

2000). This unit contains some of the few areas where vernal pool tadpole shrimp are found in Northern Volcanic Mudflow vernal pools, including vernal pools found on the Tuscan and Lovejoy Basalt geologic formations. Vernal pool tadpole shrimp also occur within Northern Hardpan vernal pools in this unit, including pools formed on the Riverbank and Modesto geologic formations. King (1996) found that vernal pool tadpole shrimp at this site were genetically distinct from vernal pool tadpole shrimp at other locations.

The majority of the lands included within this unit are privately owned. Ownership and protected lands within the unit includes BLM (48 ha (119 ac)), USFS (78 ha (194 ac)), WRP easements (14 ha (35 ac)), and CDFG administered lands (69 ha (173 ac)). The CDFG has some vernal pool areas protected at the Oroville Wildlife Area, and some vernal pool habitats are protected within the City of Chico. However, the amount of vernal pool habitat currently protected within the unit is very small. Vernal pools in this unit are highly threatened due to their location on the lower elevation slopes adjacent to agricultural and urban development. Urban expansion, particularly in the vicinity of Chico, is the greatest threat to existing vernal pool habitats throughout this unit.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where vernal pool tadpole shrimp occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for vernal pool tadpole shrimp to hatch, feed, and reproduce.

This unit occupies the northeastern portion of the Sacramento Valley from near Chico south to the Yuba River in Yuba County. This area represents one of only two vernal pool tadpole shrimp units within the Northeastern Sacramento Valley vernal pool region identified by CDFG (Keeler Wolf *et al.* 1998). The unit extends southeast of the Sacramento River paralleling the low elevation foothill region of the Sierra Nevada. This unit incorporates portions of Unit 2 for Butte County meadow foam and fully incorporates Unit 9 for vernal pool fairy shrimp, Units 3 for Greene's tuctoria, Unit 2 for hairy Orcutt grass, Unit 2 for Hoover's spurge, and Unit 4 for Butte County meadowfoam. Other vernal pool species occurring within this unit include Bogg's Lake hedge-hyssop, Red Bluff dwarf rush, Douglas' pogogyne, western spadefoot toad, legenera, California linderiella,

California tiger salamander, Ahart's paronychia, Henderson's bent grass, Sanford's arrowhead, and dwarf downingia.

Unit 5, Sacramento National Wildlife Refuge Unit, Glenn and Colusa Counties (5,718 ha (14,129 ac))

This unit is proposed as critical for vernal pool tadpole shrimp because it contains the primary constituent elements necessary for the conservation of the species, and supports occurrences of the species (Holland 1998, Silveira 2000, CNDDDB 2001). Vernal pool tadpole shrimp within this unit live within Northern Claypan and Northern Hardpan vernal pools, as defined by Sawyer and Keeler-Wolf (1995). The edaphic features that support the formation of these vernal pools include the Modesto geologic formation and Willows and Riz soils series. These vernal pools occur on alkaline soils and typically form alkali playas which are larger and contain a more diverse species composition than the hardpan pools further south (Keeler-Wolf *et al.* 1998). They may resemble small alkali playas, and display white salt deposits following pool drying.

This unit is primarily located on the Sacramento National Wildlife Refuge (5,126 ha (12,816 ac)); however, additional private lands were included within this unit. The refuge supports over 355 native plant taxa, including a number of rare alkaline species. The Sacramento National Wildlife Refuge contains the only remnants of the widespread Colusa Plains vegetation that once covered the entire Colusa Basin (Silveira 2000). Vernal pool habitats on the refuge are specifically managed for the conservation of listed species, and to promote habitat for migratory birds and waterfowl. These avian species likely aid in the dispersal of vernal pool tadpole shrimp and other vernal pool crustacean cysts. Vernal pool habitats within the area have become greatly fragmented and isolated from other habitats in the region due to agricultural and urban land conversion.

This unit occurs east of Interstate 5 to the Colusa Trough from Riz Road on the north and Delevan Road on the south. This unit coincides with Unit 1 for Colusa grass, Unit 6 for Greene's tuctoria, Unit 3 for hairy Orcutt grass, Unit 3 for Hoover's spurge, and Unit 2 for Conservancy fairy shrimp. Other important vernal pool and associated upland species found in the unit include pappose spikeweed, Fremont's goldfields, alkali goldfields, Scribe's popcorn flower, Hoover's downingia, folded downingia, Heckard's peppergrass, heartscale, brittlescale, San

Joaquin spearscale, Ferris' milk-vetch, spike-primrose, sessile mousetail, and palmate-bracted bird's beak.

Unit 6, Dolan Unit, Glenn and Colusa Counties (526 ha (1,299 ac))

This unit is proposed as critical for vernal pool tadpole shrimp because it contains the primary constituent elements necessary for the conservation of the species and supports occurrences of the species (Holland 1998, Silveira 2000, CNDDDB 2001). Vernal pool tadpole shrimp within this unit live within Northern Claypan vernal pools, as defined by Sawyer and Keeler-Wolf (1995). These vernal pools occur on alkaline soils and typically form alkali playas which are larger and contain a more diverse species composition than the hardpan pools further south (Keeler-Wolf *et al.* 1998). They may display white salt deposits following pool drying.

This unit is primarily located on the Dolan Ranch Conservation bank. This area supports a number of rare alkaline species, and contains remnants of the widespread Colusa Plains vegetation that once covered the entire Colusa Basin (Silveira 2000). Vernal pool habitats on Dolan Ranch are specifically managed for the conservation of listed species. Vernal pool habitats within the area have become greatly fragmented and isolated from other habitats in the region due to urban and agricultural land conversions. This unit occurs east of Interstate 5 and the Sacramento River, south of the City of Colusa, and west of the Colusa National Wildlife Refuge. All the lands within this unit are privately owned.

Unit 7, Beale Unit, Yuba and Placer Counties (2,853 ha (7,049 ac))

The Beale Unit is proposed as essential because it contains vernal pool tadpole shrimp occurrences within large vernal pool complexes that maintain the primary constituent elements essential for the conservation of the species (Holland 1998, CNDDDB 2001, Jones and Stokes 2002). Vernal pool tadpole shrimp within the Beale Unit live within large, relatively undisturbed vernal pool grassland habitats and a diversity of vernal pool habitat types. Beale Air Force Base contains 8,000 ha (19,800 ac) of vernal pool grasslands occurring on four major geologic formations: the Modesto Formation; the Riverbank Formation; the Laguna Formation; and the Mehrten Formation. Different geologic formations provide a diversity of habitats for vernal pool tadpole shrimp primarily through their effects on pool size and depth (Platenkamp 1998, Helm 1998). King

(1996) found that vernal pool tadpole shrimp within this unit were genetically different than occurrences in other portions of the species range, particularly those on the floor of the Central Valley. This unit is also designated to ensure that special management actions are taken to protect vernal pool habitats within the unit, including vernal pools created and restored throughout the unit which require long-term monitoring and management to ensure they continue to function as viable vernal pools. This unit is also important to maintain an opportunity for long distance dispersal of vernal pool tadpole shrimp cysts the nearest unit to the north is over 45 km (28 mi), and the nearest unit to the south is over 65 km (40 mi) away.

This unit contains DOD land (2,006 ha (5,016 ac) at Beale Air Force Base and 5 ha (13 ac) of BLM land. Other lands within this unit are located on private property. Remaining vernal pool habitats in this unit are threatened by agricultural conversion and by urban expansion. Vernal pool habitats in this area are also threatened by the expansion of Highway 70 and other transportation projects planned in the region.

The Beale Unit is located in southwestern Yuba County, south of the Yuba River and Yuba Goldfields, east of State Route 70, and north of the Bear River. The northwestern boundary of the unit borders the City of Marysville. Other rare vernal pool species found in this unit include vernal pool fairy shrimp, California linderiella, legenera, and dwarf downingia.

Unit 8, Mather Unit, Sacramento County (14,866 ha (36,733 ac))

This unit is proposed as critical habitat for vernal pool tadpole shrimp because it contains 15 percent of all known occurrences of the species (CNDDDB 2001) and vernal pools, swales, and other ephemeral wetlands and depressions mapped by Sacramento County (1999) and Holland (1998) of appropriate sizes and depths for vernal pool tadpole to complete their life cycle. These areas have been identified by the Sacramento Valley Open Space Conservancy, the CNPS, and TNC as excellent examples of vernal pool grasslands, supporting a rich and diverse community of vernal pool endemic plants and animals including vernal pool tadpole shrimp.

This unit supports vernal pool tadpole shrimp occurrences within a diversity of vernal pool habitats, including young or low terrace vernal pools on the Riverbank Formation, old or high terrace vernal pools on the

Laguna and Arroyo Seco geologic formations, and Northern Volcanic Mudflow vernal pools on the Mehrten and Valley Springs geologic formations. This unit is one of the few remaining areas where vernal pool tadpole shrimp occur on low terrace landforms on the eastern side of the Central Valley, and is important to maintain a diversity of habitats for the species. The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where vernal pool tadpole shrimp occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for vernal pool tadpole shrimp to hatch, mature, and produce cysts.

This unit includes several conservation areas established by private entities, including the Sunrise Douglas Conservation Bank, the Arroyo Seco Conservation Bank, the Churchill Downs mitigation area, and Teichert mitigation areas. These areas were established specifically to contribute to the conservation of vernal pool tadpole shrimp, and represent compensation measures for the loss of thousands of acres of vernal pool tadpole shrimp habitat within Sacramento County. The continued functioning of these areas is essential to the conservation of vernal pool tadpole shrimp and other vernal pool species. This unit contains areas on private, county, and Federal land, including lands leased or owned by Sacramento County at Mather Regional Park, the former Mather Air Force Base, and at the county landfill. Approximately 6 ha (16 ac) within this unit are BLM lands. Vernal pool habitats in this unit are threatened by urbanization from the expanding cities of Sacramento and Elk Grove. Conversion to intensive agriculture, particularly vineyards, is also a significant threat to vernal pool tadpole shrimp in this unit.

This unit includes areas to the east and south of the cities of Sacramento and Elk Grove in Sacramento County. The Cosumnes River forms part of the southwestern boundary of the unit and State Highway 16 lies just south of the southeastern boundary of the unit. The northern boundary is south of State Highway 50 and the American River. The eastern boundary of this unit lies just west of Latrobe Road. The unit is bisected by the Folsom South Canal. This unit also represents Unit 13 for vernal pool fairy shrimp, and contains Unit 6 for slender Orcutt grass and Unit 2 for the Sacramento Orcutt grass. In addition to vernal pool tadpole shrimp, this unit contains occurrences of many

other rare endemic vernal pool species including midvalley fairy shrimp, legenera, Bogg's Lake hedge-hyssop, Ahart's dwarf rush, western spadefoot toad, and California linderiella.

Unit 9, Cosumnes Unit, Sacramento, Amador, and San Joaquin Counties (29,063 ha (71,813 ac))

This unit is proposed as critical habitat for vernal pool tadpole shrimp because it contains the primary constituent elements necessary for the species survival, including over 30 percent of the remaining vernal pool habitats in the southern Sacramento Valley area (Holland 1998, Sacramento County 1999). These habitats provide the necessary timing, length, and frequency of inundation necessary for the survival of vernal pool tadpole shrimp, and this unit supports numerous occurrences of the species (CNDDDB 2001). Vernal pool tadpole shrimp within this unit occur on a diversity of pool types, including Northern Volcanic Mudflow vernal pools on the Mehrten and Valley Springs geologic formation overlain by Pardee and Pentz soils, vernal pools occurring on low terrace landforms associated with San Joaquin soils, and high terrace landforms associated with Redding and Corning soils (USDA 2001). King (1996) found that vernal pool tadpole shrimp within this unit were genetically most similar to occurrences in Stanislaus County and nearby in Sacramento County. However, vernal pool tadpole shrimp within this unit were generally different from occurrences at other sites sampled throughout the species range, and were very different from vernal pool tadpole shrimp sampled at sites found further to the west on the floor of the Central Valley, for example at Jepson Prairie or Kesterson National Wildlife Refuge (King 1996).

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where vernal pool tadpole shrimp occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for vernal pool tadpole shrimp to complete their life cycles.

This unit contains state and federally owned land, as well as private properties. Portions of the Cosumnes River Preserve occur within this unit. The Cosumnes River Preserve is jointly owned and managed by a variety of state, local, and Federal agencies including the BLM, CDFG, Ducks Unlimited, Inc., California Department

of Water Resources, Sacramento Co. Dept. of Regional Parks, Open Space, and Recreation, TNC, and the Wildlife Conservation Board. The Cosumnes River Preserve encompasses and protects thousands of acres of wetlands and adjacent uplands, oak woodlands, and riparian forests along the Cosumnes River, the only undammed river on the west slope of the Sierra. The Cosumnes floodplain is a haven for tens of thousands of migratory waterfowl, songbirds, and raptors, for a large portion of the Central Valley's population of greater sandhill cranes, and for rare reptiles and mammals like the endangered giant garter snake and the river otter. These areas provide habitat for migratory waterfowl and other avian species that aid in the dispersal of vernal pool tadpole shrimp and other vernal pool crustacean cysts.

Several large, diverse, vernal pool landscapes are protected within this unit including the Howard Ranch, and Valensin Ranch. The Clay Station Mitigation Bank, Laguna Creek Mitigation Bank, and the Borden Ranch Mitigation site are included in this unit, as well as a number of smaller conservation areas including the Rancho Seco Preserve. The conservation areas contained within this unit have been established specifically to contribute to the survival of vernal pool tadpole shrimp, and to compensate for the loss of thousands of acres of vernal pool grassland habitats throughout the Southeastern Sacramento Valley vernal pool region. This area has been identified by the Sacramento Valley Open Space Conservancy, the CNPS, and TNC as an excellent example of vernal pool grasslands, supporting a rich and diverse community of vernal pool endemic plants and animals within Sacramento County. Land ownership and protection within the unit includes CDFG (630 ha (1,557 ac)), TNC (3,988 ha (9,970 ac)) lands and WRP easements (4 ha (11 ac)). Vernal pool habitats in this unit are threatened by urbanization from the expanding cities of Sacramento and Elk Grove. Conversion from grazing to other agricultural practices, particularly vineyards, is also a significant threat to vernal pool tadpole shrimp in this unit.

This unit occupies the area south of Deer Creek and the Cosumnes River to just south of the Sacramento and San Joaquin County line near Liberty and Collier roads. The eastern boundary is the low elevation foothills of western Amador County. The western limit is the Sacramento River. This unit also coincides with Unit 19 for vernal pool fairy shrimp, and incorporates Unit 1 for succulent owl's-clover, and Unit 3 for Sacramento Orcutt grass. Other sensitive

species found within this unit include Bogg's Lake hedge-hyssop, Ahart's dwarf rush, Henderson's bent grass, legenere, Sanford's arrowhead, pincushion navarretia, dwarf downingia, California tiger salamander, western spadefoot toad, and California linderiella.

Unit 10, Davis Communications Annex Unit, Yolo County (192 ha (474 ac))

This unit is proposed as critical based on the presence of vernal pool tadpole shrimp (CNDDDB 2001) and vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths that typically become inundated during winter rains and hold water for sufficient lengths of time necessary for vernal pool tadpole shrimp incubation, reproduction, dispersal, feeding, and sheltering, but which are dry during the summer and do not necessarily fill with water every year (Yolo County 1995, Holland 1998, Yolo County Parks 2001). Vernal pool tadpole shrimp within this unit are found on claypan type vernal pools. These pools are generally larger and stay inundated for relatively longer periods than vernal pools on alluvial terraces or volcanic mudflows and lava flows. This unit contains DOD (128 ha (321 ac)) and county owned land. Vernal pool habitats in this unit are currently the focus of conservation planning efforts by Yolo County (Yolo County Parks 2001).

