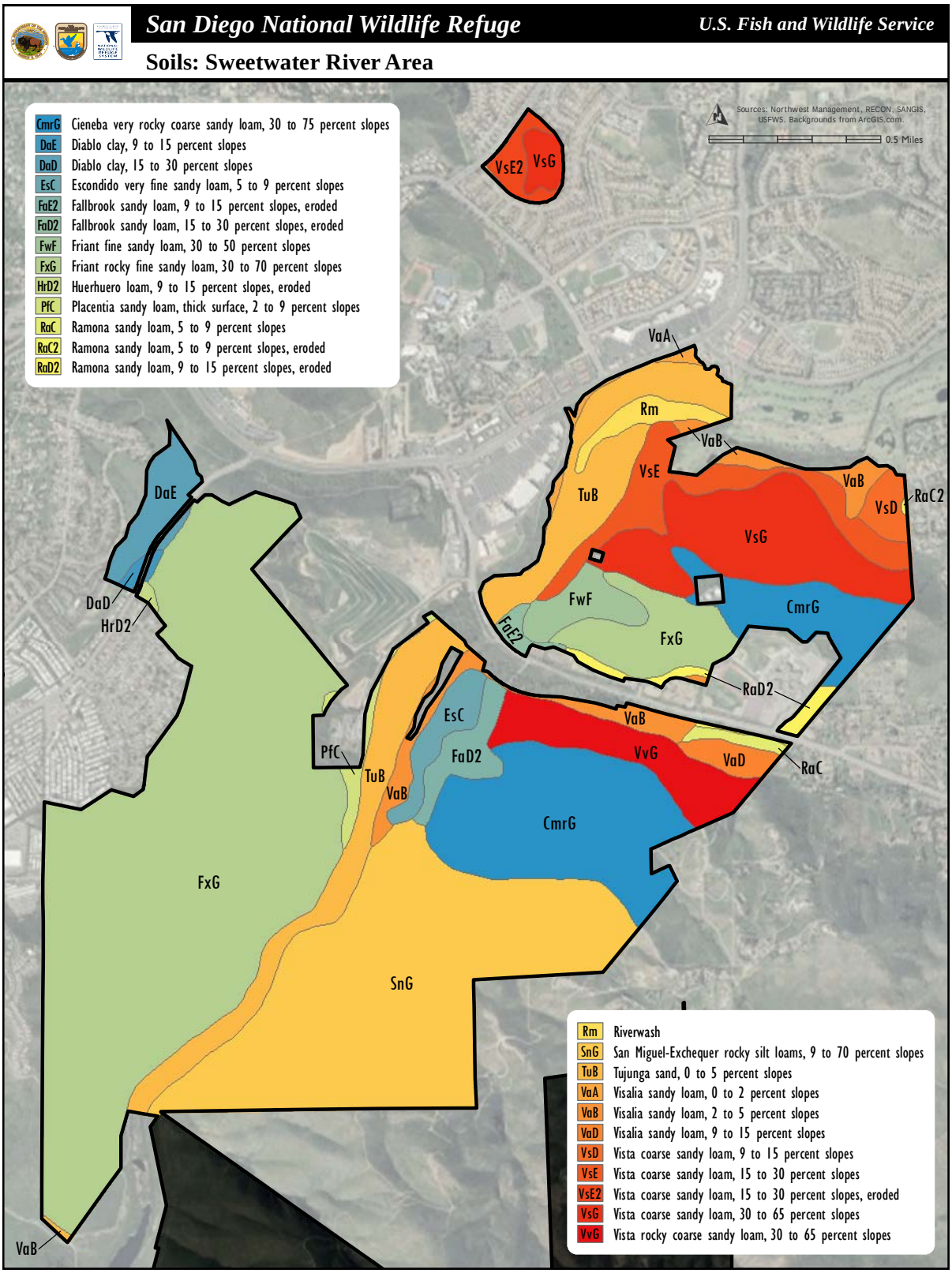

Figure F-3. Soils that Overlay the Sweetwater River Area, Otay-Sweetwater Unit

To the south of Highway 94 and west of the Sweetwater River, the area is overlain with Friant rocky fine sandy loam, 30 to 70 percent slopes (FxG). This soil, which occurs on steep slopes, demonstrates rapid to very rapid runoff velocities with high to very high potential for erosion (Bowman et al. 1973). A very small area of Huerhuero loam, 9 to 15 percent slopes (HrD2), occurs adjacent to Jamacha Boulevard, near the southern end of the Jamacha parcel. The Huerhuero series soils, which developed in sandy marine sediments, generally consist of well-developed loams with a clay subsoil, and the potential for erosion is moderate. The majority of the Jamacha parcel is overlain with Diablo clay, 15 to 30 percent slopes (DaE). In the south end of the parcel, Diablo clay, 9 to 15 percent slopes (DaD), is present. The Diablo series soils are well drained and consist of moderately deep to deep clays derived from soft, calcareous sandstone and shale (Bowman et al. 1973). The erosion hazard is moderate to high, with the higher hazard occurring on the steeper slopes.

A small area overlain with Placentia sandy loam, thick surface, 2 to 9 percent slopes (PfC), extends along the northern border of the Sweetwater River streambed for a short distance in the area south of Highway 94. This soil series consists of a well-drained loam with a sandy clay subsoil. Runoff is slow to medium, and the erosion hazard is slight to moderate. This soil is also present in the Steele Canyon drainage that follows along the south side of Highway 94. Another soil present in this general area is Visalia sandy loam, 2 to 5 percent slopes (VaB). This well-drained, very deep sandy loam has only a slight erosion hazard. Paralleling the Visalia sandy loam to the east is Escondido very fine sandy loam, 5 to 9 percent slopes (EsC). The Escondido series consists of deep, well-drained very fine sandy loams derived from weathered metamorphosed sandstone present within the site (Bowman et al. 1973). The erosion hazard is slight to moderate. Paralleling the Escondido series soil to the east is Fallbrook sandy loam, 9 to 15 percent slopes, eroded (FaD2). This soil series has also been formed in place, but its source is granodiorite rather than metamorphosed sandstone. The soil is moderately steep and 27 to 50 inches deep over rock (Bowman et al. 1973). The erosion hazard is moderate to high.

Ramona sandy loam, 5 to 9 percent slopes (RaC), is present within Steele Canyon near the eastern edge of this area, as is Visalia sandy loam, 9 to 15 percent (VaD). The erosion hazard for both soil types is slight to moderate.

The upland soils on the area to the south of Highway 94 and the east of the Sweetwater River from north to south include Vista rocky coarse sandy loam, 30 to 65 percent slopes (VvG); Cieneba very rocky coarse sandy loam, 30 to 70 percent slopes (CmrG);, and San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes (SnG). The Vista series soil type found in this area overlays steep to very steep slopes and is 20 to 32 inches deep over weathered rock. Approximately 10 percent of the surface is covered with rock outcrops, and large boulders occupy about 10 to 20 percent of this area. Similarly, the Cieneba series soil type occurs on steep to very steep slopes with approximately 20 percent of the surface covered with rock outcrops, of which very large granodioritic boulders occupy about 30 percent of the area. Soil depth is only about 5 to 15 inches over hard granodiorite. The erosion hazard for these soils is high to very high (Bowman et al. 1973). San Miguel-Exchequer rocky silt loams consists of 50 percent San Miguel silt loam, 40 percent Exchequer silt loam, and 10 percent rock outcrop (Bowman et al. 1973). Runoff potential is medium to rapid, and the erosion hazard is moderate to very high.