This unit coincides with Unit 2 for Colusa grass and Unit 1 for Solano grass. Other rare and special status species that occur in this unit are Baker's navarretia, western spadefoot toad, California tiger salamander, brittlescale, San Joaquin saltbrush, alkali milk-vetch, palmate-bracted bird's beak, and the Heckard's pepper grass.

Unit 11, Jepson Prairie Unit, Solano County (34,610 ha (85,521 ac))

This unit is proposed as critical for vernal pool tadpole shrimp because it includes one of the largest contiguous areas of habitat remaining for the species (Holland 1998, Solano County 2000, Solano County Farmlands and Open Space 2000, CNDDDB 2001). Vernal pool tadpole shrimp at Jepson Prairie occur in large, playa-like vernal pools which may be over several acres in size, including the 32 ha (80 ac) Olcott Lake. The species can also be found in smaller pools and hogwallow depressions that also occur within this unit. The Jepson Prairie area supports vernal pool tadpole shrimp within unusual combinations of low terrace and basin rim landform vernal pools on a diversity

of soil types, maintaining a diversity of habitats for vernal pool tadpole shrimp.

The relatively undisturbed, hydrologically intact condition of the Jepson Prairie increases the likelihood that it will continue to support natural vernal pool ecosystem processes and maintain suitable habitat conditions for vernal pool tadpole shrimp. This unit also provides habitat for migratory waterfowl that aid in the dispersal of vernal pool tadpole shrimp and other vernal pool crustacean cysts. King (1996) found that vernal pool tadpole shrimp within this unit were genetically distinct from sampled occurrences in other portions of the species' range, including those just a few miles to the east in Sacramento County.

Jepson Prairie has long been recognized as an outstanding example of vernal pool ecosystems. In 1987, the NPS named Jepson Prairie a National Natural Landmark, a designation given to sites that provide high quality habitat for threatened or endangered species. Jepson Prairie is the target of ongoing conservation planning efforts and active management. As part of the UC Reserve System, this area also provides critical research opportunities for scientists to study vernal pool species, including vernal pool tadpole shrimp.

The unit contains lands totaling 2,248 ha (901 ac) owned and approximately 64 ha (160 ac) administered by CDFG. Additional lands are owned by DOD (760 ha (1,879 ac)), California State Parks (15 ha (38 ac)), and the State Land Commission (109 ha (273 ac)). TNC has a conservation easement on 623 ha (1,558 ac) within this unit, and NRCS holds WRP conservation easements or agreements for 436 ha (1,090 ac). The Jepson Prairie Preserve is jointly managed by the Solano Land Trust and the UC Reserve System. Vernal pool tadpole shrimp on private land within this unit are threatened by agricultural conversion, range improvement programs, landfill expansion, power plant construction, and utility maintenance.

This unit is located in the southern portion of Solano County, southeast of Interstate 80 and the cities of Fairfield and Vacaville, north of Grizzly Bay and Montezuma Slough, west of the Sacramento River and the Solano and Sacramento county line, and south of Midway Road and the City of Dixon. The unit is bisected by Highway 13 and Highway 12. This unit is also described as Unit 16 for vernal pool fairy shrimp. This unit contains Unit 3 for Colusa grass, Unit 2 for Solano grass, Unit 3 for Conservancy fairy shrimp, and Unit 4 and portions of Unit 5 for Contra Costa goldfields. Other rare vernal pool

species which occur in this unit include alkali milk-vetch, Ferris's milk-vetch, vernal pool small scale, dwarf downingia, Delta green ground beetle, Bogg's Lake hedge-hyssop, Ricksecker's water scavenger beetle, California linderiella, midvalley fairy shrimp, legenera, and California tiger salamander.

Unit 12, Suisun Marsh Area Unit, Solano County (603 ha (1,490 ac))

This unit is proposed as critical for vernal pool tadpole shrimp because it contains vernal pools that support the necessary timing, frequency, and duration of inundation essential for vernal pool tadpole shrimp life history requirements including feeding, sheltering, reproducing, and dispersing (Levine Fricke 2000, CNDDDB 2001). This unit is one of only two areas where vernal pool tadpole shrimp occur in the saline-alkaline transition zone between vernal pools and tidal marshes, and helps to maintain a diversity of habitat types for this species. All of the habitats within this unit are on private land. The primary threats to vernal pool habitats within this unit are alterations to hydrology from filling, diking, and dredging activities which may occur in the tidal marsh.

This unit is located near the Suisun Marsh in southern Solano County, east of Montezuma Slough and west of Collinsville Road; the northernmost portion of this unit is bisected by Birds Landings Road. Portions of this unit coincide with Unit 4 for Conservancy fairy shrimp. This unit also contains occurrences of other rare vernal pool species including alkali milk-vetch and dwarf downingia.

Unit 13, Stanislaus Unit, Stanislaus, Tuolumne, Mariposa, and Merced Counties (9,408 ha (23,246 ac))

This unit is proposed as critical for vernal pool tadpole shrimp because it contains hardpan pools that occur on soils of alluvial fans and terraces of appropriate sizes and depths that become inundated during winter rains and hold water for sufficient lengths of time necessary for vernal pool tadpole shrimp incubation, reproduction, dispersal, feeding, and sheltering, but which are dry during the summer and do not necessarily fill with water every year (Holland 1998, CNDDDB 2001). Vernal pool tadpole shrimp in this unit occur within numerous small pools and swales on mima mound topography, supported by soils that are typically older than those of the alluvial terraces in the Sacramento area. This unit contains almost 25 percent of vernal pool habitats found along the eastern

margin of the San Joaquin Valley. King (1996) found that vernal pool tadpole shrimp within this unit, although similar to vernal pool tadpole shrimp in eastern Sacramento County, were genetically different from other tadpole shrimp occurrences sampled throughout the species' range, particularly those on the floor of the Central Valley.

The Stanislaus Unit contains very high quality, hydrologically intact vernal pool complexes. The well-known Hickman pools in Stanislaus County are located within this unit. Not only does the Hickman pool complex contain one of the largest vernal lakes in California at more than 121 ha (300 ac), but it also exhibits tremendous biodiversity, including one of the largest concentrations of imperiled amphibians (Medeiros 2000). However, the watershed containing the Hickman vernal pools has been breached by hundreds of acres of orchards that have been planted upstream. While most of the watershed has been managed over the years in a trust of the Fred Robinson family, the integrity of the vernal pool ecosystem is threatened by agricultural development and potential biocide pollution (Medeiros 2000).

The Stanislaus Unit is bordered by the Stanislaus River to the north and Dry Creek to the south and southeast. This unit coincides with vernal pool fairy shrimp Unit 22. It also encompasses succulent owl's-clover units 3 and 4, San Joaquin Valley Orcutt grass units 1 and 2, hairy Orcutt grass units 4 and 5, Colusa grass units 5 and 6, Hoover's spurge units 4 and 5, Greene's tuctoria units 8 and 9, and Conservancy fairy shrimp units 4 and 6. Other sensitive vernal pool species found within this unit include western spadefoot toad, dwarf downingia, California linderiella, California tiger salamander, and Hartweg's golden sunburst. All the land within this unit is privately owned.

Unit 14, San Francisco Bay Unit, Alameda and Santa Clara Counties (458 ha (1,132 ac))

This unit is proposed as critical habitat for vernal pool tadpole shrimp because it contains occurrences of the species living within vernal pools that are inundated for sufficient periods of time for vernal pool tadpole shrimp hatching, growth, and reproduction, but are dry during the summer to prevent the establishment of aquatic predators such as bullfrogs and fish (Holland 1998, CNDDDB 2001). The unit boundary was identified based on the distribution of vernal pool tadpole shrimp and the presence of these primary constituent elements, including vernal pools mapped by Holland (1998) and vernal

pool areas delineated by Wetlands Research Associates (1999). The southern and western boundaries were delineated to exclude estuarine habitats and urban areas visible on SPOT imagery. This unit is also designated so that special management actions will be taken within vernal pool creation areas occurring within this unit. These areas have been created specifically to contribute to the conservation of vernal pool tadpole shrimp. Monitoring and management of these created pools will be necessary to ensure their continued suitability for vernal pool tadpole shrimp. We own approximately 10 ha (24 ac) within this unit.

This area represents the only location where vernal pool tadpole shrimp occur in the San Francisco Bay region. Vernal pool tadpole shrimp within this unit are found in a unique tidal marsh estuary area that represents an unusual habitat type for the species. This unit represents the western extent of the species range, and is disjunct from other vernal pool tadpole shrimp populations elsewhere within the species' range in central California. This unit is over 60 km (37 mi) from the nearest unit to the north, and over 90 km (56 mi) from the nearest units to the east and south. Peripheral populations such as these may have genetic characteristics essential to overall long-term conservation of the species (*i.e.*, they may be genetically different than more central populations) (Lesica and Allendorf 1995).

This unit is situated south of the cities of Fremont and Newark, west of Interstate 880 and north of Mud Slough. This unit is a portion of Unit 8B for Contra Costa goldfields. Portions of this unit occur within the boundaries of San Francisco Bay National Wildlife Refuge. This unit includes a preserve established as conservation measures for vernal pool tadpole shrimp as part of the Pacific Commons development project (Service 2000b). This subunit also supports a large population of the California tiger salamander.

Unit 15, Merced Unit, Merced and Mariposa Counties (71,076 ha (175,626 ac))

This unit is proposed as critical for vernal pool tadpole shrimp because it contains more documented occurrences of the species than any other area throughout the species range (CNDDDB 2001). The vernal pool tadpole shrimp in this area occur in the largest block of pristine, high density vernal pool grasslands remaining in California (Vollmar 1999). These vernal pools provide the primary constituent elements essential for the conservation of vernal pool tadpole shrimp, and

supports multiple large vernal pool tadpole shrimp occurrences that are capable of producing large numbers of cysts in good years, which is important for this species to survive through a variety of natural and environmental changes, as well as stochastic (random) events. The Merced Unit contains almost 15 percent of all remaining vernal pool habitats in the Central Valley, and 40 percent of vernal pool habitats along the eastern margin of the San Joaquin Valley (Holland 1998). Genetic analyses of vernal pool tadpole shrimp revealed that occurrences in this unit are genetically different from other sampled occurrences (King 1996). Of all occurrences studied, King (1996) found these to be the most highly divergent.

The integrity of the vernal pool complexes in eastern Merced is seriously threatened by irrigated agriculture, upland housing development, and the proposed UC Merced Campus and associated development. Construction of facilities to educate and serve twenty-five thousand UC students as well as faculty, staff, and their families within the vernal pool complexes in eastern Merced County, could have a major impact on vernal pool tadpole shrimp occurrences. However, the recent draft biological opinion for the UC Merced campus and community developed environmental parameters which should reduce impacts to vernal pool habitats. Indirect and cumulative impacts of the proposed 1,673 ha (4,133 ac) campus and associated community may be minimized with the creation of a 2,036 ha (5,030 ac) preserve intended to protect sensitive vernal pool habitat, to be purchased with money donated by the Packard Foundation. Land ownership within the unit includes approximately 3 ha (8 ac) of BLM, and 11 ha (26 ac) of California State Parks. TNC has a total of 4,513 ha (11,283 ac) of conservation easements within this unit.

A majority of the vernal pool habitat in the Merced Unit is in Merced County. The eastern edge of the unit generally follows the Mariposa County line. The Chowchilla River in Madera County flows along the southern boundary of the unit. The northern boundary parallels the Merced River. The entire unit is located east of Highway 99. The Merced Unit coincides with vernal pool fairy shrimp Unit 22, succulent owl's-clover units 3B, Greene's tuctoria Unit 6, Conservancy fairy shrimp Unit 6, Colusa grass Unit 7, San Joaquin Valley Orcutt grass units 2 and 3. Other sensitive vernal pool species found within this unit include the California tiger salamander, shining navarretia,

dwarf downingia, Bogg's Lake hedge-hyssop, western spadefoot toad, California linderiella, and spiny-sepaled button celery (*Eryngium spinosepalum*).

Unit 16, Grassland Ecological Unit, Madera, Merced and Stanislaus Counties (55,910 ha (138,153 ac))

This unit is proposed as critical for vernal pool tadpole shrimp because it supports seven percent of the known occurrences of the species (CNDDDB 2001) within large vernal pool complexes mapped by Holland (1998). This is the only area where vernal pool tadpole shrimp occur on the floor of the San Joaquin Valley, and contains over 50 percent of the remaining vernal pool habitats within this region (Holland 1998). Vernal pool tadpole shrimp within this unit occur on Northern Claypan vernal pools formed by a diversity of vernal pool soil types, including Delhi-Dello-Himar, Solano-Caypay-Willows, Rossi-Waukena, and Lewis-Landlow soils (Silveira 2000). Many of the vernal pools supporting vernal pool tadpole shrimp within this unit are large (over several acres in size), turbid, and alkaline. All of these pool types provide the necessary timing and length of inundation for vernal pool tadpole shrimp hatching, growth, and reproduction.

This unit boundary was drawn to include the large, intact vernal pool grasslands supporting hydrologically interconnected pools, swales, and other ephemeral wetlands and depressions within a matrix of surrounding uplands where vernal pool tadpole shrimp are known, as mapped by Holland (1998) and as visible on SPOT imagery. However, the 16-ha (40-ac) minimum mapping unit of Holland (1998), and the resolution of SPOT imagery, did not allow us to exclude all agricultural areas from within this unit. These features, which comprise the vernal pool complex, contribute to the filling and drying of the vernal pools, and maintain suitable periods of pool inundation, water quality, and soil moisture for vernal pool tadpole shrimp hatching, growth and reproduction, and dispersal. This unit also provides essential habitat for migratory waterfowl that aid in the dispersal of vernal pool tadpole shrimp and other vernal pool crustacean cysts. King (1996) found that vernal pool tadpole shrimp occurrences within this unit, although most similar to occurrences at Sequoia Field in Tulare County, are genetically different from other vernal pool tadpole shrimp throughout the species range. The vernal pool tadpole shrimp in this unit genetically very different from sampled occurrences less than 12 km (7 mi) to

the east in the foothills of the Sierra Nevada.

The Grassland Ecological Unit includes Kesterson, San Luis, and Merced National Wildlife Refuges (13,943 ha (34,452 ac)), CDFG lands (1,703 ha (4,257 ac)), CDFG administration lands (1,052 ha (2,631 ac)), California State Parks (1,358 ha (3,392 ac)), and WRP easements (54 ha (134 ac)). Together, these areas are known as the Grasslands Ecological Area. This area supports diverse wetland habitats including seasonally flooded marshlands, semi-permanent marsh, riparian habitat, wet meadows, vernal pools, native uplands, pastures, and native grasslands. Wetlands within this area, including seasonal marsh and open water habitats, constitute 30 percent of the remaining wetlands in California's Central Valley and are extremely important to Pacific Flyway waterfowl populations. Over 60 million duck use-day and 3 million goose use-days occur annually in this unit. This habitat also supports a diversity of other migratory birds, including raptors, shorebirds, wading birds, and other wildlife species.