San Miguel Mountain Area

The majority of the San Miguel Mountain area is underlain by Jurassic Santiago Peak volcanics, although the portion of this area located closest to SR-125 (referred to as the Shinohara parcel) is underlain by upper Pliocene marine sediments, and the area just to the east is underlain with Pleistocene non-marine sediments.

The predominant soil type in this area is San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes (SnG) (Figure F-4). Runoff potential is medium to rapid, and the erosion hazard is moderate to very high.

Linne clay loam, 9 to 30 percent slopes (LsE), a moderately deep clay loam derived from soft calcareous sandstone and shale (Bowman et al. 1973), occurs in an area along the western edge of the Refuge boundary near Sweetwater Reservoir. Runoff is medium to rapid, and the erosion hazard is moderate to high.

In the northeastern portion of the San Miguel Mountain area, the soils transition from rocky, silt loams to sandy loams. From northwest to southeast, the northeast-facing slopes are overlain with Las Posas fine sandy loam, 9 to 15 percent slopes, eroded (LpD2); Placentia sandy loam, thick surface, 2 to 9 percent slopes (PfC); and Friant rocky, fine sandy loam, 9 to 30 percent slopes (FxE). The southwest-facing slopes are overlain primarily with Cieneba very rocky coarse sandy loam, 30 to 75 percent slopes (CmrG), with some areas of Vista rocky coarse sandy loam, 30 to 65 percent slopes (VvG), and Vista rocky coarse sandy loam, 15 to 30 percent slopes (VvE). The narrow valley floor is overlain by Visalia sandy loam, 5 to 9 percent slopes (VaC); Escondido very fine sandy loam, deep, 5 to 9 percent slopes (EvC); and Visalia sandy loam, 2 to 5 percent slopes (VaB).

In the extreme southwestern portion of this area, the predominant soil type is Olivenhain cobbly loam, 9 to 30 percent slopes (OhE). Because of the gentle slopes in this area, it may be more appropriate to classify this area as Olivenhain cobbly loam, 2 to 9 percent slopes (OhC), which is described as including microrelief of broad-based mimamounds (Bowman et al. 1973 [Sheet No. 64]). Although some of the original mimamound topography remains in this area, many of the mounds were eliminated as a result of soil disturbance associated with farming and other human activities. Actions to recreate this lost microtopography have been taken over the past few years in an effort to reestablish vernal pool habitat at this site. This soil series consists of moderately deep to deep cobbly loam with a very cobbly clay subsoil. Runoff is slow to medium, and the erosion hazard is slight to moderate.

Also in the southwestern portion of the San Miguel Mountain area and just to the northeast of the area of Olivenhain soil, the land is overlain with Diablo clay, 9 to 15 percent slopes (DaD). Runoff is medium and the erosion hazard is slight to moderate (Bowman et al. 1973). A small area of Diablo clay is also mapped along the south central edge of the San Miguel Mountain area.

In the southeastern portion of this area, the soils include Olivenhain cobbly loam, 2 to 9 percent slopes (OhC); Olivenhain cobbly loam, 9 to 30 percent slopes (OhE); and a small area of Visalia gravelly sandy loam, 2 to 5 percent slopes (VbB). Runoff on the Visalia series soil is slow, and the erosion hazard is slight (Bowman et al. 1973). Friant fine sandy loam, 30 to 50 percent slopes (FwF), is also mapped in this area. Runoff over this steep soil is rapid and the erosion hazard is high.

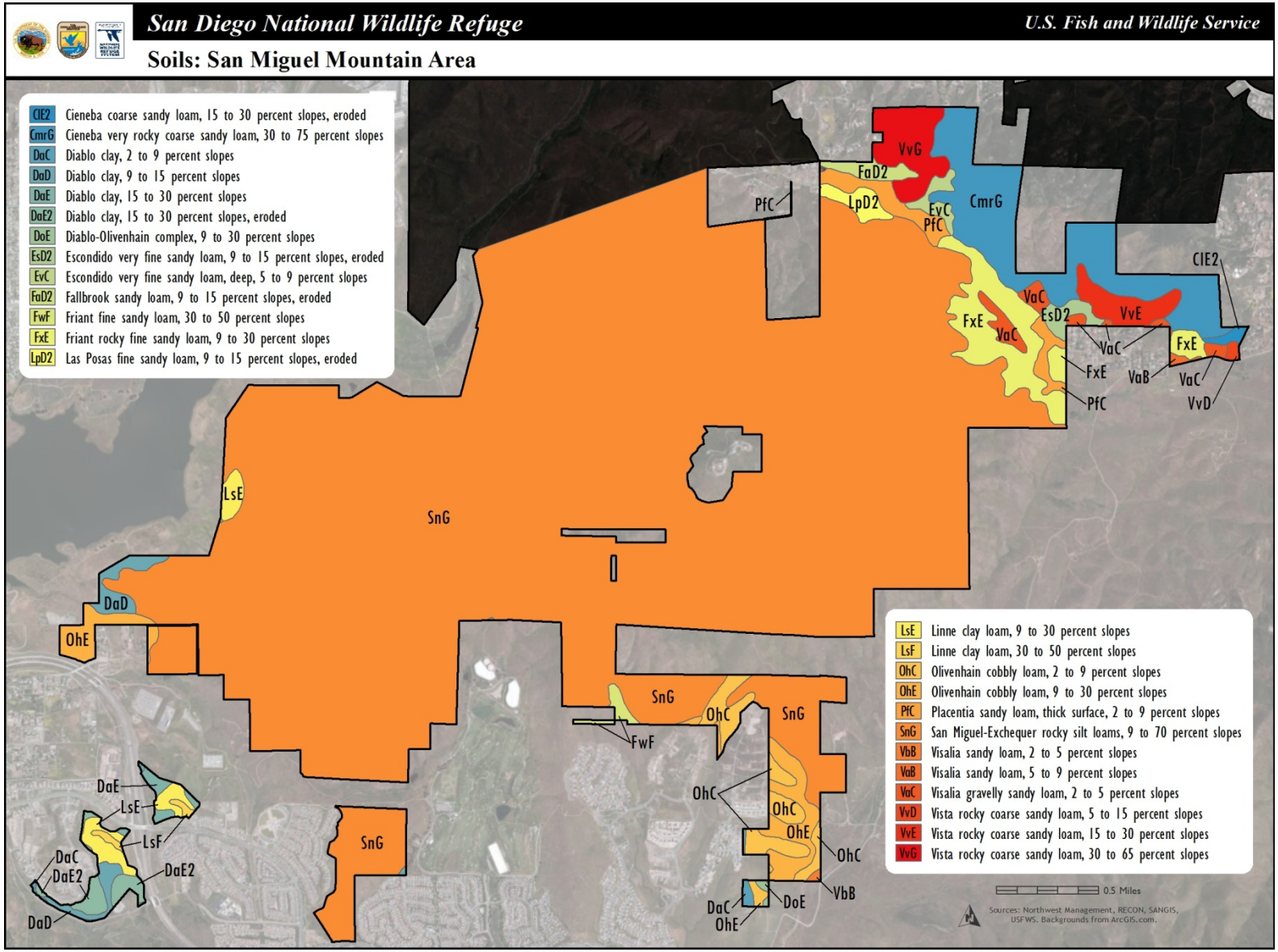

Figure F-4. Soils that Overlay the San Miguel Mountain Area, Otay-Sweetwater Unit

Otay Mesa and Lakes Area

The majority of the parcels in this area are underlain by Jurassic Santiago Peak volcanic rock. The exception is the northern portion of the parcel lying to the south of Proctor Valley Road, which is underlain by Pleistocene non-marine sediments.

As illustrated in Figure F-5, the northern parcel in this area is overlain primarily by Friant rocky fine sandy loam, 30 to 70 percent slopes (FxG), with a thin area of Friant rocky fine sandy loam, 9 to 30 percent slopes (FxE), identified at the southernmost end of the parcel. The Friant soil series is characterized by shallow and very shallow, well-drained sandy loams (Bowman et al. 1973). The soil is typically 3 to 12 inches deep over hard rock, with rock outcrops covering 2 to 10 percent of the surface. Runoff is rapid to very rapid, and the erosion hazard is described as high to very high.

The soils present on the southern parcel are considerably more diverse. A small area of Friant rocky fine sandy loam (FxG) has been identified in the northeast corner of the site, while much of the mountainous area on the parcel is overlain with San Miguel-Exchequer rocky silt loams, 9 to 70 percent slopes (SnG). As described previously, this soil type has an erosion hazard of moderate to very high and a runoff potential of medium to rapid (Bowman et al. 1973).

Two of the major drainages on the site are overlain with Olivenhain cobbly loam, 9 to 30 percent slopes (OhE), near the bottom of the drainage and Olivenhain cobbly loam, 30 to 50 percent slopes (OhF), along the higher elevation, steeper sides of the drainages. Runoff in areas with 9 to 30 percent slopes is medium to rapid, and the erosion hazard is moderate to high. In areas with 30 to 50 percent slopes, runoff is rapid, and the erosion hazard is high (Bowman et al. 1973).

A small area of Visalia gravelly sandy loam, 2 to 5 percent slopes (VbB), is identified adjacent to the Friant series soil in the northeast corner. This soil is gently sloping with about 15 percent gravel. Runoff is slow, and the erosion hazard is slight (Bowman et al. 1973).

Del Mar Mesa Vernal Pool Unit

This unit occurs within the Coastal Plain geomorphic region of San Diego County, which is characterized by layers of marine and non-marine sedimentary rock units (Deméré no date). The upper most geological formations within the Del Mar Mesa area consists of middle to early Pleistocene marine and marine terrace deposits, sometimes referred to as Linda Vista Terrace. This formation is underlain by Stadium Conglomerate, one of three conglomerate formations that make up the Poway Group—an Eocene geologic formation that formed some 35 to 50 million years ago. Stadium Conglomerate, which is exposed along the steep canyon walls and drainages that cut through the marine terrace, consists of smooth cobbles mixed with light-brown, medium-grained sandstone (San Diego State University no date). Although not accepted by all, some theorize that many of the cobbles found within the Poway Group conglomerate formations began as Sonoran volcanic rocks and granitic rocks that were carried out of distant mountains and onto the coastal plain by large seasonal flood events (City of San Diego 2011, San Diego State University no date).

The mesas within the Del Mar Mesa Vernal Pool Unit are overlain with Redding gravelly loam soils (RdC) (Figure F-6). The surface topography in these areas typically consists of broad, low mimamounds (hummocks) that are moderately to well drained with intervening poorly drained areas that can be almost impervious (Bowman et al. 1973). The erosion hazard on these soils is slight to high depending upon the slope gradient, and erosion can best be controlled by maintaining a permanent vegetation cover (Bowman et al. 1973).