The unit lies north of the City of Los Banos, southwest of the City of Merced, and is bisected by the San Joaquin River. This unit overlaps Unit 23 for vernal pool fairy shrimp and Unit 7 for Conservancy fairy shrimp. The western half of this unit also represents Unit 2 for longhorn fairy shrimp, and the eastern half represents Unit 8 for Colusa grass, and Unit 6 for Hoover's spurge. In addition to the species mentioned above, vernal pool smallscale, alkali milk-vetch, western spadefoot toad, and California linderiella are other special status vernal pool species present in this unit.

Unit 17, Table Mountain Unit, Fresno County (740 ha (1,829 ac))

This unit is proposed as critical for vernal pool tadpole shrimp because it supports occurrences of vernal pool tadpole shrimp (CNDDDB 2001) and extensive vernal pool complexes (Holland 1998, Keeler-Wolf *et al.* 1998). The unit also contains Northern Basalt Flow vernal pools that provide the necessary timing, frequency, and length of inundation necessary for the species to hatch, mature, reproduce, and complete its life cycle. The basalt flow vernal pools within this unit are found on narrow, sinuous basalt mesas above the surrounding low-lying terrain. Basalt flow vernal pools are a very rare habitat type for vernal pool tadpole shrimp and the habitats within this unit are important for maintaining the range of ecological conditions in which the

species occurs. They typically contain small, irregularly clustered pools with "flashy hydrology" (Keeler-Wolf *et al.* 1998). The occurrences of vernal pool tadpole shrimp in this unit are genetically different from occurrences in other portions of the species range, particularly those occurring on the floor of the Central Valley (King 1996). Big Table Mountain, an ancient basalt mesa near Millerton Lake, is found within this unit and is owned and managed by CDFG, TNC, BLM. Land ownership within the unit includes BLM (84 ha (209 ac)), CDFG lands (172 ha (430 ac)), and TNC conservation easements (256 ha (639 ac)). All other lands within this unit are privately owned.

Located in Fresno County, this unit contains vernal pool habitats east and south of the San Joaquin River and east of Millerton Lake. The unit is west of Marshall Station and North of Table Mountain Rancheria. This unit coincides with succulent owl's-clover Unit 6A and San Joaquin Valley Orcutt grass Unit 6B. Other sensitive vernal pool species found within this unit include the Bogg's Lake hedge-hyssop, Molestan blister beetle (*Lytta molesta*), California linderiella, California tiger salamander, and the western spadefoot toad.

Unit 18 A, B and C, Tulare Unit, Tulare County (3,193 ha (7,890 ac))

This unit is proposed as critical for vernal pool tadpole shrimp because it supports occurrences of the species (CNDDDB 2001) within vernal pools that provide the essential primary constituent elements essential for vernal pool tadpole shrimp conservation (Holland 1998). The unit boundary was delineated to include vernal pool tadpole shrimp occurrences (CNDDDB 2001) and the vernal pool complexes in which they occur (Holland 1998). However, the 16-ha (40-ac) minimum mapping unit of Holland (1998), and the resolution of SPOT imagery, did not allow us to exclude all agricultural or developed areas from within this unit. Vernal pool tadpole shrimp in this area are found within pools formed on San Joaquin, Cometa, and Madera soils, among others. This unit represents the southern extent of vernal pool tadpole shrimp's range. The Sequoia Field occurrence was most closely related to occurrences at Kesterson National Wildlife Refuge, and was generally more similar to other occurrences on the valley floor than occurrences found on the eastern margin of the valley in the Sierra Nevada Foothills. However, King (1996) found that vernal pool tadpole shrimp within this unit were genetically

different from other populations studied.

These pools are the focus of ongoing conservation efforts by CDFG, who manage vernal pool habitats at the Stone Corral and Sequoia Field Ecological Reserves found within this unit. Keeler-Wolf *et al.* (1998) identified the vernal pools in these areas as "high quality hardpan pools." Much of the area within this unit is owned by CDFG (348 ha 861 ac) or occurs on private land. Agricultural conversion of range or barren land, particularly for orchards and feed lots, as well as residential and commercial development, have greatly reduced the amount of vernal pool habitat in Tulare County and threatens remaining habitats on private land in this unit.

This unit is comprised of three subunits. Subunit A is located in northwest Tulare County and contains vernal pool habitat located west of Seville. The Friant Kern Canal is north of the unit and the Cottonwood Creek Levee is south of the unit. Road 140 runs west of the unit. Subunit B contains vernal pools in northeastern Kings County and northwestern Tulare County. Highway 99 and St. Johns River cut through the unit in a southeasterly direction. Cross Creek and Cottonwood Creek cut through the unit in a southwesterly direction. Road 112 is east of the unit and the Lakeland Canal is west of the unit. The towns of Goshen and Visalia are south of the unit and Traver and London are north of the unit. Subunit C is known as Sequoia Field Unit and is located in northwestern Tulare County. This unit is south of County Road J36. Road 112 crosses through the western edge of the unit, Avenue 352 crosses through the southern edge, and State Route 63 crosses through the eastern edge. The Cross Creek Unit coincides with vernal pool fairy shrimp Unit 26 and contains portions of San Joaquin Valley Orcutt grass Unit 8 and Hoover's spurge Unit 9. Other sensitive vernal pool species found within this unit include the California tiger salamander, spiny-sealed button-celery, and western spadefoot toad.

Butte County Meadowfoam

In proposing critical habitat units for Butte County meadowfoam, we evaluated the life history and current distribution of the species, the primary constituent elements, the threats to the species. This information allowed us to determine which areas are likely to contribute to the conservation of these species and to delineate units so that threats to this species might be minimized.

Butte County meadowfoam is restricted to a single county in California. The species is only known from 11 extant occurrences. An additional two occurrences are considered extirpated. Butte County meadowfoam is found in four centers of concentration. One center of concentration is the Shippee Road area between Chico and Oroville, while the other three centers of concentration are in the vicinity of the City of Chico.

An important consideration for designating Butte County meadowfoam critical habitat is to minimize the threat of habitat fragmentation. All of the Chico area populations have been fragmented by the construction of roads or canals; several of the now separate occurrences may well have been continuous in the past. The roads and canals also altered the drainage patterns at many sites, reducing their suitability for Butte County meadowfoam by creating conditions too dry or too wet for its survival (Dole 1988, Jokerst 1989, Kelley and Associates Environmental Sciences 1992). Although some plants still remained at the type locality as of 1989, the site had been severely degraded by grading, agricultural use, and off-road vehicles (Jokerst 1989, Dole and Sun 1992, 2000). Several populations have been reduced in size by surface disturbances such as grading and removal of topsoil (Jokerst 1989, Service 1992a).

Another important criterion is that critical habitat units minimize the potential for alterations in hydrology. Changes in hydrology throughout the range of Butte County meadowfoam are possible from developments adjacent to extant populations, from further construction of roads and canals, and from grading or other surface disturbances. Moreover, subtle hydrological changes that already have taken place are likely to continue reducing Butte County meadowfoam, leading to the eventual extirpation of populations such as one occurrence north of the Chico Municipal Airport.

Special management actions may be necessary in some areas to promote occurrences of Butte County meadowfoam. Light grazing may help to control competing plant species and prevent thatch accumulation (Jokerst 1989). Competition from medusa head (*Taeniatherum caput-medusae*) apparently has reduced population size and seed set in Butte County meadowfoam at the Doe Mill Preserve (Center for Natural Lands Management 1997), and invasion of grasses and other weedy non-native plants poses a potential problem at three other occurrences (CNDDDB 2002) including

the occurrence at the Chico airport and an occurrence in the southern portion of the species range near Shippee Road.

Butte County Meadowfoam Unit Review

We conducted a regional review across the range of Butte County meadowfoam to evaluate and select vernal pool habitats that are essential to the conservation of the species and may require special management. Important factors we considered were the known presence of Butte County meadowfoam and the presence of the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1, Rock Creek Unit, Butte, and Tehama Counties (6,105 ha (15,086 ac))

This unit is proposed as critical for Butte County meadowfoam because it contains the species identified by CNDDDB (2002) within vernal pools, swales, and complexes mapped by Holland (1998) and the EPA (1994). These habitats contain the primary constituent elements necessary for the species survival and long-term conservation, including vernal pools on the Tuscan formation, which typically contain water for shorter periods of time than other types of vernal pools.

This unit represents the northern extent of Butte County meadowfoam's range, and includes occurrences from the northern race of Butte County meadowfoam. This race is genetically different from the southern race (Jokerst 1989, Dole and Sun 1992), and is important to maintain genetic diversity within the species. An introduced occurrence also occurs within this unit, although this occurrence represents individuals thought to be of the southern race. This unit represents one of only four areas where Butte County meadowfoam occurs throughout its entire range. Each unit is likely important to allow the species to tolerate natural and environmental changes, as well as random (stochastic) events.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and to maintain suitable periods of pool inundation, water quality, and soil moisture for Butte County meadowfoam germination and reproduction. The majority of the lands included within this unit are privately owned. Urban development, agricultural conversion, and hydrologic disruptions

or modifications have greatly disturbed vernal pool habitats and restricted Butte County meadowfoam's distribution in this unit.

This unit for Butte County meadowfoam occupies an area north of the City of Chico and includes vernal pool habitats east of Highway 99 along the Sierra foothills from near Pine Creek southeast to Rock Creek. This unit overlaps Unit 1 for Conservancy fairy shrimp, Unit 7 for vernal pool fairy shrimp, and Unit 3 for vernal pool tadpole shrimp. All the lands within this unit are privately owned.

Unit 2, Chico Unit, Butte County (3,508 ha (8,667 ac))

This unit is proposed as critical for Butte County meadowfoam because the species is present and represents a large portion of the species range (CNDDDB 2002). Vernal pools and swales that have the primary constituent elements necessary for the conservation of Butte County meadowfoam occur throughout this unit, including vernal pool habitats on Tuscan-Anita soils and the Tuscan, Riverbank, Redbluff, and Modesto geologic formations (EPA 1994, Holland 1998, Liss 2001, CNDDDB 2001). This unit contains individuals from the northern race of the species, which is genetically different from the southern race (Jokerst 1989, Dole and Sun 1992) and is important to maintain the species genetic diversity. This unit is also designated so that special management actions, such as grazing, will be taken to reduce the negative effects of invasion of non-natives on occurrences of Butte County meadowfoam. This unit is one of only four units for Butte County meadowfoam across its entire range. Each unit is important to allow the species to tolerate a variety of natural and environmental changes, as well as random (stochastic) events.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Butte County meadowfoam germination and reproduction. The majority of the lands included within this unit are privately owned. Portions of the Chico County Airport are included within this unit. A protected area has been set up at Foothill Park. Urban development, agricultural conversion, and hydrologic disruptions or modifications have greatly disturbed vernal pool habitats and reduced Butte County meadowfoam's distribution throughout this unit.

This unit for Butte County meadowfoam occupies an area directly northeast and adjacent to the City of Chico. The unit extends south from Rock Creek and the Chico Airport to near Big Chico Creek. Highway 99 is located west of this unit. This unit is within Unit 7 for vernal pool fairy shrimp, and Unit 3 for vernal pool tadpole shrimp. Other sensitive vernal pool species found within this unit include California linderiella and western spadefoot toad.

Unit 3, Doe Mill Unit, Butte County (1,696 ha (4,191 ac))

This unit is proposed as critical for Butte County meadowfoam because the species is found living within vernal pools that provide the necessary timing and duration of inundation for Butte County meadowfoam growth, reproduction, and dispersal, including vernal pools underlain by the Tuscan geologic formation on Igo-Redding soils (EPA 1994, Holland 1998, Liss 2001, CNDDDB 2001). This unit is also designated so that special management actions, including grazing or other forms of thatch removal, will be taken to reduce the negative effects of invasion of non-natives on occurrences of Butte County meadowfoam. Plants within this unit are of the southern race of Butte County meadowfoam (Jokerst 1989, Dole and Sun 1992) and comprise a significant portion of the species genetic diversity.

The Doe Mill Preserve (6 ha (15 ac)), managed by the City of Chico, is within this unit. Approximately 8.8 ha (22 ac) are public lands owned by the USFS. The remaining lands within this unit are privately owned. Urban development, agricultural conversion, and hydrologic disruptions or modifications have greatly disturbed vernal pool habitats and Butte County meadowfoam occurrences throughout this unit. The distribution of the species and vernal pool habitats within the Chico area have become highly fragmented and isolated from each other.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools and swales where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Butte County meadowfoam germination and reproduction. This unit occupies an area directly southeast and adjacent to the City of Chico. This unit is within Unit 9 for vernal pool fairy shrimp, and Unit 4 for vernal pool tadpole shrimp.

*Unit 4, Oroville Unit, Butte County
(5,011 ha (12,382 ac))*

This unit is proposed as critical for Butte County meadowfoam because it contains vernal pools and swales on the Tuscan, Red Bluff and Riverbank geologic formations where the species is found (EPA 1994, Holland 1998, Liss 2001, CNDDDB 2001). This unit contains individuals from the southern race of Butte County meadowfoam and represents an important component of the species genetic diversity. This unit also represents the southern extent of Butte County meadowfoam's range. The "Shipee Site" has been described as the type locality for the species and is located within this unit. This unit is also designated so that special management actions, such as grazing, will be taken to reduce the negative effects of invasion of non-natives on occurrences of Butte County meadowfoam. This unit represents one of only four units for Butte County meadowfoam across its entire range. All four of these units are essential for the species to endure through a variety of natural and environmental changes, as well as random (stochastic) events.

The lands included within this unit are privately owned. Urban development, highway expansion and construction, agricultural conversion, and hydrologic disruptions or modifications have greatly impacted vernal pool habitats and restricted Butte County meadowfoam's distribution throughout this unit. The distribution of the species and vernal pool habitats within the Chico area have become highly fragmented and isolated from each other.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Butte County meadowfoam germination and reproduction. This unit occupies an area northwest of the City of Oroville. The unit is located south of Dry Creek near State Route 70 southeast to the Thermalito Diversion Pool. This unit is within Unit 4 for vernal pool tadpole shrimp, and encompasses part of Unit 5 for Greene's tuctoria.

Contra Costa Goldfields

In proposing critical habitat units for Contra Costa goldfields, we evaluated the life history and current distribution of the species, the primary constituent elements, and the current threats to the species. This information allowed us to

determine which areas are essential to the conservation of this species and to delineate units so that threats to this species might be minimized.

Of the 30 occurrences of Contra Costa goldfields that were documented between 1884 and 1999, 19 are probably extant. The uncertainty is due in part to the difficulty of relocating sites based on vague descriptions. In addition, this species may reappear on a site after several years even if it is absent during a given survey. Contra Costa goldfields is known from disjunct locations in the coastal regions of California. By far the greatest concentration of this species is in the area east of Fairfield in Solano County. Additional occurrences are extant at Fort Ord in Monterey County, the San Francisco Bay National Wildlife Refuge and near Fremont in Alameda County, near Rodeo in Contra Costa County, near Manchester in Mendocino County, and at Suscol Ridge and Milliken Canyon in Napa County (CNDDDB 2001).