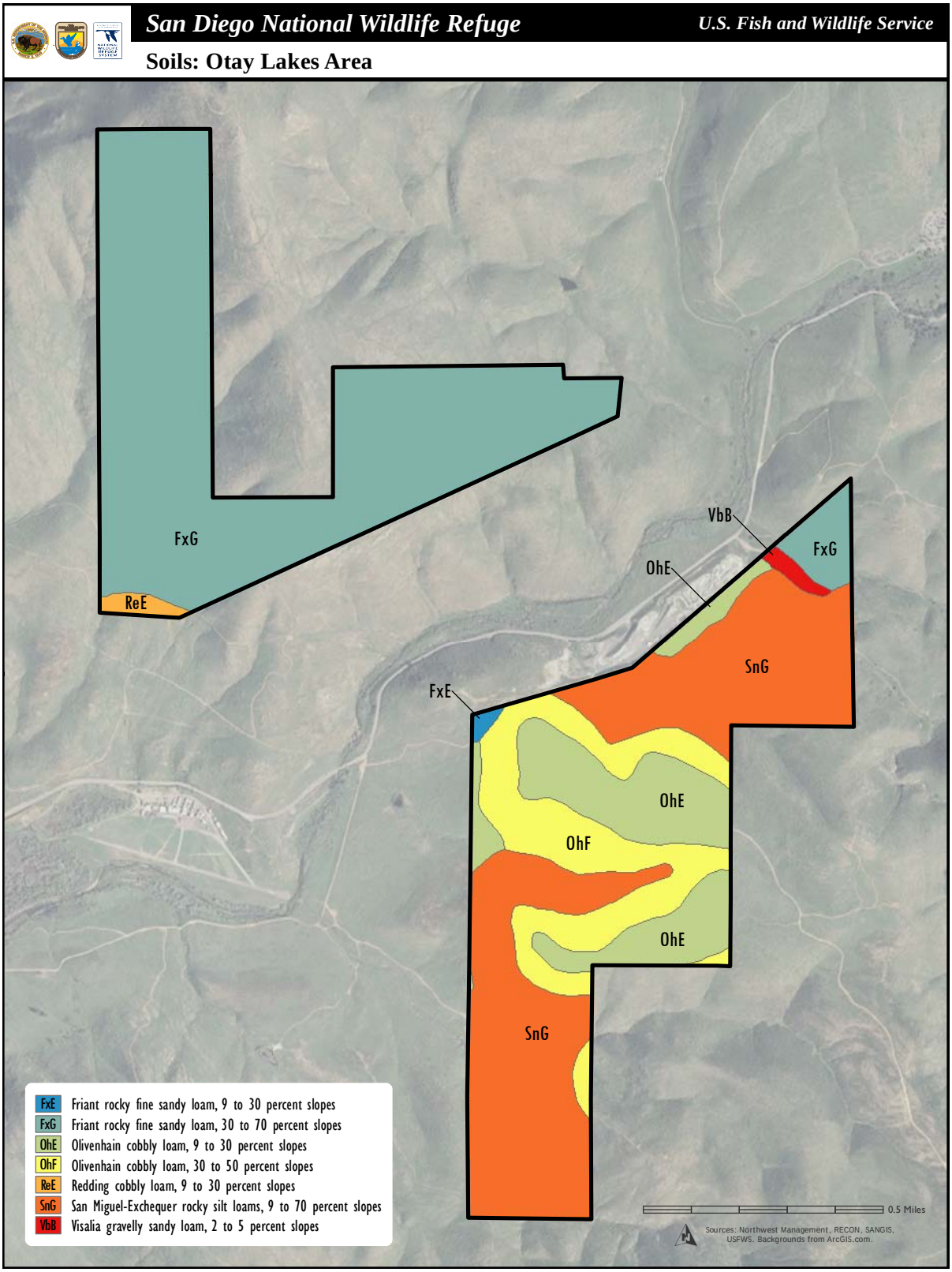

Figure F-5. Soils that Overlay the Otay Mesa and Lakes Area, Otay-Sweetwater Unit

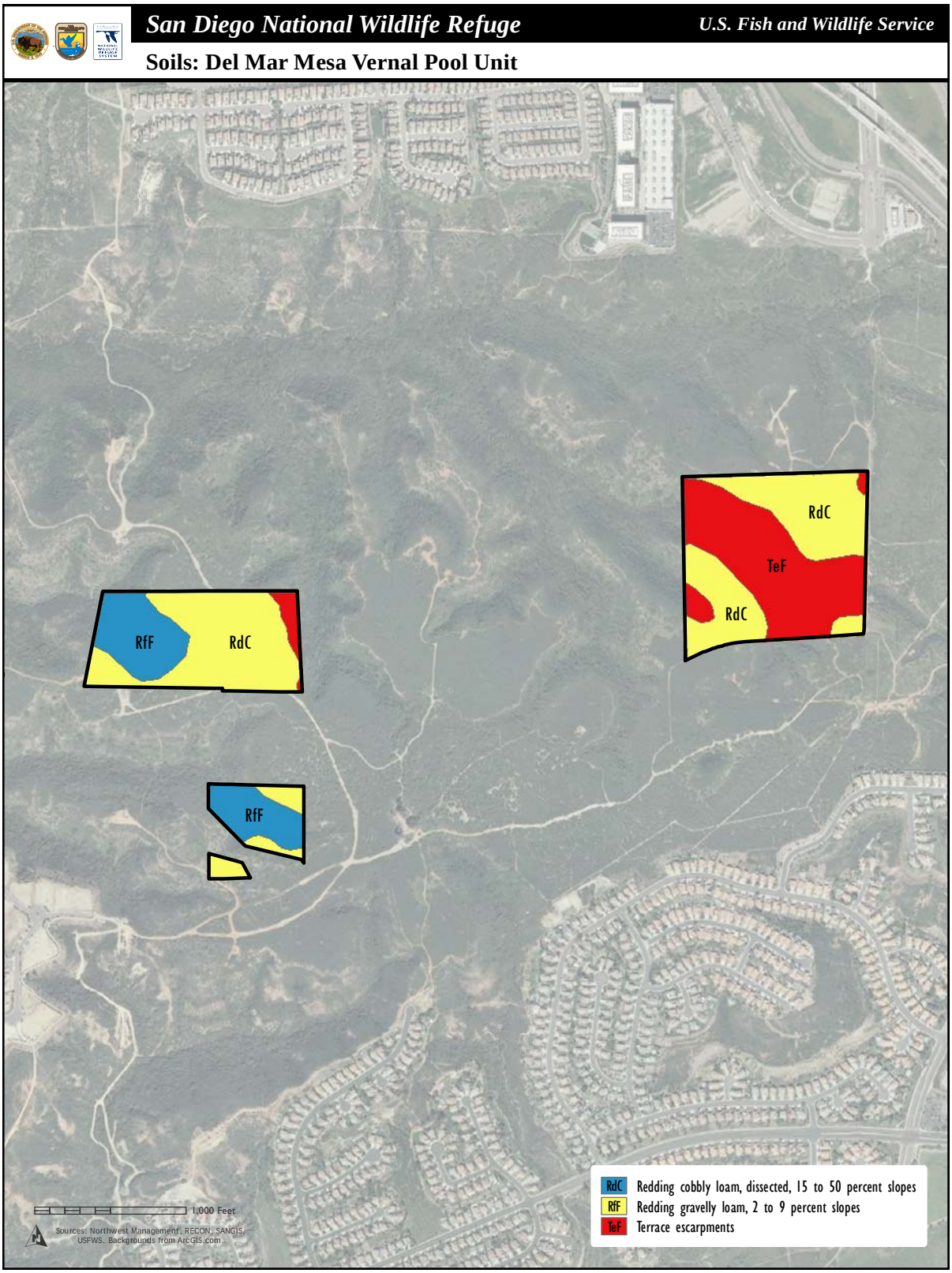

Figure F-6. Soils that Overlay the Del Mar Mesa Vernal Pool Unit

The steep canyon slopes that cut through the western three parcels in this area are overlain by Redding cobbly loam, dissected (RfF). Moderately steep to steep slopes are overlain by 10 to 18 inches of deep soil with a surface layer that consists of 20 to 30 percent cobblestones (Bowman et al. 1973). The erosion hazard is moderate to high, and runoff is medium to rapid.

The steep and very steep slopes located on the eastern parcel are identified in the Soil Survey (Bowman et al. 1973) as terrace escarpments (TeF). These areas typically support 4 to 10 inches of loamy or gravelly soil over soft marine sandstone, shale, or gravelly sediments. Runoff is rapid, and the erosion hazard is high.

Reference Cited

Bowman, R. H., R. E. Bishop, R. W. Griffin, and M. L. Jones. 1973. Soil Survey, San Diego Area, California, Parts I and II and Accompanying Maps. USDA, Soil Conservation Service.

Deméré, T. No Date. Geology of San Diego County, California, San Diego Natural History Museum on the web at http://www.sdnhm.org/research/paleontology/sdgeol.html.

Appendix G

Federal and State Ambient Air Quality Standards

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards [1]		National Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.075 ppm (147 µg/m^3)		
Respirable Particulate Matter (PM10)[8]	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)[8]	24 Hour	—	—	35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	12.0 µg/m^3	15 µg/m^3	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[9]	1 Hour	0.18 ppm (339 µg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 µg/m^3)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)		0.053 ppm (100 µg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[10]	1 Hour	0.25 ppm (655 µg/m^3)	Ultraviolet Fluorescence	75 ppb (196 µg/m^3)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 µg/m^3)	
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (for certain areas)[10]	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)[10]	—	
Lead[11,12]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 µg/m^3 (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 µg/m^3		
Visibility Reducing Particles[13]	8 Hour	See footnote 13	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[11]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

See footnotes on next page …

1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the U.S. EPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the U.S. EPA.

8. On December 14, 2012, the national annual PM2.5 primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM10 standards (primary and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

9. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

10. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

    Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

11. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

12. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

13. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

Appendix H

Species Lists

Appendix H: Species Lists

Bird Species List

The following list includes bird species that have been observed within the San Diego NWR. The birds' common and scientific names are provided in accordance with the 7th edition (1998), 10th Supplement (2010) of the A.O.U. Checklist of North American Birds.

Common Name	Scientific Name
Cackling goose	*Branta hutchinsii*
Canada goose	*Branta canadensis*
Gadwall	*Anas strepera*
American wigeon	*Anas americana*
Mallard	*Anas platyrhynchos*
Northern pintail	*Anas acute*
Green-winged teal	*Anas crecca*
Canvasback	*Aythya valisineria*
Ring-necked duck	*Aythya collaris*
Bufflehead	*Bucephala albeola*
Ruddy duck	*Oxyura jamaicensis*
California quail	*Callipepla californica*
Ring-necked pheasant	*Phasianus colchicus*
Pied-billed grebe	*Podilymbus podiceps*
Western grebe	*Aechmophorus occidentalis*
Double-crested cormorant	*Phalacrocorax auritus*
American white pelican	*Pelecanus erythrorhynchos*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Snowy egret	*Egretta thula*
Green heron	*Butorides virescens*
Black-crowned night heron	*Nycticorax nycticorax*
Turkey vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
White-tailed kite	*Elanus leucurus*
Bald eagle	*Haliaeetus leucocephalus*
Northern harrier	*Circus cyaneus*
Sharp-shinned hawk	*Accipiter striatus*
Cooper's hawk	*Accipiter cooperii*
Red-shouldered hawk	*Buteo lineatus*
Swainson's hawk	*Buteo swainsoni*
Red-tailed hawk	*Buteo jamaicensis*
Ferruginous hawk	*Buteo regalis*
Golden eagle	*Aquila chrysaetos*

Common Name	Scientific Name
Sora	*Porzana carolina*
Common gallinule	*Gallinula galeata*
American coot	*Fulica Americana*
Killdeer	*Charadrius vociferus*
Wilson's snipe	*Gallinago delicata*
Ring-billed gull	*Larus delawarensis*
Western gull	*Larus occidentalis*
Caspian tern	*Hydroprogne caspia*
Forster's tern	*Sterna forsteri*
Rock pigeon	*Columba livia*
Eurasian collared-dove	*Streptopelia decaocto*
White-winged dove	*Zenaida asiatica*
Mourning dove	*Zenaida macroura*
Common ground-dove	*Columbina passerina*
Greater roadrunner	*Geococcyx californianus*
Barn owl	*Tyto alba*
Western screech-owl	*Megascops kennicottii*
Great horned owl	*Bubo virginianus*
Burrowing owl	*Athene cunicularia*
Long-eared owl	*Asio otus*
Lesser nighthawk	*Chordeiles acutipennis*
Common poorwhill	*Phalaenoptilus nuttallii*
Black swift	*Cypseloides niger borealis*
Vaux's swift	*Chaetura vauxi*
White-throated swift	*Aeronautes saxatalis*
Black-chinned hummingbird	*Archilochus alexandri*
Anna's hummingbird	*Calypte anna*
Costa's hummingbird	*Calypte costae*
Rufous hummingbird	*Selasphoras rufus*
Allen's hummingbird	*Selasphoras sasin*
Calliope hummingbird	*Selasphorus calliope*
Belted kingfisher	*Megaceryle alcyon*
Acorn woodpecker	*Melanerpes formicivorus*
Red-breasted sapsucker	*Sphyrapicus ruber*
Nuttall's woodpecker	*Picoides nuttallii*
Downy woodpecker	*Picoides pubescens*
Northern flicker	*Colaptes auratus*
American kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine falcon	*Falco peregrinus*
Prairie falcon	*Falco mexicanus*
Olive-sided flycatcher	*Contopus cooperi*
Western wood-peewee	*Contopus sordidulus*
Willow flycatcher	*Empidonax traillii*

Common Name	**Scientific Name**
Hammond's flycatcher	*Empidonax hammondii*
Dusky flycatcher	*Empidonax oberholseri*
Pacific-slope flycatcher	*Empidonax difficilis*
Black phoebe	*Sayornis nigricans*
Eastern phoebe	*Sayornis phoebe*
Say's phoebe	*Sayornis saya*
Ash-throated flycatcher	*Myiarchus cinerascens*
Cassin's kingbird	*Tyrannus vociferans*
Western kingbird	*Tyrannus verticalis*
Loggerhead shrike	*Lanius ludovicianus*
White-eyed vireo	*Vireo griseus*
Bell's vireo	*Vireo bellii*
Cassin's vireo	*Vireo cassinii*
Hutton's vireo	*Vireo huttoni*
Warbling vireo	*Vireo gilvus*
Western scrub-jay	*Aphelocoma californica*
American crow	*Corvus brachyrhynchos*
Common raven	*Corvus corax*
Horned lark	*Eremophila alpestris*
Purple martin	*Progne subis*
Tree swallow	*Tachycineta bicolor*
Violet-green swallow	*Tachycineta thalassina*
Northern rough-winged swallow	*Stelgidopteryx serripennis*
Bank swallow	*Riparia riparia*
Cliff swallow	*Petrochelidon pyrrhonota*
Barn swallow	*Hirundo rustica*
Oak titmouse	*Baeolophus inornatus*
Bushtit	*Psaltriparus minimus*
Rock wren	*Salpinctes obsoletus*
Canyon wren	*Catherpes mexicanus*
House wren	*Troglodytes aedon*
Marsh wren	*Cistothorus palustris*
Bewick's wren	*Thryomanes bewickii*
Cactus wren	*Camphylorhynchus brunneicapillus*
Blue-gray gnatcatcher	*Polioptila caerulea*
California gnatcatcher	*Poliptila californica*
Ruby-crowned kinglet	*Regulus calendula*
Wrentit	*Chamea fasciata*
Western bluebird	*Sialia mexicana*
Swainson's thrush	*Catharus ustulatus*
Hermit thrush	*Catharus guttatus*
American robin	*Turdus migratorius*
Northern mockingbird	*Mimus polyglottos*
Sage thrasher	*Oreoscoptes montanus*