Urban and residential development are believed to be responsible for the loss of at least four Contra Costa goldfields occurrences east of San Francisco Bay. Although the original collection sites cannot be pinpointed from the descriptions given on specimen labels, the areas in question (Antioch, Concord, Newark, San Jose, and Walnut Creek) are highly developed. One site in Fremont (near Newark) was degraded by cultivation and operation of a racetrack, but Contra Costa goldfields reappeared approximately a decade after the fields were abandoned (Baye *in litt.* 2000a). Urbanization is presumed to have extirpated one or more occurrences near Santa Barbara. One Napa County occurrence was destroyed by conversion to a vineyard. At least four former occurrence sites in Solano County have been degraded by surface disturbances, including discing and creek channelization, which removed some habitat, altered the hydrology, and allowed invasion of non-native, upland plants. Contra Costa goldfields has not grown at three of these sites during the past 10 years (CNDDDB 2002).

Urbanization is the greatest threat to Contra Costa goldfields. Except for Travis Air Force Base, the entire concentration area in Solano County is in the Fairfield sphere of influence and is subject to development under the city's general plan. Development also threatens one of the two remaining Alameda County/San Francisco Bay occurrences. Another serious threat is conversion to vineyards. The largest Napa County occurrence, at Suscol

Ridge (CNDDDB 2001), is threatened by vineyard conversion.

Invasion of non-native plants, particularly Italian ryegrass, threatens at least eight occurrences, several of which are also targeted for development (CNDDDB 2001). Encroachment by non-native plants often follows surface-disturbing activities such as discing, grading, filling, and off-road vehicle use, which can alter hydrology and microhabitat conditions. Such surface disturbances are apparent at nine sites, four of which do not yet have reported problems with non-native species (CNDDDB 2001). The CNDDDB (2001) cites livestock grazing as a threat to seven occurrences. However, grazing may help to control invasion of non-native plants under certain conditions. Contra Costa goldfields persisted through horse grazing on Travis Air Force Base, but several small colonies disappeared when horses were excluded. Even moderately heavy grazing can be compatible with Contra Costa goldfields if it is suspended during critical growth periods. Occurrences of Contra Costa goldfields in the Fort Ord area of Monterey County exist at locations that have or potentially contain ordinance and explosives that are byproducts of military training activities. Efforts at the former military base have been underway to remove and dispose of these items. Clearance of ordinance and explosives may involve selectively removing vegetation, digging to expose buried objects, burning, and clearing of the ground surface. Project personnel have and will continue to implement measures that are designed to minimize and mitigate adverse effects to Contra Costa goldfields as ordinance and explosive removal activities proceed, but a potential exists that some plants and habitat may be affected by the clean up activities.

Contra Costa Goldfields Unit Review

We conducted a regional review across the range of Contra Costa goldfields to evaluate and select areas that are essential to the conservation of the species and that may require special management. Important factors we considered were the presence of the species and the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1, Manchester Unit, Mendocino County (1,067 ha (2,637 ac))

This unit is proposed as critical habitat for Contra Costa goldfields because it contains the last known occurrence of Contra Costa goldfields in Mendocino County and is the northern

and western limit of the species range (CNDDDB 2002). Vernal pools in which Contra Costa goldfields are found occur on Crispin loam soils, which provide the necessary timing and length of inundation to meet the life history requirements of Contra Costa goldfields. This is also the only location where Contra Costa goldfields is found on this soil type.

This unit represents the only occurrence of Contra Costa goldfields in the Mendocino coast area. This unit is over 140 km (87 mi) from the closest Contra Costa goldfields unit to the south. Peripheral populations such as this may have genetic characteristics essential to the overall long-term conservation of the species (i.e., they may be genetically different from more central populations) (Lesica and Allendorf 1995).

The boundaries of this unit were delineated by using SPOT imagery and elevation contours to include the open flat areas associated with the vernal pool habitat and associated uplands that contribute to the filling and drying of the vernal pools where the Contra Costa goldfields occur. The unit includes area sufficient to maintain suitable periods of pool inundation, water quality, and soil moisture for Contra Costa goldfields to germinate, grow, and reproduce.

This unit is on private land and threats to this unit include conversion to vineyards, erosion, draining, and residential development. This unit is located in the vicinity of the town of Manchester just north of the Garcia River and east of the Pacific Ocean. State Highway 1 bisects this unit and Brushy Creek forms the northern and northeastern boundary of the unit.

Unit 2, Berryessa Unit, Napa County (411 ha (1,016 ac))

This area is proposed as critical habitat for Contra Costa goldfields because the species is found (CNDDDB 2002) within rock outcrops pools on soils derived from Rhyolite lava flows, within chaparral ecosystems (Holland 1998, USDA 2001, CNDDDB 2002). These pools provide the necessary primary constituent elements essential for the conservation of Contra Costa goldfields. This is the only unit where Contra Costa goldfields occurs on Northern Basalt Flow vernal pools, and this area is important to maintain the range of habitats in which the species is known to occur.

The boundaries of this unit were delineated by using SPOT imagery, elevation contours, and CNDDDB (2002) data which identified Northern Basalt Flow vernal pool habitat within the unit. The unit includes the open flat

areas associated with the vernal pool habitat and associated uplands that contribute to the filling and drying of the vernal pools where the Contra Costa goldfields occur. The unit includes area sufficient to maintain suitable periods of pool inundation, water quality, and soil moisture for Contra Costa goldfields to germinate, grow, and reproduce.

This unit represents some of the last remaining vernal pool habitats in the north bay foothills, and is the only unit for Contra Costa goldfields in this area. This unit is over 25 km (15 mi) from the nearest Contra Costa goldfields unit.

This unit is located south of Lake Berryessa and lies in the Milliken Canyon area east of the City of Yountville and northeast of the City of Napa. Other sensitive vernal pool species found within this unit include dwarf downingia, and few-flowered navaretia. All the lands within this unit are privately owned.

Unit 3, Napa River Unit, Napa and Sonoma Counties (275 ha (678 ac))

This unit is proposed as critical for Contra Costa goldfields because the species is found within vernal pool habitats that support the primary constituent elements essential to the conservation of Contra Costa goldfields (CNDDDB 2002). This unit is located on private land, including the Suscol Ridge area, which is threatened by vineyard conversion. This unit is located directly east of the Napa River adjacent to the salt marsh areas of the lower Napa River. Other rare vernal pool species found in this unit include alkali milk-vetch.

Unit 4, Travis and Fairfield Unit, Solano County (7,885 ha (19,484 ac))

This unit is proposed as essential for the conservation of Contra Costa goldfields because it contains 30 percent of the known occurrences of this species within vernal pools in alkaline and saline-alkaline sites, as well as those on San Ysidro and Antioch soil series (Holland 1998, USDA 2001, Solano County 1999, CNDDDB 2002). The unit boundary was delineated to include Contra Costa goldfields occurrences and the vernal pool complexes in which they occur. These complexes contribute to the filling and drying of Contra Costa goldfields habitats, and maintain suitable periods of pool inundation, water quality, and soil moisture for Contra Costa goldfields germination, growth and reproduction, and dispersal, but not necessarily every year. The eastern boundary of this unit was identified by the Elmira watershed boundary to exclude vernal pool habitats in the Jepson Prairie area that

are outside the currently known range of Contra Costa goldfields.

This unit is located primarily on private land, but also includes DOD property at Travis Air Force Base (1,931 ha (4,828 ac)), CDFG land (117 ha (292 ac)), and State Land Commission Property (4 ha (9 ac)). Conservation areas have been established for Contra Costa goldfields at Travis Air Force Base, and these occurrences are the subject of on-going research projects addressing the restoration and management of this and other vernal pool species and their habitats. Vernal pool habitats within this unit are threatened by urbanization from the cities of Fairfield and Suisun City, and by large-scale transportation projects, such as Jepson Parkway. The remaining vernal pool habitats within the City of Fairfield and Suisun City are currently the subject of conservation planning efforts by local agencies.

This unit occurs in the southern portion of Solano County, northeast of the City of Fairfield, southwest of the City of Vacaville, and north of the Potrero Hills and Nurse Slough. This unit overlaps with Unit 3 for Conservancy fairy shrimp, and is a portion of Unit 11 for vernal pool tadpole shrimp and Unit 16 for vernal pool fairy shrimp. Other rare vernal pool species which occur in this unit include alkali milk-vetch, legenera, and California tiger salamander.

Unit 5 A and B, Suisun Marsh Area Unit, Solano County (411 ha (1,014 ac))

This unit is proposed as critical habitat for Contra Costa goldfields because it contains occurrences of the species within vernal pools in the saline-alkaline transition zone between vernal pools and tidal marshes on Rincon soil series (USDA 1994, CNDDDB 2002). The boundaries of this unit includes the vernal pool complexes mapped by Holland (1998) and the grassland habitats mapped by Solano County (2001) where Contra Costa goldfields occurs (CNDDDB 2001). These habitats provide the necessary timing and length of inundation for Contra Costa goldfields germination, maturation, reproduction, and dispersal (CNDDDB 2001).

The primary threats to Contra Costa goldfields habitats within this unit are alterations to hydrology from filling, diking, and dredging activities which may occur in the tidal marsh. Most of the habitats within this unit are on private land, although portions of the Hill Slough Wildlife Area managed by the CDFG are also included within this unit. Subunits in the vicinity of

Fairfield and Suisun City are also threatened by urbanization.

This unit consists of two subunits in the Suisun Marsh area of southern Solano County. Subunit 5A is the westernmost subunit and is located south and east of the City of Cordelia and the junction of Interstate Highways 80 and 680; this subunit is bisected by the Southern Pacific Railroad line. Subunit 5B is located southwest of the City of Fairfield and west of the City of Suisun City; this subunit is bisected by the Southern Pacific Railroad line. In addition to vernal pool fairy shrimp and vernal pool tadpole shrimp, this unit contains occurrences of other rare vernal pool species including alkali milk-vetch and dwarf downingia.

Unit 6, Rodeo Creek Unit, Contra Costa County (243 ha (599 ac))

This unit is proposed as critical habitat for Contra Costa goldfields because it supports occurrences of the species within vernal pool habitats formed on Conejo clay loam soils (USDA 2001, CNDDDB 2002). The unit boundary was delineated to include the features that contribute to the filling and drying of the vernal pools where Contra Costa goldfields occurs, and that maintain suitable periods of pool inundation, water quality, and soil moisture for Contra Costa goldfields' germination, growth and reproduction, and dispersal, but not necessarily every year. It is the only area where the species occurs in the vicinity of the Sacramento-San Joaquin delta. This unit is over 25 km (16 mi) from the closest unit to the north, and almost 50 km (32 mi) from the closest unit to the south.

This unit is situated along Rodeo Creek and adjacent to State Highway 4. The unit lies southeast of the City of Rodeo and northeast of the City of Hercules. The unit contains a 3.94 ha (9.74 ac) conservation easement area established in 1999 to protect three known locations of Contra Costa goldfields along Rodeo Creek from highway construction activities along State Route 4. Other rare species which occur in this unit include the federally threatened California red-legged frog and another sensitive species, the western pond turtle (*Clemmys marmorata*). All the lands within this unit are privately owned.

Unit 7, Byron Hot Springs Unit, Contra Costa County (1,379 ha (3,406 ac))

This unit is proposed as critical habitat for Contra Costa goldfields because it contains the only remaining extant occurrence of Contra Costa goldfields in southeastern Contra Costa County (CNDDDB 2001). This occurrence

within vernal pools formed on Linne clay loam soils, and has been characterized as alkaline meadow (USDA 2001, CNDDDB 2002). This habitat provides the timing and frequency of inundation essential to the germination, growth, and reproduction of Contra Costa goldfields, and this area includes a unique habitat type for this species. The unit boundary includes vernal pool complexes mapped by Holland (1998) where Contra Costa goldfields is known to occur (CNDDDB 2002). This unit is over 35 km (22 mi) from the closest unit to the north, and almost 50 km (32 mi) from the closest unit to the south.

This unit is in the vicinity of Byron Hot Springs and Byron Airport and lies directly west of Clifton Court Forebay. This unit mostly includes habitat in low-lying areas east of Altamont Hills, but also includes habitat within a small portion of Altamont Hills. A small portion of this unit overlaps with Unit 19B for vernal pool fairy shrimp. Approximately 232 ha (581 ac) within this unit are owned by the CDFG and 55 ha (137 ac) are owned by the State Land Commission the rest is privately owned.

Unit 8, Southeastern San Francisco Bay Unit, Alameda and Santa Clara Counties (458 ha (1,132 ac))

This unit is proposed as critical for Contra Costa goldfields because it contains occurrences of this species within vernal pools, swales, moist flats, and other ephemeral wetlands in saline alkaline transition zones with tidal marsh habitats that sustain Contra Costa goldfields germination, growth and reproduction (CNDDDB 2002, Holland 1998). The unit boundary was identified based on the distribution of Contra Costa goldfields and the presence of these primary constituent elements, including vernal pools mapped by Holland (1998) and vernal pool areas delineated by Wetland Research Associates (1999). The southern and western boundaries were delineated to exclude estuarine habitats and urban areas visible on SPOT imagery.

This unit contains a 180 ha (450 ac) preserve established specifically to contribute to the recovery of Contra Costa goldfields (Service 2000b, Wetland Research Associates 1999) and 443 ha (1,108 ac) of this unit is owned by the Service. This unit is over 50 km (31 mi) from the nearest units to the north, and almost 100 km (62 mi) from the nearest Contra Costa goldfields unit to the south.

This unit occurs in southeastern San Francisco Bay and also represents Unit 14 for vernal pool tadpole shrimp. The unit lies between the northernmost and

southernmost subunits and is situated south of the cities of Fremont and Newark and north of Mud Slough. Portions of this unit is found within the boundaries of San Francisco Bay National Wildlife Refuge and the rest is privately owned.

Unit 9, Fort Ord Unit, Monterey County (3,372 ha (8,331 ac))

The Fort Ord unit includes seasonally flooded pool habitats and mima mound grassland areas that are within the boundary of an area that was previously managed as the Fort Ord Army Base. These lands are now or will be managed by a number of Federal and local governments following a transfer from the DOD. Approximately 2,894 ha (7,234 ac) of this unit are currently owned by the DOD, 437 ha (1,093 ac) by BLM, and 2 ha (4 ac) by Monterey County. The critical habitat unit includes a number of seasonally-flooded wetland habitats and at least four locations that possess Contra Costa goldfields. Monitoring activities at two of the four locations suggest that listed plant numbers vary on an annual basis, and that differences in species abundance may be attributable to differences in annual rainfall totals and water duration in ponded areas (Harding Lawson Associates 2001). The total combined population estimates for the two areas where monitoring occurred in 1998, 1999, and 2000 were 500–1500, 56,000, and 162,500 individuals, respectively. The areas on the former military base that contain Contra Costa goldfields are being transferred to the BLM as a habitat reserve Natural Resource Management Area. Contra Costa goldfields in Monterey County are located 60 miles south of other locations where the species has been documented. This unit is essential to the conservation of Contra Costa Goldfields because it contains the southern-most extant occurrence of the species.

Hoover's Spurge Criteria

In proposing critical habitat units for Hoover's Spurge we evaluated the life history and current distribution of the species, the primary constituent elements, and the current threats to the species. This information allowed us to determine which areas are likely to contribute to the conservation of these species.