Common Name	**Scientific Name**
California thrasher	*Toxostoma redivivum*
European starling	*Sturnus vulgaris*
American pipit	*Anthus rubenscens*
Cedar waxwing	*Bombycilla cedrorum*
Phainopepla	*Phainopepla nitens*
Lapland longspur	*Calcarius lapponicus*
Chestnut-collared longspur	*Calcarius ornatus*
Northern waterthrush	*Parkesia noveboracensis*
Black-and-white warbler	*Mniotilta varia*
Orange-crowned warbler	*Oreothlypis celata*
Nashville warbler	*Oreothlypis ruficapilla*
MacGillivray's warbler	*Geothlypis tolmiei*
Common yellowthroat	*Geothlypis trichas*
Magnolia warbler	*Setophaga magnolia*
Yellow warbler	*Setophaga petechia*
Palm warbler	*Setophaga palmarum*
Yellow-rumped warbler	*Setophaga coronata*
Black-throated gray warbler	*Setophaga nigrescens*
Townsend's warbler	*Setophaga townsendi*
Hermit warbler	*Setophaga occidentalis*
Wilson's warbler	*Cardellina pusilla*
Yellow-breasted chat	*Icteria virens*
Green-tailed towhee	*Pipilo chlorurus*
Spotted towhee	*Pipilo maculatus*
California towhee	*Melozone crissalis*
Rufous-crowned sparrow	*Aimophila ruficeps*
Chipping sparrow	*Spizella passerina*
Brewer's sparrow	*Spizella breweri*
Black-chinned sparrow	*Spizella atrogularis*
Vesper sparrow	*Pooecetes gramineus*
Lark sparrow	*Chondestes grammacus*
Sage sparrow	*Artemisiospiza belli*
Savannah sparrow	*Passerculus sandwichensis*
Grasshopper sparrow	*Ammodramus savannarum*
Fox sparrow	*Passerella iliaca*
Song sparrow	*Melospiza melodia*
Lincoln's sparrow	*Melospiza lincolnii*
Swamp sparrow	*Melospiza georgiana*
White-crowned sparrow	*Zonotrichia leucophrys*
Golden-crowned sparrow	*Zonotrichia atricapilla*
Dark-eyed junco	*Junco hyemalis*
Western tanager	*Piranga ludoviciana*
Rose-breasted grosbeak	*Pheucticus ludovicianus*
Black-headed grosbeak	*Pheucticus melanocephalus*

Common Name	Scientific Name
Blue grosbeak	*Passerina caerulea*
Lazuli bunting	*Passerina amoena*
Indigo bunting	*Passerina cyanea*
Red-winged blackbird	*Agelaius phoeniceus*
Tricolored blackbird	*Agelaius tricolor*
Western meadowlark	*Sturnella neglecta*
Brewer's blackbird	*Euphagus cyanocephalus*
Great-tailed grackle	*Quiscalus mexicanus*
Brown-headed cowbird	*Molothrus ater*
Hooded oriole	*Icterus cucullatus*
Bullock's oriole	*Icterus bullockii*
Purple finch	*Haemorhous purpureus*
House finch	*Haemorhous mexicanus*
Pine siskin	*Spinus pinus*
Lesser goldfinch	*Spinus psaltria*
Lawrence's goldfinch	*Spinus lawrencei*
American goldfinch	*Spinus tristis*
House sparrow	*Passer domesticus*

Reptile and Amphibian Species List

Amphibians and reptiles present or potentially present within the acquisition boundary of San Diego NWR are based on range maps from *A Field Guide to Western Reptiles and Amphibians* (Stebbins and Peterson 1985); the presence of suitable habitat within the acquisition boundary of the Refuge; research captures; and biological reports for and near the Refuge. The first name listed is the species name; the second name listed (in parenthesis) is the subspecies, if any, potentially found in the Refuge.

Common Name	Scientific Name
Ensatina (Monterey salamander)	*Ensatina eschscholtzii (eschscholtzii)*
Arboreal salamander	*Aneides lugubris*
Pacific slender salamander	*Batrachoseps pacificus*
Garden Slender Salamander	*Batrachoseps major*
Western spadefoot	*Scaphiopus hammondii*
Western toad (California toad)	*Bufo boreas (halophilus)*
Arroyo southwestern toad	*Bufo microscaphus californicus*
Red-spotted toad	*Bufo punctatus*
California treefrog	*Hyla cadaverina*
Pacific treefrog	*Hyla regilla*
Red-legged frog (California red-legged frog)	*Rana aurora (draytonii)*
Bullfrog	*Rana catesbeiana*
African clawed frog	*Xenopus laevis*
Southwestern pond turtle	*Clemmys marmorata (pallida)*
Slider (Red-eared slider)	*Pseudemys scripta (elegans)*

Common Name	**Scientific Name**
Spiny softshell (Western spiny softshell)	*Trionyx spiniferus (hartwegi)*
Western banded gecko (San Diego banded gecko)	*Coleonyx variegatus (abbotti)*
Desert spiny lizard	*Sceloporus magister*
Granite spiny lizard	*Sceloporus orcutti*
Western fence lizard (Great Basin fence lizard)	*Sceloporus occidentalis (biseriatus)*
Sagebrush lizard (Southern sagebrush lizard)	*Sceloporus graciosus (vandenburgianus)*
Side-blotched lizard	*Uta stansburiana*
Coast horned lizard (San Diego horned lizard)	*Phrynosoma coronatum (blainevillei)*
Granite night lizard	*Xantusia vigilis*
Western skink (Coronado skink)	*Eumeces skiltonianus (interparietalis)*
Gilbert skink (Western red-tailed skink)	*Eumeces gilberti (rubricaudatus)*
Orange-throated whiptail (Belding's orange-throated whiptail)	*Cnemidophorus hyperythrus (beldingi)*
Western whiptail (Coastal whiptail)	*Cnemidophorus tigris (multiscutatus)*
Southern alligator lizard (San Diego alligator lizard)	*Elgaria multicarinatus (webbi)*
California legless lizard (Silvery legless lizard)	*Anniella pulchra (pulchra)*
Western blind snake	*Leptotyphlops humilis*
Rosy boa (Coastal rosy boa)	*Lichanura trivirgata (roseofusca)*
Western yellow-bellied racer	*Coluber constrictor mormon*
Ringneck snake (San Diego ringneck snake)	*Diadophis punctatus (similis)*
Red coachwhip	*Masticophis flagellum (piceus)*
Baja coachwhip	*Masticophis fuiginosus*
California whipsnake (Chaparral whipsnake) (Striped racer)	*Masticophis lateralis (lateralis)*
Western patch-nosed snake (Coast patch-nosed snake)	*Salvadora hexalepis (virgultea)*
Glossy snake (California glossy snake)	*Arizona elegans (occidentalis)*
Gopher snake (San Diego gopher snake)	*Pituophis melanoleucus (annectens)*
Common kingsnake (California kingsnake)	*Lampropeltis getulus (californiae)*
California mountain kingsnake (San Diego mountain kingsnake)	*Lampropeltis zonata (pulchra)*
Long-nosed snake (Western long-nosed snake)	*Rhinocheilus lecontei (lecontei)*
Two-striped garter snake (Hammond two-striped garter snake)	*Thamnophis hammondii (hammondii)*
California black-headed snake	*Tantilla planiceps*
Lyre snake (California lyre snake)	*Trimorphodon biscutatus (vandenburghi)*
Night snake	*Hypsiglena torquata*

Common Name	Scientific Name
Red diamond rattlesnake (Northern red rattlesnake)	*Crotalus ruber (ruber)*
Speckled rattlesnake (Southwestern speckled rattlesnake)	*Crotalus mitchellii (pyrrhus)*
Western rattlesnake (Southern Pacific rattlesnake)	*Crotalus viridis (helleri)*

Fish Species List

Fish species present within the San Diego NWR based on *A list of freshwater, anadromous, and euryhaline fishes of California* (Moyle and Davis 2000); the presence of suitable habitat; and observations of Refuge staff. All are non-native species.

Common Name	Scientific Name
Carp	*Cyprinus carpio*
Mosquitofish	*Gambusia afinis*
Green sunfish	*Lepomis cyanellus*
Largemouth bass	*Micropterus salmoides*

Mammal Species List

Mammals present or potentially present within the acquisition boundary of San Diego NWR based on range maps from *National Audubon Society Field Guide to North American Mammals* (Whitaker 1996); the presence of suitable habitat for the species within the acquisition boundary; research captures; and biological reports for and near the Refuge.

Common Name	Scientific Name
Virginia opossum	*Didelphis virginiana*
Ornate shrew	*Sorex ornatus*
Desert shrew	*Notiosorex crawfordi*
Broad-footed mole	*Scapanus latimanus*
California leaf-nosed bat	*Macrotus californicus*
Mexican long-tongued bat	*Choeronycteris mexicana*
California myotis	*Myotis californicus*
Western small-footed myotis	*Myotis ciliolabrum*
Long-eared myotis	*Myotis evotis*
Occult little brown myotis	*Myotis lucifugus occultus*
Fringed myotis	*Myotis thysanodes*
Long-legged myotis	*Myotis volans*
Yuma myotis	*Myotis yumanensis*
Western red bat	*Lasiurus blossevillii*
Hoary bat	*Lasiurus cinereus*
Western yellow bat	*Lasiurus xanthinus*
Western pipistrelle	*Pipistrellus hesperus*

Common Name	**Scientific Name**
Big brown bat	*Eptesicus fuscus*
Townsend's big-eared bat	*Plecotus townsendii*
Pallid bat	*Antrozous pallidus*
Mexican free-tailed bat	*Tadarida brasiliensis*
Pocketed free-tailed bat	*Nyctinomops femorosaccus*
Big free-tailed bat	*Nyctinomops macrotis*
Western mastiff bat	*Eumops perotis californicus*
Desert cottontail	*Sylvilagus audubonii*
Brush rabbit	*Sylvilagus bachmani*
San Diego black-tailed jackrabbit	*Lepus californicus bennettii*
Merriam's chipmunk	*Tamias merriami*
California ground squirrel	*Spermophilus beecheyi*
Golden-mantled ground squirrel	*Spermophilus lateralis*
Western gray squirrel	*Sciurus griseus*
Botta's pocket gopher	*Thomomys bottae*
Dulzura California pocket mouse	*Perognathus (= Chaetodipus) californicus femoralis*
Northwestern San Diego pocket mouse	*Perognathus (= Chaetodipus) fallax fallax*
Agile kangaroo rat	*Dipodomys agilis*
Merriam's kangaroo rat	*Dipodomys merriami*
Western harvest mouse	*Reithrodontomys megalotis*
Brush mouse	*Peromyscus boylii*
California mouse	*Peromyscus californicus*
Cactus mouse	*Peromyscus eremicus*
Deer mouse	*Peromyscus maniculatus*
Southern grasshopper mouse	*Onychomys torridus*
Dusky-footed woodrat	*Neotoma fuscipes*
San Diego desert woodrat	*Neotoma lepida intermedia*
California vole	*Microtus californicus*
Norway rat	*Rattus norvegicus*
Black rat	*Rattus rattus*
House mouse	*Mus musculus*
Coyote	*Canis latrans*
Kit fox	*Vulpes velox*
Gray fox	*Urocyon cinereoargenteus*
Ringtail	*Bassariscus astutus*
Raccoon	*Procyon lotor*
Long-tailed weasel	*Mustela frenata*
American badger	*Taxidea taxus*
Western spotted skunk	*Spilogale gracilis*
Striped skunk	*Mephitis mephitis*
Domestic cat	*Felis catus*
Mountain lion	*Felis concolor*
Bobcat	*Lynx rufus*

Common Name	**Scientific Name**
Mule deer	*Odocoileus hemionus*

References Cited:

Moyle, P. B. and L. H. Davis. 2000. A list of freshwater, anadromous, and euryhaline fishes of California. California Fish and Game 86(4:244-258).

Stebbins, R. C. and R. T. Peterson. 1985. A Field Guide to Western Reptiles and Amphibians (Peterson Field Guides, No. 16). Houghton Mifflin; 2nd Revised edition (June 10, 1985).

Whitaker, John O., Jr. 1996. National Audubon Society Field Guide to North American Mammals. New York: Alfred A. Knopf.

Appendix I

Table of Acquisition History for the San Diego NWR

Appendix I: Table of Acquisition History for the San Diego NWR

Table of Acquisition History for the San Diego NWR			
Acquisition Date	**Tract Name**	**Method of Acquisition**	**Acreage Acquired**
04/10/1996	FDIC	Donation	1,168.44
04/10/1996	FDIC	Donation	25.88
04/10/1996	FDIC	Donation	128.63
04/10/1996	FDIC	Donation	28.05
04/10/1996	FDIC	Donation	475.08
08/06/1997	National Fish and Wildlife Foundation	Donation	255.38
08/27/1997	Emerald Properties Corp	Monetary Purchase	500.00
08/28/1997	Emerald Properties Corp	Donation	1,186.00
03/09/1998	CMR Properties	Monetary Purchase	19.70
03/27/1998	Trust for Public Land	Monetary Purchase	322.32
03/27/1998	Hervey	Monetary Purchase	32.82
04/13/1998	Singing Hills (Duncan)	Donation	74.30
08/25/1998	Hamel	Monetary Purchase	52.66
08/28/1998	Mozaffarian	Monetary Purchase	5.00
08/28/1998	Mozaffarian	Monetary Purchase	10.00
10/28/1998	Doenges	Monetary Purchase	85.82
11/19/1998	Liker	Monetary Purchase	8.16
12/30/1998	Trust for Public Land	Monetary Purchase	631.44
02/25/1999	Trust for Public Land	Monetary Purchase	582.11
04/01/1999	Hamel	Monetary Purchase	79.41