The CNDDDB (2001) includes 30 occurrences of Hoover's spurge, six of which were discovered in 1992 (three each in Glenn and Tulare counties). Of the 30 occurrences, one each in Tehama and Tulare counties are classified as extirpated; two others, in Butte and

Tehama counties, are “possibly extirpated” because this species was not observed for 2 consecutive years (Stone *et al.* 1988, CNDDDB 2001). Of the 26 occurrences presumed to be extant, only 12 have been observed within the past decade (CNDDDB 2001).

The main area of concentration for Hoover's spurge is within the Vina Plains area of Tehama and Butte counties, which contains over half of the 26 presumed extant occurrences for Hoover's spurge (CNDDDB 2001). One other site in the same region is near Chico in Butte County. Other extant occurrences of the species are found in the Visalia-Yettem area of Tulare County, the Hickman-La Grange area of Stanislaus County, the Sacramento National Wildlife Refuge in Glenn County, and on the Bert Crane Ranch in Merced County (CNDDDB 2001).

One population of Hoover's spurge in Tulare County and another in Tehama County were destroyed when the areas were converted for agricultural use (CNDDDB 2002). Agricultural conversion continues to threaten Hoover's spurge, particularly in Stanislaus County (Stone *et al.* 1988). However, more subtle factors such as changes in hydrology, invasion by aggressive plants, and inappropriate livestock grazing regimes constitute a greater threat to survival of the species at this time. Five of the remaining occurrences of Hoover's spurge are subject to obvious hydrologic threats; four of the five are in the San Joaquin Valley and the fifth is in the Vina Plains. Hydrology has been altered by (1) construction of levees and other water barriers and (2) by runoff from adjacent agricultural operations, roads, and culverts. Due to these changes, some pools receive insufficient water and others remain flooded for too long to allow growth of Hoover's spurge. Although no occurrences have been completely extirpated due to hydrologic changes, the species has been eliminated from one or more individual pools at several sites and a number of the remaining populations appear to be declining (Stone *et al.* 1988, Stebbins *et al.* 1995, CNDDDB 2002).

Competition from invasive native or non-native plant species threatens nine of the extant occurrences, including eight in the Vina Plains and one on the Sacramento National Wildlife Refuge in Glenn County. Native competitors of Hoover's spurge include coyote-thistle, alkali mallow (*Malvella leprosa*, a noxious weed according to Hill 1993), lippia (*Phyla nodiflora*), hard-stemmed tulle (*Scirpus acutus* var. *occidentalis*), alkali bulrush (*Scirpus maritimus*), and cocklebur. Non-native competitors include bindweed (a noxious weed

according to Dempster 1993) and swamp grass (*Crypsis schoenoides*) (Silveira *in litt.* 2000, CNDDDB 2001). On the Vina Plains Preserve, the pools with Hoover's spurge also had the highest frequency of bindweed, at least in 1995 (Alexander and Schlising 1997). Increasing dominance by these competitors may be associated with changes in hydrology and livestock grazing practices (Stone *et al.* 1988, Alexander and Schlising 1997, CNDDDB 2002).

The issue of livestock grazing effects on Hoover's spurge is complex. In general, moderate levels of grazing appear to be compatible with Hoover's spurge and presumably benefit the species by reducing competition from other plants (Stone *et al.* 1988). Livestock do not eat Hoover's spurge because it grows so close to the ground and possibly because the milky sap is toxic (Wheeler 1941, Stone *et al.* 1988). During 1986 and 1987, Stone *et al.* (1988) deemed the intensity of cattle grazing at most Hoover's spurge sites to be appropriate. In fact, several species experts (Stone *et al.* 1988, Silveira *in litt.* 2000) have cautioned that decreases in grazing intensity could be detrimental to Hoover's spurge. On the other hand, cattle trampling has seriously reduced Hoover's spurge populations at one site each in Butte and Stanislaus counties (Stone *et al.* 1988), and increased summer stocking rates at other sites could similarly damage those populations.

Populations with small numbers of plants may be more vulnerable to extirpation from random events (Shaffer 1981, Menges 1991). This may be the case for at least four of the known occurrences, which total fewer than 100 individuals even in favorable years (CNDDDB 2002).

Hoover's Spurge Unit Review

We conducted a review across the range of Hoover's spurge to evaluate and select areas that are essential to the conservation of the species and that may require special management. Important factors we considered were the documented presence of the species and the presence of the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1, Vina Plains Unit, Tehama and Butte Counties (11,673 ha (28,845 ac))

This unit is proposed as critical for Hoover's spurge because it supports numerous occurrences of the species within vernal pools on acidic soils over iron-silica cemented hardpan, including Anita and Tuscan soils (USDA 2001,

Holland 1998, CNDDDB 2002). The Vina Plains Unit contains over 50 percent of the known occurrences of Hoover's spurge, including several large, stable occurrences (CNDDDB 2002). This area represents the northern extent of the species range.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Hoover's spurge germination and reproduction.

The majority of the lands included within this unit are privately owned. This unit contains TNC's 1862 ha (4,600 ac) Vina Plains preserve. The preserve contains over 300 species of plants and diverse communities of aquatic invertebrates. Since the 1960s, the Vina Plains area has been the focus of a number of research projects, including long-term adaptive management and monitoring efforts evaluating the effects of grazing and fire on vernal pool plants (Griggs 2000). Much of the basic life history information known about Hoover's spurge was collected at Vina Plains (e.g., Stone *et al.* 1988, Alexander and Schlising 1997). The results of this research have provided crucial information to guide management and monitoring of vernal pool ecosystems and to identify factors which influence population dynamics of a number of endangered species.

The Vina Plains is open to the public and provides excellent outreach and educational opportunities. In addition to TNC, the importance of vernal pool habitats in this area has been recognized by the CDFG, the Service, the EPA, the CNPS, the NRCS's WRP, and by researchers at the CSU at Chico, who have all supported research and conservation efforts for Hoover's spurge and other vernal pool species within this unit. Urban development north of Chico and the conversion of grazed lands to more intensive agricultural uses threaten vernal pool habitat within this unit.

This unit for Hoover's spurge occupies the area south of Toomes Creek and north of Pine Creek to near Cana Highway. State Route 99 bisects this unit and the western boundary generally parallels the Southern Pacific Railway line. This unit overlaps Unit 7 for vernal pool fairy shrimp, Unit 3 for vernal pool tadpole shrimp, Unit 1 for Conservancy fairy shrimp, Unit 2 for Greene's tuctoria, Unit 1 for Hoover's spurge, and Unit 4 for slender Orcutt grass. Additional sensitive vernal pool

species occurring in this unit include California linderiella and Bogg's Lake hedge-hyssop. Property ownership and protection within this unit includes CDFG (0.4 ha (1 ac)), CDFG administration (0.4 ha (1 ac)), TNC (2,295 ha (5,738 ac)), TNC easements (4,661 ha (11,653)), and WRP easements and agreements (57 ha, 142 ac)).

Unit 2, Butte Unit, Butte County (979 ha (2,418 ac))

This unit is proposed as critical habitat for Hoover's spurge because it supports the species within vernal pools on acidic Tuscan soils over iron-silica cemented hardpan (CNDDDB 2002, Liss 2001, USDA 2001, Holland 1998, EPA 1994) and the vernal pool habitat remains inundated for sufficient periods of time to allow Hoover's spurge to complete its life-cycle. This unit represents one of only three areas where Hoover's spurge is known to occur in the Sacramento Valley, and is over 225 km (140 mi) from the nearest occupied areas to the south.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Hoover's spurge germination and reproduction. Hoover's spurge is known from only seven general locations across its entire range, and each of these locations is essential to the conservation of this species.

This unit for Hoover's spurge occupies the area north of the intersection of State Route 99 and Route 149 in Butte County. The eastern boundary extends up the watershed of Clear Creek and the western boundary extends south paralleling State Route 99 to Little Dry Creek. This unit is within Unit 9 for vernal pool fairy shrimp and Unit 4 for vernal pool tadpole shrimp, and coincides with Unit 3 for Greene's tuctoria and Units 2 and 3 for hairy Orcutt grass. All the land within this unit is privately owned.

Unit 3, Sacramento National Wildlife Refuge Unit, Glenn and Colusa Counties (5,718 ha (14,129 ac))

This unit is proposed as critical habitat for Hoover's spurge because it contains multiple occurrences of the species within alkaline vernal pools on Willows and Riz soil types (Holland 1998, Silveira 2000, CNDDDB 2002). The vernal pool habitat remains inundated for sufficient periods of time to allow Hoover's spurge to complete its life cycle. This habitat contributes to the

diversity of environmental conditions in which Hoover's spurge is known to occur. This area represents one of only three general locations where Hoover's spurge is found in the Sacramento Valley, and is one of only seven areas across its entire range where Hoover's spurge is known to occur. This unit is over 40 km (25 mi) from the nearest unit to the northeast, and over 225 km (140 mi) from the nearest unit to the south. Hoover's spurge occurrences at the Sacramento National Wildlife Refuge have been monitored annually since 1992 (Silveira *in litt.* 2000).

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Hoover's spurge germination and reproduction to take place.

This unit for Hoover's spurge occupies the vernal pool habitat and surrounding area east of Interstate 5 to the Colusa Trough from Riz Road on the north and Delevan Road on the south. The area encompasses a portion of the Sacramento National Wildlife Refuge (5,126 ha (12,816 ac)). The remaining portions of the unit are privately owned. This unit is also part of vernal pool fairy shrimp Unit 10, and vernal pool tadpole shrimp Unit 5, and coincides with Unit 2 for Conservancy fairy shrimp, Unit 1 for Greene's tuctoria, and Unit 3 for hairy Orcutt grass. Other vernal pool and associated upland species found in the unit include pappose spikeweed, Fremont's goldfields, alkali goldfields, Scribe's popcorn flower, Hoover's downingia, folded downingia, Heckard's peppergrass, heartscale, brittlescale, San Joaquin spearscale, Ferris' milk-vetch, spike-primrose, sessile mouseltail, and palmate-bracted bird's beak.

Unit 4, Waterford Unit, Stanislaus and Tuolumne Counties (16,839 ha (41,609 ac))

This unit is proposed as critical habitat for Hoover's spurge because it supports the species within vernal pools on Whitney sandy loam soils that maintain the necessary timing and duration of inundation for Hoover's spurge germination, growth, and reproduction (USDA 2001, CNDDDB 2002). This unit contains soils that are typically older than those of the alluvial terraces in the Sacramento area which are estimated to be early Pleistocene.

The Waterford Unit contains very high quality, hydrologically intact vernal pool complexes important for the

conservation of Hoover's spurge. Hoover's spurge is sparsely distributed in the southern Sierra Nevada foothills, and these occurrences are highly disjunct from the occurrences of Hoover's spurge in the northern portion of the species range. This unit is over 225 km (140 mi) from the nearest units to the north. The largest threat to Hoover's spurge in this unit is agricultural conversion (Stone *et al.* 1988). Cattle trampling has also impacted an occurrence of Hoover's spurge in the southeastern region of the unit (CDNNB 2001). There are numerous deep pools in this area that provide suitable habitat for Hoover's spurge because the duration of inundation is generally longer than in shallow pools. These pools contain habitat components that are essential for the primary biological needs of germination, growth, reproduction, and dispersal of the species.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery, as well as elevation contours in the eastern foothill region and sub-watershed boundaries. The Waterford Unit is bordered by the Tuolumne River to the south. The Modesto Reservoir is adjacent to the southwest boundary of the unit. Warnerville Road cuts through the northern portion of the unit. The City of La Grange is located southeast of the unit. The eastern boundary extends into the low elevation foothills of the Sierra Nevada. Vernal pools in the Waterford Unit are located mainly in eastern Stanislaus County, but overlap into western Tuolumne County. This unit coincides with Colusa grass Unit 4, San Joaquin Valley Orcutt grass Unit 1, and hairy Orcutt grass Unit 4. It overlaps succulent owl's-clover Unit 2 and Greene's tuctoria Unit 6. Other sensitive vernal pool species found within this unit include California tiger salamander, western spadefoot toad, dwarf downingia, and California linderiella. CDFG administers approximately 0.8 ha (2 ac) of this unit. The remaining land within this unit is privately owned.

Unit 5, Turlock Unit, Stanislaus and Merced Counties (19,850 ha (49,049 ac))

This unit is proposed as critical habitat for Hoover's spurge because it contains occurrences of the species within large vernal pools on Meikle soils, including two of the seven known occurrences of Hoover's spurge on the eastern margin of the San Joaquin Valley (Holland 1998, CNDDDB 2002). One occurrence is within the well-known Hickman pools in Stanislaus County.

Not only does the Hickman pool complex contain one of the largest vernal lakes in California at more than 121 ha (300 ac), but it also exhibits tremendous biodiversity (Medeiros 2002).

The Turlock Unit contains large intact and contiguous vernal pool grassland areas that help maintain connectivity between hairy Orcutt grass habitat to the north and south. There are numerous vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths in this unit to sustain Hoover's spurge germination, growth and reproduction. Hoover's spurge populations in Stanislaus County typically flower from mid-June into October, whereas those in Merced and Tulare counties typically flower from late May through July (Alexander and Schlising 1997). The Hoover's spurge habitat in this unit is important to conserve phenotypic variation within the species and to maintain the geographic distribution of Hoover's spurge throughout its range.

The largest threat to this species in this unit is agricultural conversion (Stone *et al.* 1988). The watershed containing the vernal pools has been breached by hundreds of acres of orchards that have been planted upstream. East of the Hickman vernal pools, there is a large, hydrologically intact vernal pool complex that likely contains other occurrences of Hoover's spurge.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. The Turlock Unit is bordered by the Tuolumne River to the north and the Merced River to the south. The unit lies between the towns of La Grange and Snelling. County Road J9 runs west of the unit and the eastern edge is located in the low elevation foothills of the Sierra Nevada. Vernal pools in the Turlock Unit are located in Stanislaus and Merced counties. This unit coincides with Colusa grass Unit 6, hairy Orcutt grass Unit 5, succulent owl's-clover Unit 3A, and vernal pool fairy shrimp Unit 21. Other sensitive vernal pool species found within this unit include California tiger salamander, Hartweg's golden sunburst, and dwarf downingia. California State Parks owns approximately 24 ha (60 ac) within this unit. The remaining land within this unit is privately owned.

Unit 6, Grasslands Unit, Madera, Merced and Stanislaus Counties (14,310 ha (35,359 ac))

This unit is proposed as critical habitat for Hoover's spurge because it support occurrences of the species within saline-alkaline vernal pools on Lewis soils (USDA 2001, CNDDDB 2002). The unit boundary was designated to include occurrences of Hoover's spurge and the vernal pool complex in which they occur (Holland 1998). The vernal pools, swales, and associated uplands within this unit contribute to the filling and drying of Hoover's spurge habitat, and maintain suitable periods of pool inundation, water quality, and soil moisture for Hoover's spurge germination, growth and reproduction, and dispersal.

The Grasslands Unit includes portions of the Kesterson, San Luis, and Merced National Wildlife Refuges (3,232 ha (7,985 ac)). The remaining land within this unit is privately owned. This unit contains a diversity of vernal pool types, including vernal pools occurring on Delhi-Dello-Himar, Solano-Caypay-Willows, Rossi-Waukena, and Lewis-Landlow soils (USDA 1994). This unit contains the majority of the remaining vernal pool habitats in the San Joaquin Valley (Holland 1998). Threats to remaining vernal pool habitats within this unit include agricultural conversion.

The unit lies north of the City of Los Banos, southwest of the City of Merced, and is bisected by the San Joaquin River. This unit represents Unit 23 for vernal pool fairy shrimp, Unit 7 for Conservancy fairy shrimp, and Unit 16 for vernal pool tadpole shrimp. The western half of this unit represents Unit 8 for Colusa grass. In addition to the species mentioned above, vernal pool smallscale, alkali milk-vetch, western spadefoot toad, and California linderiella are present in this unit as well.

Unit 7 A, B, C, and D, Tulare Unit, Tulare County (12,375 ha (30,578 ac))

This unit is proposed as critical habitat for Hoover's spurge because it supports almost 20 percent of the known occurrences of the species, including occurrences found within vernal pools on Lewis soils (USDA 2001, CNDDDB 2002). This unit comprises the southern extent of the range of Hoover's spurge. Occurrences within this unit are more than 110 km (68 mi) distant from the nearest Hoover's spurge unit to the north. Peripheral populations may have genetic characteristics essential to overall long-term conservation of the

species (*i.e.*, they may be genetically different than more central populations) (Lesica and Allendorf 1995). Hoover's spurge populations in Tulare County typically flower from late May through July, whereas those in Stanislaus and Sacramento County typically flower from mid-June into October (Alexander and Schlising 1997). This phenotypic variation also suggests there may be regional differences between these and other occurrences in other portions of the species range.

This unit includes several protected areas, including the Sequoia Fields Ecological Reserve and the Stone Corral Ecological Reserve in Tulare County managed by CDFG (355 ha (877 ac)) as well as 13 ha (33 ac) of BLM land. Other areas within this unit are privately owned, and are threatened by conversion to irrigated agriculture of range. This unit contains scattered vernal pool complexes in northwestern Tulare County. This unit contains deeper pools that maintain suitable periods of pool inundation, water quality, and soil moisture for vernal pool plant germination, growth and reproduction, and dispersal.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery, as well as elevation contours in the eastern foothill region and sub-watershed boundaries. There are four subunits within the Tulare Unit. The westernmost subunit is located east of J19. Road 63 cuts through its eastern edge. St. Johns River is south of the subunit and the Southern Pacific Railroad runs northeast of the unit. The other three subunits are located east of Road 63. The smallest subunit lies directly east of the westernmost subunit. Road 201 passes through both of the easternmost subunits. The subunit that lies next to the easternmost subunit contains vernal pool habitat north of Stokes Mountain. In the south it is bordered by Cottonwood Creek. The easternmost subunit extends into the low elevation foothills of the Sierra Nevada. Colvin Mountain is located within its southwest boundary. Road 245 bisects this subunit and the south side of Red Mountain is within its northeast boundary. Tulare Unit coincides with San Joaquin Valley Orcutt grass Unit 7, and overlaps with vernal pool tadpole shrimp Unit 18 and vernal pool fairy shrimp Unit 26. Other sensitive vernal pool species found within this unit include the California tiger salamander, spiny-sepaled button-celery, and western spadefoot toad.

Succulent Owl's-clover

In proposing critical habitat units for succulent owl's-clover we evaluated the life history and current distribution of the species, the primary constituent elements, and the threats to the species. This information allowed us to determine which areas are likely to contribute to the conservation of this species and to delineate units so that threats to this species might be minimized.

Succulent owl's-clover is currently known from 63 occurrences, of which one in Fresno County is considered to be "possibly extirpated" (CNDDDB 2002) because the site had been disced when it was last visited in 1981. Another site in Fresno County also may be extirpated. Among the areas where succulent owl's-clover is known to occur, more than half are in Merced County. Additional occurrences are found in Fresno, Madera, Stanislaus, and San Joaquin counties (CNDDDB 2001).

The current status of most succulent owl's-clover populations is unknown because most sites have not been visited for decades. Inappropriate cattle grazing and trampling degraded three occurrences of succulent owl's-clover. One of the same sites plus three others were degraded by discing. The CNDDDB (2002) lists one of the latter as "possibly extirpated" due to discing. However, succulent owl's-clover persisted at another site that had been disced, although the population size was reduced by an order of magnitude (CNDDDB 2001).

A wide variety of factors threaten the continued existence of succulent owl's-clover, including urban development, year-round or summer livestock grazing, changes in hydrology, agricultural conversion, gravel mining, and small population size. Construction of the proposed new UC campus in Merced County, plus the associated residential community and access roads, threatens the extensive population in that area. Different types of urban development that threaten numerous known occurrences include planned housing subdivisions in Fresno, Madera, and San Joaquin counties; a freeway expansion in Madera County; and a proposed landfill in Fresno County (Service 1997, Stebbins *in litt.* 2000, CNDDDB 2001).

Approximately two-thirds of the reported occurrences, including those at the UC Merced site, were subject to cattle grazing when they were discovered (EIP Associates 1999, CNDDDB 2001). However, grazing is not necessarily detrimental to succulent

owl's-clover. Winter and spring grazing may be helping in controlling non-native grass invasions (Barry 1998). Stebbins *et al.* (1995) noted that among the sites they studied, those that were grazed "did not appear to suffer long-term damage due to grazing." Damage from livestock would be harmful when pools are dry and during the time that the water is evaporating; thus summer or year-round grazing poses a threat (Barry 1998).

Hydrological alterations can create conditions unsuitable for succulent owl's-clover and other vernal pool plants by increasing or decreasing the depth and duration of inundation. Threats due to alterations in natural hydrology include the Merced County Stream Channel Project proposed by the U.S. Army Corps of Engineers (Corps)(Service 1997a) and proposed enlargement of Burns Reservoir in Merced County (CNDDDB 2001), which collectively threaten seven occurrences of succulent owl's-clover. Expansion of agricultural operations threatens three occurrences in Fresno and Madera counties that are surrounded by orchards, vineyards, or citrus groves (CNDDDB 2001). Also, populations in grain fields already have been subject to discing, as mentioned above. A proposed gravel mine threatens one occurrence in Fresno County (Service 1997a).

Threats posed by small population size are less immediate but also potentially significant. Random genetic, environmental, or other processes can lead to the extirpation of small populations; adequate populations would be in the range of thousands to millions (Shaffer 1981, Thomas 1990, Menges 1991). Species that are subject to extreme fluctuations in population size from year to year are particularly vulnerable to chance events (Thomas 1990). Among the 24 populations of succulent owl's-clover for which size estimates were given, 10 consisted of fewer than 100 plants at their peak size (CNDDDB 2001, Stebbins *in litt.* 2000).

Succulent Owl's-Clover Unit Review

We conducted a regional review across the range of succulent owl's-clover to evaluate and select areas that are essential to the conservation of the species and that may require special management. Important factors we considered were the presence of the species and the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1, Southeast Sacramento Valley Unit, Sacramento and San Joaquin Counties (1,052 ha (2,598 ac))

This unit is proposed as critical habitat for succulent owl's-clover because it contains occurrences of the species living within vernal pools occurring on San Joaquin soils that provide the necessary timing and length of inundation for succulent owl's-clover germination, growth, and reproduction (Holland 1998, Sacramento County 1999, CNDDDB 2002).

The site is a "Nature Study Area" for the UC Cooperative Extension (CNDDDB 2001). This unit represents the northern most extent of succulent owl's-clover range and is the only unit designated for this species within the Sacramento Valley. The unit is isolated from other succulent owl's-clover occurrences to the south in the San Joaquin Valley by a distance of over 80 km (50 mi). Isolated and peripheral populations such as this may have genetic characteristics essential to the overall long-term conservation of the species (*i.e.*, they may be different from more central populations) (Lesica and Allendorf 1995).

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for succulent owl's-clover germination and reproduction.

This unit for succulent owl's-clover occupies the area east of Galt near Dustin and Liberty roads. All the lands included within this unit are privately owned. Urban expansion and conversion from grazing to other agricultural practices, particularly vineyards have greatly affected existing vernal pool habitats throughout this area. Other sensitive vernal pool species found within this unit includes the California tiger salamander.

Unit 2, Waterford Unit, Stanislaus and Tuolumne Counties (14,131 ha (34,917 ac))

This unit is proposed as critical habitat for succulent owl's-clover because it supports occurrences of the species within hardpan vernal pools on alluvial terraces on Amador and Redding soils that provide the necessary timing and length of inundation essential to the conservation of the species (CNDDDB 2002). This is the northernmost extent of succulent owl's-clover's range within the San Joaquin Valley, and is over 80 km (50 mi) from

the isolated occurrence to the north. This unit contains a variety of pools and ephemeral habitats in which the plants are known to occur, including shallow and deep pools and pools with both long and short inundation periods. These pools contain appropriate conditions for germination, growth, reproduction, and dispersal of succulent owl's-clover. The Waterford Unit is important for the survival of succulent owl's-clover because it represents large areas of contiguous habitat with relatively intact hydrology. All the lands within this unit are privately owned.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery, as well as elevation contours in the eastern foothill region and sub-watershed boundaries. The Waterford Unit is bordered by the Tuolumne River to the south. The Modesto Reservoir is adjacent to the southwest boundary of the unit. Warnerville Road cuts through the northern portion of the unit. The City of La Grange is located southeast of the unit. The eastern boundary extends into the low elevation foothills of the Sierra Nevada. Vernal pools in the Waterford Unit are located mainly in eastern Stanislaus County, but overlap into western Tuolumne County. This unit overlaps with San Joaquin Valley Orcutt grass Unit 1, hairy Orcutt grass Unit 4, Colusa grass Unit 4, Hoover's spurge Unit 4, and Greene's tuctoria Unit 6. Other sensitive vernal pool species found within this unit include California tiger salamander, western spadefoot toad, dwarf downingia, and California linderiella.

Unit 3A and B, Merced Unit, Merced County (63,352 ha (156,542 ac))

This unit is proposed as critical habitat for succulent owl's-clover because it supports over 50 percent of the known occurrences of the species, living within vernal pools on Redding, Corning, and Pentz soil series that provide the primary constituent elements essential to the conservation of the species (CNDDDB 2002). This unit represents the largest remaining habitat area for succulent owl's-clover, and includes the largest block of pristine, high density vernal pool grasslands remaining in California (Holland 1998, Vollmar 1999). This unit is important to maintain a diversity of habitats for succulent owl's-clover, and supports hydrologically intact vernal pool complexes that are likely to maintain ecosystem processes important to the recovery of succulent owl's-clover.

A majority of the land in this unit is privately owned, and is used to graze cattle. The integrity of the vernal pool complexes in eastern Merced is threatened by the proposed UC Merced Campus and associated development. Succulent owl's-clover has been found in 296 vernal pools in the proposed campus and community area, although only 34 percent of the area was surveyed intensively (EIP Associates 1999). Construction of facilities to educate and serve twenty-five thousand UC students as well as faculty, staff, and their families within the vernal pool complexes in eastern Merced County, could have a major impact on the survival and recovery of succulent owl's-clover. However, the recent draft biological opinion for the UC Merced campus and community developed environmental parameters which should reduce impacts to vernal pool habitats. Indirect and cumulative impacts of the proposed 1,673 ha (4,133 ac) campus and associated community may be minimized with the creation of a 2,036 ha (5,030 ac) preserve intended to protect sensitive vernal pool habitat, to be purchased with money donated by the Packard Foundation.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery, as well as elevation contours in the eastern foothill region and sub-watershed boundaries. The Merced Unit is comprised of two subunits. Subunit A is located north of the Merced River, and south of Dry Creek. Subunit B is located south of the Merced River and north of Mariposa Creek. Both subunits are located east of State Highway 99. Approximately 419 ha (1,048 ac) is owned by the DOD, 3 ha (8 ac) by U.S. Bureau of Reclamation (BOR), 10 ha (26 ac) by California State Parks. TNC has 4,513 ha (11,283 ac) of easement lands within this unit. The remaining lands within this unit are privately owned. The Merced Unit overlaps with vernal pool tadpole shrimp Unit 15, vernal pool fairy shrimp Unit 22, Conservancy fairy shrimp Unit 6, hairy Orcutt grass Unit 5, Hoover's spurge Unit 5, Greene's tuctoria Unit 7, San Joaquin Valley Orcutt grass Units 2 and 3, and Colusa grass Units 5 and 6. Other sensitive vernal pool species found within this unit include California linderiella, California tiger salamander, shining navaretia, dwarf downingia, and Bogg's Lake hedge-hyssop.

Unit 4, Madera Unit, Madera County (33,071 ha (81,717 ac))

This unit is proposed as critical habitat for succulent owl's-clover because it supports multiple occurrences of the species within hardpan vernal pools on soils of alluvial fans and terraces, including San Joaquin soils (CNDDDB 2002). This unit is important for the survival of succulent owl's-clover because it represents large areas of contiguous habitat with relatively intact hydrology. These pools are typically found in vernal pool/swale complexes on mima mound topography. This unit contains vernal pools and other ephemeral features and associated watersheds that maintain suitable periods of pool inundation, water quality, and soil moisture for succulent owl's-clover germination, growth, reproduction, and dispersal.

Most of the area within this unit is on private land, although a large population of succulent owl's-clover occurs on property acquired by the California Department of Transportation for mitigation purposes (CNDDDB 2001). The integrity of vernal pool complexes and their associated watersheds in the Madera Unit is threatened by agricultural conversion and urban encroachment.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery, as well as elevation contours in the eastern foothill region and sub-watershed boundaries. Located entirely in Madera County, this unit contains vernal pool habitat extending from the Chowchilla River in the north to the San Joaquin River in the south. All vernal pools in this unit are located east of State Highway 99. Land ownership within the unit includes 3 ha (8 ac) by BOR, 2 ha (5 ac) by NPS, 47 ha (117 ac) by CDFG, and 9 ha (22 ac) by State Land Commission. The Madera Unit overlaps hairy Orcutt grass Units 6 and 7, Greene's tuctoria Unit 8, San Joaquin Valley Orcutt grass Units 4 and 5 and vernal pool fairy shrimp Unit 24A. Other sensitive vernal pool species found within this unit include spiny-seped button-celery, California tiger salamander, western spadefoot toad and California linderiella.

Unit 5, Fresno Unit, Fresno County (11,888 ha (29,375 ac))

This unit is proposed as critical habitat for succulent owl's-clover because it contains occurrences of the species growing within vernal pools formed on Fallbrook, Ramona, San Joaquin, Vista, and Pollasky soil series

(CNDDDB 2002). The diversity of vernal pool types found within the Fresno Unit contributes to the range of ecological conditions in which succulent owl's-clover occurs. This area represents the southern extent of the species range. This unit contains suitable habitat within annual grassland communities to enable the species to carry out its life-cycle. Some habitat in this unit consists of typical "bowl-like" pools, whereas other areas are more similar to swales. Vernal pools within this unit have been destroyed by conversion to irrigated agriculture, as well as urban encroachment from the cities of Fresno and Clovis.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. Located in Fresno County, this unit contains vernal pool habitat extending from the San Joaquin River in the north to Shaw Avenue in the south. The western boundary of this unit lies east of Fresno and Clovis and the eastern boundary parallels the low elevation foothill region of the Sierra Nevada. Property ownership and protection within this unit includes CDFG (0.4 ha (1 ac)) and CDFG administered land (0.4 ha (1 ac)). The remainder of the property within this unit is privately owned. The Fresno Unit overlaps San Joaquin Valley Orcutt grass Unit 5 and vernal pool fairy shrimp Unit 24B. Other sensitive vernal pool species found within this unit include California linderiella, California tiger salamander, and western spadefoot toad.