Table of Acquisition History for the San Diego NWR			
Acquisition Date	**Tract Name**	**Method of Acquisition**	**Acreage Acquired**
04/06/1999	Miller/Rust	Monetary Purchase	0.75
04/06/1999	Miller/Rust	Monetary Purchase	6.75
06/11/1999	Department of Treasury	Primary Transfer	88.00
06/14/1999	Trust for Public Land	Donation	116.40
08/12/1999	Desert Pacific Council/Boy Scouts	Monetary Purchase	82.68
10/28/1999	Beitmann	Monetary Purchase	5.00
11/01/1999	Deguzman	Monetary Purchase	40.00
12/09/1999	Deguzman	Monetary Purchase	34.00
12/30/1999	Deguzman	Monetary Purchase	40.00
04/27/2000	Trust for Public Land	Monetary Purchase	160.00
05/26/2000	Grant	Monetary Purchase	14.62
06/05/2000	Immenschuh (Easement)	Monetary Purchase	1.01
06/05/2000	Immenschuh (Easement)	Monetary Purchase	0.00
06/05/2000	Immenschuh	Monetary Purchase	640.70
07/31/2000	Trust for Public Land	Monetary Purchase	10.00
08/18/2000	Rice (Easement)	Monetary Purchase	0.00
08/18/2000	Rice (Easement)	Monetary Purchase	0.00
08/18/2000	Rice	Monetary Purchase	0.70
08/18/2000	Rice	Monetary Purchase	253.30
05/16/2001	Trust for Public Land	Monetary Purchase	80.73
06/15/2001	Rice	Monetary Purchase	301.88
11/27/2001	Clarke	Monetary Purchase	37.76

Table of Acquisition History for the San Diego NWR			
Acquisition Date	**Tract Name**	**Method of Acquisition**	**Acreage Acquired**
02/26/2002	Trust for Public Land	Monetary Purchase	39.54
05/24/2002	Sampo	Monetary Purchase	69.44
06/07/2002	Mills	Monetary Purchase	18.77
02/12/2004	Trust for Public Land	Monetary Purchase	324.08
04/27/2004	Baker Trust	Monetary Purchase	1.00
04/27/2004	Baker Trust	Monetary Purchase	19.91
06/18/2004	Asisto/SDMR Holdings	Monetary Purchase	40.00
07/15/2004	Chula Vista 186 LLC	Monetary Purchase	186.33
05/20/2005	Trimark	Monetary Purchase	5.86
07/14/2005	King	Monetary Purchase	5.07
08/15/2005	Roberts	Monetary Purchase	10.14
08/23/2005	Mitchell	Monetary Purchase	3.44
12/02/2005	County of San Diego	Donation	18.91
12/14/2005	Robinson	Monetary Purchase	10.00
08/04/2006	Kelly, et al	Monetary Purchase	4.66
10/27/2006	The Environmental Trust Inc.	Monetary Purchase	50.00
06/11/2007	Brown	Monetary Purchase	40.00
06/13/2007	Wilhite	Monetary Purchase	40.00
05/18/2009	Catholic Diocese	Monetary Purchase	30.00
08/28/2009	Hovnanian	Donation	76.73
11/25/2009	The Environmental Trust, Inc.	Donation	357.63
02/11/2010	Jones	Monetary Purchase	20.00

Table of Acquisition History for the San Diego NWR			
Acquisition Date	**Tract Name**	**Method of Acquisition**	**Acreage Acquired**
06/10/2010	The Environmental Trust, Inc.	Donation	253.55
05/12/2011	Kennerly	Monetary Purchase	10.00
05/24/2011	Salerno	Monetary Purchase	10.00
07/07/2011	Nauman	Monetary Purchase	1.72
07/27/2011	Sevel	Monetary Purchase	1.00
08/08/2011	Evans	Monetary Purchase	2.00
01/06/2012	Peppard	Monetary Purchase	10.00
06/27/2012	Hidden Valley (The Nature Conservancy)	Donation	1,904.81
10/11/2012	Cuevas	Monetary Purchase	10.20
04/19/2013	Trimark (Tract 102 lots c,d,q,r)	Donation	59.83
04/19/2013	Trimark (Tract 102a lot a)	Donation	24.60
04/19/2013	Trimark (Tract 102b North)	Donation	166.00
06/17/2013	Heuschele	Monetary Purchase	6.00
07/23/2013	Lee	Donation	6.00
08/09/2014	Trimark (Tract 102d lot o)	Donation	102.36
Total Acres Acquired as of August 09, 2013			**11,527.15**

Appendix J

Request for Cultural Resource Compliance Form

REQUEST FOR CULTURAL RESOURCE COMPLIANCE

U.S. Fish and Wildlife Service, Region 1 and 8

Project Name:					**FWS Program:** (ES, Refuges, Fisheries, Fire…)	
					Funding Program: (Partners, Refuges, TEA-21, HCP, NAWCA…)	
State: CA, ID, HI, NV, OR, WA		**EcoRegion:** CBE, IPE,KCE, NCE			**FWS Unit: Org Code:**	
Project Location:	**County**	**Township**	**Range**	**Section**	**FWS Contact:** Name, Tel#, Address	
USGS Quad:					**Date of Request:**	**Proposed Project Start Date:**
Total project acres/ linear ft/m:		**APE Acres / linear ft/m** (if different)				

Have you consulted with Tribe(s)?				Have you consulted with other interested parties?				**Is there another federal agency involved with this project?**		No	If yes, provide name:
Yes		No		Yes		No				Yes	
MAPS Attached				**Check below**				**If yes, which agency is taking lead for Section 106 compliance?**		FWS	Other Agency
Copy of portion of USGS Quad with project area marked clearly **(required)**								Project (sketch) map showing Area of Potential Effect with locations of specific ground altering activities **(required)**			
Photocopy of aerial photo showing location **(if available)**								Any other project plans, photographs, or drawings that may help CRT in making determination **(if available)**			

Directions to Project: (if not obvious)	

Description of Undertaking:	Describe proposed project and means to facilitate (e.g., provide funds to revegetate 1 mile of riparian habitat, restore 250 acres of seasonal wetlands, and construct a 5-acre permanent pond). How is the project designed (e.g., install 2 miles of fence and create approximately 25' of 3' high check dam)?

Return Form and maps to: Virginia_parks@fws.gov
If unable to send digitally, mail or fax to USFWS Region 1 Cultural Resources Team, 20555 SW Gerda Lane, Sherwood, OR 97140
Questions: 503-625-4377 or fax 503-625-4887

Area of Potential Effects (APE):	Describe where disturbance of the ground will occur. What are the dimensions of the area to be disturbed? How deep will you excavate? How far apart are fenceposts? What method are you using to plant vegetation? Where will fill be obtained? Where will soil be dumped? What tools or equipment will be used? Are you replacing or repairing a structure? Will you be moving dirt in a relatively undisturbed area? Will the project reach below or beyond the limits of prior land disturbance? Differentiate between areas slated for earth movement vs. areas to be inundated only. Is the area to be inundated different from the area inundated today, in the recent past, or under natural conditions? Provide acres and/or linear ft/m for all elements of the project.
Environmental and Cultural Setting:	Briefly describe the environmental setting of the APE. **A)** What was the natural habitat prior to modifications, reclamation, agriculture, settlement? **B)** What is land-use history? When was it first settled, modified? How deep has it been cultivated, grazed, etc.? **C)** What is land use and habitat today? What natural agents (e.g., sedimentation, vegetation, inundation) or cultural agents (e.g., cultivation) might affect the ability to discover cultural resources? **D)** Do you (or does anybody else) know of cultural resources in or near the project area?
Please return this RCRC and map showing APE digitally, if possible, to virginia_parks@fws.gov. Questions, call 503-625-4377	

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