Unit 6A and B, Table Mountain Unit, Fresno and Madera Counties, (1,723 ha (4,258 ac))

This area is proposed as critical habitat for succulent owl's-clover because it supports occurrences of the species within Northern Basalt Flow vernal pools (CNDDDB 2002). This is the only area where succulent owl's-clover is found on this vernal pool type. Northern Basalt Flow pool complexes, such as Table Mountain, are extremely rare, occurring only on ancient terraces and hilltops. Basalt tables are perched on narrow, sinuous basalt mesas above the surrounding low-lying terrain. They typically contain small, irregularly clustered pools with "flashy hydrology" (Keeler-Wolf *et al.* 1998). They are less common than hardpan and claypan pools that are typically found in this region, and occur in complexes that are less dense than habitat in units further north.

Three occurrences of succulent owl's-clover within this unit are wholly or in

part within designated reserves, which are on two "tabletop" mountains near Millerton Lake. The Sierra Foothill Conservancy's Big Table Mountain Preserve includes one of these occurrences and a portion of another, which is shared with the BLM. The other is in the CDFG's Big Table Mountain Ecological Reserve. A fourth occurrence, which is on a nearby tabletop, is partially under the control of the BLM and partly in private ownership. A cooperative group consisting of the CDFG, California Department of Parks and Recreation, Sierra Foothill Conservancy, BLM and BOR has developed a management and monitoring plan for Big Table Mountain. Initial efforts of the plan will focus on grazing as a means to control non-native grasses while comparing population trends of threatened and endangered species in grazed and ungrazed portions of the tableland (Griggs *in litt.* 2000a). BLM owns approximately 149 ha (371 ac) and CDFG owns approximately 429 ha (172 ac) of land within this unit. TNC has 256 ha (650 ac) of conservation easements within this unit. The BLM has attempted to protect the occurrence on the other tabletop mountain by erecting fencing to prevent trespass by cattle (Franklin *in litt.* 1993).

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery, as well as elevation contours in the eastern foothill region and sub-watershed boundaries. Unit 6 for succulent owl's-clover is comprised of two subunits. Both subunits are located east of Millerton Lake on basalt mesas above the San Joaquin River. Subunit 6B is located on Kennedy Table in Madera County, and Subunit 6A is directly south of this unit across the San Joaquin River on Table Mountain in Fresno County. The Table Mountain Rancheria is south of this unit. Unit 6 coincides with vernal pool fairy shrimp Unit 25, vernal pool tadpole shrimp Unit 17, and San Joaquin Valley Orcutt grass units 6A and 6B. Other sensitive vernal pool species found within this unit include Bogg's lake hedge-hyssop and California linderiella.

Colusa Grass Criteria

In proposing critical habitat units for Colusa grass, we evaluated the life history and current distribution of the species, the primary constituent elements, and the current threats to the species. This information allowed us to determine which areas are most likely to contribute to the conservation of Colusa grass.

Currently, the CNDDDB (2001) includes 59 occurrences of Colusa grass; 48 occurrences are presumed to be extant and 11 others are either known or presumed to be extirpated. The extant populations occur primarily in the foothills region of the San Joaquin Valley, where 80 percent known occurrences are found northeast of the city of Merced in Merced County and east of Hickman in Stanislaus County. Of the remaining extant occurrences, four are in central Merced County, and two each occur in southeastern Yolo and central Solano counties (Stone *et al.* 1988, Keeler-Wolf *et al.* 1998, CNDDDB 2001). This species has been extirpated from Colusa County (CNDDDB 2001).

Colusa grass declined primarily because pools in which it occurred were destroyed by conversion to irrigated agriculture, primarily to orchards and vineyards (Crampton 1976, Medeiros 1976, CNDDDB 2002). Agricultural conversion continues to threaten Colusa grass. In eastern Stanislaus County agricultural conversion threatens the 16 occurrences (33 percent) there. Dry-land farming there is gradually being replaced by irrigated agriculture; the former apparently is compatible with the persistence of Colusa grass, but the latter is not (Crampton 1959, Crampton 1976).

Other factors that extirpated populations of Colusa grass included surface disturbances and degradation of vernal pool hydrology. At least 9, and possibly 11, occurrences have been extirpated as a result of these factors, although several others most likely were eliminated before being reported (Stone *et al.* 1988). Changes in natural hydrology, such as draining pools or creating reservoirs, could create unsuitable conditions for Colusa grass by decreasing or increasing inundation periods. The two Yolo County occurrences are threatened by herbicide run-off from adjacent agricultural operations (CNDDDB 2002).

Additional factors threaten the survival of Colusa grass, particularly the problem of small population size. Although populations may drop to only a few visible plants in certain years, seven populations consisted of fewer than 100 plants even at their peak (CNDDDB 2002) and thus are likely to be small populations. Non-native plants and invasive native species could invade Colusa grass occurrences and may be particular problems in combination with other factors such as decreased inundation and inappropriate livestock grazing (Stone *et al.* 1988, Witham *in litt.* 2000a). Grasshopper foraging has been observed on Colusa

grass (Stone *et al.* 1988), but the extent of this threat is unknown.

Colusa Grass Unit Review

We conducted a regional review across the range of Colusa grass to evaluate and select areas that are essential to the conservation of the species and that may require special management. Important factors we considered were the presence of the species and the presence of the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1, Davis Communications Annex and Grasslands Area Unit, Yolo County (192 ha (474 ac))

This unit is proposed as critical for Colusa grass because it contains one of six areas where the species is known to occur (CNDDDB 2002, Yolo County Parks 2001, EIP Associates 2001) within large vernal playa pools of the Pescadero soil series (Holland 1998, USDA 2001, Yolo County 1995).

The unit boundary was drawn to include the vernal pool complex mapped by Holland (1998) and Yolo County Parks (2001) where Colusa grass is known to occur. This vernal pool complex maintains suitable periods of pool inundation, water quality, and soil moisture for Colusa grass germination, growth and reproduction, and dispersal, but not necessarily every year. Colusa grass in this unit is threatened by altered hydrology, contamination, competition with invasive plant species, and surface disturbances such as discing.

This unit is located southeast of the City of Davis and south of the South Fork of Putah Creek. This unit's western boundary coincides with the Solano and Yolo county line. This unit also represents Unit 1 for Solano grass, and is a portion of Unit 10 for vernal pool tadpole shrimp. The unit contains land owned by Yolo County. Approximately 128 ha (322 ac) is owned by the DOD.

Unit 2, Jepson Prairie Unit, Solano County (7,153 ha (17,675 ac))

This unit is proposed as critical for Colusa grass because it supports the species (CNDDDB 2002) within large, alkaline, playa type vernal pools (Holland 1998, USDA 2001, Solano County 2000, Solano County Farmlands and Open Space 2000). These pools occur on Pescadero and Antioch-San Ysidro soil series, and contribute to the diversity of vernal pool types where the species is found. The unit boundary was drawn to include the vernal pool complex where Colusa grass is known to

occur. The pools, swales, and adjacent uplands that comprise this complex are essential to maintain the necessary timing and length of pool inundation for Colusa grass germination, growth, pollination, seed production, and dispersal. This unit includes one of the largest contiguous areas of habitat remaining for the species. The relatively undisturbed, hydrologically intact condition of the vernal pool habitats within this unit increase the likelihood that it will continue to support natural vernal pool ecosystem processes and maintain suitable habitat conditions for Colusa grass.

This unit includes the Jepson Prairie Preserve (623 ha (1,558 ac)), jointly managed by the Solano County Farmlands and Open Space and the UC Reserve System. Jepson Prairie contains large playa-like vernal pools which may be over several acres in size, including the 32 ha (80 ac) Olcott Lake. These larger pools often occur in complexes with smaller pools and hogwallow depressions. Jepson Prairie has long been recognized as an outstanding example of vernal pool ecosystems. In 1987, the NPS named Jepson Prairie a National Natural Landmark, a designation given to well preserved sites that illustrate a particular type of natural feature and provide high quality habitat for threatened or endangered species. Jepson Prairie is the target of ongoing conservation planning and active management. As part of the UC Reserve System, this area also provides critical research opportunities for scientists to study vernal pool species, including Colusa grass. The unit also contains lands totaling 248 ha (620 ac) owned and approximately 64 ha (161 ac) administered by CDFG. Additional lands are owned by DOD (93 ha (233 ac)), and the State Land Commission (7 ha (17 ac)), with another 436 ha (1,090 ac) of private land protected under WRP easements or agreements. Within the greater Jepson Prairie grassland area, existing vernal pools are threatened by agricultural conversion, landfill expansion, power plant construction, and utility maintenance.

This unit is situated east of the City of Fairfield, south of the City of Dixon, and north of the Montezuma Hills and the confluence of the Sacramento and San Joaquin rivers. This unit is also described as Unit 2 for Solano grass. This unit is encompassed by Unit 3 for Conservancy fairy shrimp, Unit 11 for vernal pool tadpole shrimp, and Unit 16 for vernal pool fairy shrimp. This unit also supports a diverse community of plants and animals, including the only known occurrence of delta green ground beetle, and occurrences of California

tiger salamander, alkali milk-vetch, Bogg's Lake hedge-hyssop, legenere, California linderiella, and midvalley fairy shrimp.

Unit 3, Farmington Unit, Stanislaus County (16,475 ha (40,709 ac))

This unit was identified as critical for Colusa grass because the species is found (CNDDDB 2002) within vernal pools on high terrace landforms and Redding-Pentz-Peters soil complexes (USDA 2001). The impermeable layers underlying these occupied vernal pools are generally iron-silica cemented hardpan. The Farmington Unit contains pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths and the adjacent upland margins of these depressions that sustain Colusa grass germination, growth, and reproduction. Habitat in this unit includes deeper pools that are most likely to provide the long inundation period required for germination of Colusa grass (EIP Associates 1999). This unit is isolated from the other Colusa grass units to the north by over 80 km (50 mi).

The Farmington unit is located in northeast Stanislaus County. It is hydrologically separated from units to the south by the Stanislaus River. The eastern boundary generally parallels the Calaveras County Line. Woodward Reservoir and the town of Oakdale are all located outside and to the west of the unit. The unit is generally south of State Highway 4 and north of State Highway 108. The unit boundary was drawn to include these species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. Lands within this unit are privately owned.

Unit 4, Waterford Unit, Stanislaus and Tuolumne Counties (35,134 ha (86,814 ac))

The Waterford Unit was identified as critical habitat for Colusa grass because it contains large occurrences of Colusa grass. Approximately one-fifth of all extant occurrences are found within this unit (CNDDDB 2002). These occurrences are found within vernal pools formed on alluvial terraces and associated Whitney soils, among others. These pool types provide the necessary timing and length of inundation for Colusa grass to germinate, mature, and set seed. The Waterford Unit contains very large vernal pool complexes that will likely continue to support vernal pool ecosystem processes important to the conservation of Colusa grass. This unit contains vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths and the

adjacent upland margins of these depressions that sustain Colusa grass germination, growth and reproduction, and that typically become inundated during winter rains, including, but not limited to vernal pools formed on acidic soils of alluvial fans and stream terraces along the eastern margin of the San Joaquin Valley and into the adjacent foothills.

Agricultural conversion has resulted in the extirpation of at least two documented Colusa grass occurrences in this unit. Although Colusa grass has the ability to persist with dry-land farming, dry-land farming is gradually being replaced by irrigated agriculture throughout this unit.

The Waterford Unit is bordered by the Stanislaus River to the north and the Tuolumne River to the south. The City of La Grange is located southeast of this unit. County Road J9 runs west of the unit, and Oakdale is located outside of the northwest corner. The eastern boundary extends into the low elevation foothills of the Sierra Nevada. Vernal pools in the Waterford Unit are mainly located in eastern Stanislaus County, but overlap into southwestern Tuolumne county. Approximately 0.8 ha (2 ac) of this unit are lands administered by the CDFG. The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. Watershed boundaries were also used in the determination. This unit coincides with Hoover's spurge Unit 4, San Joaquin Valley Orcutt grass Unit 1, and hairy Orcutt grass Unit 4. It overlaps with Greene's tuctoria Unit 5, succulent owl's-clover Unit 2, and vernal pool tadpole shrimp Unit 13.

Unit 5, Turlock Unit, Stanislaus and Merced Counties (19,850 ha (49,049 ac))

This unit is proposed as critical habitat for Colusa grass because it supports large, playa vernal pools where the species is found (CNDDDB 2002, Holland 1998). The well-known Hickman pools in Stanislaus County are located within this unit. These unusual pools provide a unique habitat for Colusa grass, as well as a number of other vernal pool species. Not only does the Hickman pool complex contain one of the largest vernal lakes in California, occupying more than 121 ha (300 ac), but it also exhibits tremendous biodiversity, including one of the largest concentrations of imperiled amphibians (Medeiros 2000). Other habitat in this unit contains the primary constituent elements essential to the conservation of Colusa grass, including soil type and

deeper pools that are more likely to provide the long inundation period required for germination.

The watershed containing the Hickman Colusa grass occurrences has been breached by hundreds of acres of orchards that have been planted upstream. While most of the watershed has been managed over the years in a trust of the Fred Robinson family, the integrity of the vernal pool ecosystem is threatened by agricultural development and potential biocide pollution (Medeiros 2000). Much of the irrigated farmland habitat adjacent to the western edge of this unit was historically vernal wetlands. Intensive agriculture poses the largest threat to Colusa grass habitat in the Turlock Unit.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. The Turlock Unit is bordered by the Tuolumne River to the north and the Merced River to the south. The unit lies between the towns of La Grange and Snelling. County Road J9 runs west of the unit and the eastern edge is located in the low elevation foothills of the Sierra Nevada. Vernal pools in the Turlock Unit are located in Stanislaus and Merced counties. Approximately 61 ha (24 ac) of lands within this unit are owned by the California State Parks. This unit coincides with hairy Orcutt grass Unit 5. Portions of this unit overlap with Hoover's spurge Unit 5, vernal pool fairy shrimp Unit 21, and succulent owl's-clover Unit 3A.

Unit 6, Merced Unit, Merced and Mariposa Counties (45,641 ha (112,779 ac))

This unit is proposed as critical for Colusa grass because it contains over 40 percent of all known Colusa grass occurrences (CNDDDB 2002). This unit also contains a diversity of habitats for Colusa grass, including the only locations where this species is known to occur on Keyes-Pentz, Redding, and Keyes soils (USDA 2001). Although many populations of Colusa grass have been extirpated in the past two decades, populations in the Merced Unit are among the most robust remaining (Holland 2000). The area within this unit encompasses the largest block of pristine, high density vernal pool grasslands remaining in California (Vollmar 1999). It contains habitat for three listed branchiopods, six listed plants, and a number of rare species.

The majority of the land in this unit is privately owned and is used to graze cattle. TNC is conserving three occurrences of Colusa grass through a

conservation easement on the Flying M Ranch located northeast of the City of Merced. The integrity of the vernal pool complexes in eastern Merced is seriously threatened by irrigated agriculture, upland housing development, and the proposed UC Merced Campus and associated development. Construction of facilities to educate and serve 25,000 UC students as well as faculty, staff, and their families within the vernal pool complexes in eastern Merced County, could have a major impact on these vernal pools. However, the recent draft biological opinion for the UC Merced campus and community developed environmental parameters which should reduce impacts to vernal pool habitats. Indirect and cumulative impacts of the proposed 1,673 ha (4,133 ac) campus and associated community may be minimized with the creation of a 2,036 ha (5,030 ac) preserve intended to protect sensitive vernal pool habitat, to be purchased with money donated by the Packard Foundation.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. A majority of the vernal pool habitat in the Merced Unit is in Merced County, although the eastern edge of the unit overlaps into Mariposa County in the low elevation foothills of the Sierra Nevada. The northern boundary parallels the Merced River, and Bear Creek serves as the southern border. The entire unit is located east of Highway 99. Approximately 419 ha (1,047 ac) of lands within this unit are owned by the USAF, 3 ha (8 ac) by BLM, and 10 ha (26 ac) by the California State Parks. The Merced Unit coincides with San Joaquin Valley Orcutt grass Unit 2, Conservancy fairy shrimp Unit 6, vernal pool fairy shrimp Unit 22, and Hoover's spurge Unit 6. It overlaps with vernal pool tadpole shrimp Unit 15, Greene's tuctoria Unit 6, and succulent owl's-clover Unit 3B.

Unit 7A and B, Grassland Ecological Unit, Madera, Merced and Stanislaus Counties (8,163 ha (20,170 ac))

This unit is proposed as critical habitat for Colusa grass because it contains vernal pools that support numerous occurrences of the species, including the only location where Colusa grass is found on clay or silty clay loam soils in the Landlow and Lewis series (Silveira *in litt.* 2000). The unit boundary was drawn to include these pool types, swales and associated uplands that comprise the vernal pool complexes mapped by Holland (1998)

where Colusa grass is known to occur. These vernal pool complexes maintain suitable periods of pool inundation, water quality, and soil moisture for Colusa grass germination, growth and reproduction, and dispersal, but not necessarily every year (CNDDDB 2001). Remaining vernal pool complexes in this unit, particularly in the eastern subunit, have been fragmented by conversion to agriculture. These areas were historically interconnected vernal pool complexes, and current efforts are underway to restore wetland habitats in this area.

The Grassland Ecological Unit includes Arena Plains and the Merced National Wildlife Refuges. We own and administer approximately 1,406 ha (3,514 ac) within this unit. Our personnel have been monitoring Colusa grass occurrences on National Wildlife Refuge lands within this unit annually since 1993. This Arena Plains and Merced NWR area contains the majority of vernal pool habitats remaining in the San Joaquin Valley and is the only location where Colusa grass occurs on the San Joaquin Valley floor. Threats to the vernal pools in this unit include agricultural conversion, changes in hydrology, invasion by aggressive plants, and inappropriate livestock grazing regimes.

The unit lies north of the City of Los Banos, southwest of the City of Merced, and is bisected by the San Joaquin River. This unit overlaps Unit 23 for vernal pool fairy shrimp and Unit 16 for vernal pool tadpole shrimp. The western half of this unit also represents Unit 6 for Hoover's spurge, and portions of Unit 7 for Conservancy fairy shrimp. In addition to the species mentioned above, vernal pool smallscale, alkali milk-vetch, western spadefoot toad, and California linderiella are present in this unit.

Greene's Tuctoria

In proposing critical habitat units for Greene's tuctoria, we evaluated the life history and current distribution of the species, the primary constituent elements, and the current threats to the species. This information allowed us to determine which areas are most likely to contribute to the conservation of this species and to delineate units so that threats to this species might be minimized.

Since Greene's tuctoria was first described, 19 of the 39 known occurrences (50 percent of all occurrences) have been extirpated. The other 20 occurrences are presumed to be extant, although 6 of those have not been verified for more than a decade (Alexander and Schlisling 1997, CNDDDB

2001). Greene's tuctoria is currently known from the Vina Plains area of Tehama and Butte counties, from portions of eastern Merced County, and from isolated occurrences in Glenn and Shasta counties (CNDDDB 2001). The species is considered possibly extirpated from Fresno, Madera, San Joaquin, Stanislaus, and Tulare counties (Stone *et al.* 1988, Skinner and Pavlik 1994, CNDDDB 2001). The areas that continue to support robust occurrences of the species include the Vina Plains area of Tehama and Butte counties, and an area in eastern Merced County. All other occurrences are considered declining and may require special management actions to ensure their long-term conservation.

One of the primary causes of extirpation for Greene's tuctoria has been conversion to irrigated agriculture; 11 of 19 (57.9 percent) extirpated occurrences were due at least in part to agricultural conversions. Stanislaus and Fresno counties experienced the greatest loss to agricultural conversion, with four and three such extirpations, respectively. Excessive livestock grazing was the sole or partial cause of extirpation for six populations (31.6 percent) (Stone *et al.* 1988, CNDDDB 2002).

Greene's tuctoria is less tolerant of livestock grazing and competition than most of the other Orcuttieae, probably because it occurs in portions of pools that dry early in the spring. Anecdotal evidence of its lower tolerance to grazing is that Greene's tuctoria has disappeared from one grazed site where Hoover's spurge still occurs and from another site where Colusa grass remains (CNDDDB 2002). Fifteen of the 20 remaining populations are subject to cattle grazing and the associated trampling, and at least 4 of those are declining (Stone *et al.* 1988, CNDDDB 2001). Four other occurrences on the Vina Plains Preserve had been declining (Stone *et al.* 1988, CNDDDB 2001), but improved after grazing was discontinued. Invasion from weedy plants, such as cocklebur (*Xanthium* sp.) and other non-native species, apparently is reducing population vigor at six localities in the Sacramento and San Joaquin valleys (Stone *et al.* 1988, Alexander *in litt.* 1998, CNDDDB 2001). Agricultural conversion remains a threat to the Merced County populations, which are the only ones confirmed to be remaining in the San Joaquin Valley. Grasshoppers have been documented to consume entire populations of Greene's tuctoria before they set seed (Griggs 1980, Griggs and Jain 1983, Stone *et al.* 1988).

Finally, small populations of Greene's tuctoria (fewer than 100 plants) may limit persistence of several occurrences. One population in Merced County consisted of only a single plant in 1987, and one in Butte County contained 75 plants (Stone *et al.* 1988, CNDDDB 2001). The Shasta County population also may have declined to the point where it is more vulnerable to extirpation by random events, such as fire, or by other threats as previously discussed; the Shasta County population consisted of 2,500 plants in 1993 and 1994, but declined to 120 in 1996 and 35 in 1998 despite favorable hydrological conditions. However, additional investigation of all four populations is necessary to determine whether or not larger soil seed banks exist.

Greene's Tuctoria Unit Review

We conducted a regional review across the range of Greene's tuctoria to evaluate and select areas that are essential to the conservation of the species and that may require special management. Important factors we considered were the known presence of the species and the presence of the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1, Modoc Plateau Unit, Lassen, and Shasta Counties (973 ha (2,403 ac))

This unit is proposed as critical habitat for Greene's tuctoria because it contains the species within Northern Basalt Flow vernal pools (CNDDDB 2002) and the vernal pool habitat remains inundated for sufficient periods of time to allow Greene's tuctoria to complete its life cycle. These areas are not threatened by land conversion or development at this time due to their remote location, however, grazing activities may be contributing to the species decline in this area and may require special management actions, such as reduction or elimination of grazing, to prevent further decline and possible extirpation of the occurrence within this unit (CNDDDB 2001).

Greene's tuctoria within this unit are located within an area described as a large vernal pool in an open flat in an eastside pine forest. The occurrence is located at higher elevations and has the coldest climatic conditions of any other occurrences and represents the northern extent of the species range. This unit is over 110 km (68 mi) disjunct from occurrences further south. Isolated and peripheral populations such as this may be essential to the overall long-term conservation of the species (*i.e.*, may be genetically different from other

populations in other parts of its range) (Lesica and Allendorf 1995).

The boundaries of this unit were delineated by using SPOT imagery and elevation contours to include the open flat area associated with the vernal pool including the adjacent uplands that contribute to the filling and drying of the vernal pool where Greene's tuctoria occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Greene's tuctoria to germinate and reproduce. Approximately 892 ha (2,231 ac) of this unit is owned by the USFS. The remaining lands within this unit are privately owned.

This unit for Greene's tuctoria occurs within the volcanic plateau of northeastern California. The unit is located in the area surrounding Murken Lake east of Hat Creek near Cinder Butte. Bidwell Road crosses through the southern boundary. This is the only unit where Greene's tuctoria occupies Northern Basalt Flow vernal pools. Maintaining this ecologically distinct unit is essential to the conservation of the species because it is the northern extent of its range, and is essential to maintain the diversity of habitats in which Greene's tuctoria is known to occur.

Unit 2, Vina Unit, Tehama and Butte Counties (11,673 ha (28,845 ac))

This unit is proposed as critical habitat for Greene's tuctoria because it contains occurrences of the species within vernal pools (CNDDDB 2002) and the vernal pool habitat remains inundated for sufficient periods of time to allow Greene's tuctoria to complete its life cycle. This unit is proposed as critical for Greene's tuctoria because it includes 60 percent of the occurrences that are thought to be extant (CNDDDB 2001). Greene's tuctoria occurs within vernal pools found on Anita and Tuscan soil series within this unit. These pool types maintain the necessary timing and length of inundation for Greene's tuctoria germination, growth, and reproduction (CNDDDB 2002). This unit represents one of only two areas throughout the species range where Greene's tuctoria occurrences are not considered to be declining (CNDDDB 2001).

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Greene's tuctoria germination and reproduction.

The majority of the lands included within this unit are privately owned. This unit contains TNC's 1,862 ha (4,600 ac) Vina Plains preserve. The preserve contains over 300 species of plants, and diverse communities of aquatic invertebrates. Since the 1960's, the Vina Plains area has been the focus of a number of research projects, including long-term adaptive management and monitoring efforts evaluating the effects of grazing and fire on vernal pool plants, including Greene's tuctoria (Griggs 2000). Much of the basic life history information known about Greene's tuctoria was collected at Vina Plains (e.g., Stone *et al.* 1988, Alexander and Schlising 1997). The results of this research have provided crucial information to guide management and monitoring of vernal pool ecosystems and to identify factors which influence population dynamics of a number of endangered species, including Greene's tuctoria. The Vina Plains is open to the public and provides excellent outreach and educational opportunities. In addition to TNC, the importance of vernal pool habitats in this area has been recognized by CDFG, the Service, the EPA, the CNPS, the NRCS's WRP, and by researchers at the CSU at Chico, who have all supported research and conservation efforts for Greene's tuctoria and other vernal pool species within this unit. Urban development north of Chico and the conversion of grazed lands to more intensive agricultural uses threaten vernal pool habitat within this unit. Property ownership and protection within this unit includes CDFG (0.4 ha (1 ac)), CDFG administration (0.4 ha (1 ac)), TNC (2,295 ha (5,738 ac)), TNC easements (4,661 ha (11,653)), and WRP easements and agreements (57 ha, 142 ac)).

This unit for Greene's tuctoria occupies the area south of Toomes Creek, and north of Pine Creek and the Cana Highway. State Route 99 bisects this unit and the western boundary generally parallels the Southern Pacific Railway line. This unit is within Unit 7 for vernal pool fairy shrimp and Unit 3 for vernal pool tadpole shrimp, and encompasses part of Unit 1 for Conservancy fairy shrimp and Unit 1 for Butte County meadowfoam. The unit coincides with Unit 1 for hairy Orcutt grass, and Unit 4 for slender Orcutt grass and portions of Unit 1 for Hoover's spurge. Additional sensitive vernal pool species occurring in this unit include California linderiella and Bogg's Lake hedge-hyssop.

Unit 3, Butte Unit, Butte County (979 ha (2,418 ac))

This unit is proposed as critical habitat for Greene's tuctoria because it supports the species within large vernal pools on Tuscan soils (EPA 1994, Holland 1998, CNDDDB 2002). These pools have the necessary timing and length of inundation for Greene's tuctoria germination, growth, and reproduction that typically become inundated during winter rains, but are dry during the summer. This occurrence may be threatened by overgrazing, and is described as "possibly declining" by CNDDDB (2002).

Vernal pool habitats within this area have become greatly fragmented and isolated from other habitats in the region. This area is one of only four areas occupied by Greene's tuctoria in the Sacramento Valley. This area is important to maintain the geographical distribution of Greene's tuctoria throughout the areas where it occurs. The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Greene's tuctoria germination and reproduction.

This unit for Greene's tuctoria occupies the area north of the intersection of State Route 99 and Route 149 in Butte County. The eastern boundary extends up the watershed of Clear Creek and the western boundary extends south paralleling State Route 99 to Little Dry Creek. This unit is within Unit 9 for vernal pool fairy shrimp and Unit 4 for vernal pool tadpole shrimp, and coincides with Unit 2 for hairy Orcutt grass and Unit 2 for Hoover's spurge. All the property within this unit is privately owned.

Unit 4, Richvale Unit, Butte County (299 ha (738 ac))

This unit is proposed as critical habitat for Greene's tuctoria because it contains occurrences of the species within vernal pools found on Rocklin and San Joaquin soils (CNDDDB 2002) and the vernal pool habitat remains inundated for sufficient periods of time to allow Greene's tuctoria to complete its life cycle. This is the only area where Greene's tuctoria is found in vernal pools formed on these soil types.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of

the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Greene's tuctoria germination and reproduction.

Vernal pool habitats within this area have become greatly fragmented and isolated from other habitats. This unit is over 200 km (120 mi) from the nearest Greene's tuctoria occurrences to the south. This occurrence of Greene's tuctoria helps to maintain the species range in the Sacramento Valley. This unit for Greene's tuctoria occupies the area west of the Thermalito Afterbay near the Richvale Highway and directly west of the Oroville Wildlife Area managed by CDFG (4 ha (9ac)). The remaining property within this unit is privately owned.

Unit 5, Sacramento National Wildlife Refuge Unit, Glenn and Colusa Counties (5,718 ha (14,129 ac))

This unit is proposed as critical for Greene's tuctoria because it contains occurrences of the species within vernal pools that provide the necessary timing and length of inundation essential to the conservation of Greene's tuctoria, including alkaline vernal pools on Willows soils (Silveira 2000). Greene's tuctoria has been declining within this unit and we have taken management actions to prevent extirpation of the species from the refuge lands (Silveira 2000).

This area is one of only four areas occupied by Greene's tuctoria in the Sacramento Valley. This occurrence is important to maintain the geographical distribution of Greene's tuctoria into the unique alkali flat habitats of the Colusa Basin. The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Greene's tuctoria germination and reproduction.

This unit occurs predominantly on the Sacramento National Wildlife Refuge (5,126 ha (12,816 ac)). It is the only known location where Greene's tuctoria occurs on public land. It occurs east of Interstate 5 to the Colusa Trough from Riz Road on the north and Delevan Road on the south. Other rare vernal pool species found in the unit include pappose spikeweed, Fremont's goldfields, alkali goldfields, Scribe's popcorn flower, Hoover's downingia, folded downingia, Heckard's peppergrass, heartscale, brittlescale, San Joaquin spearscale, Ferris' milk-vetch, spike-primrose, sessile mousetail, and

palmate-bracted bird's beak. This unit is also part of vernal pool fairy shrimp Unit 10, and vernal pool tadpole shrimp Unit 5, and coincides with Unit 2 for Conservancy fairy shrimp, Unit 3 for Hairy Orcutt grass, and Unit 3 for Hoover's spurge.

Unit 6, Waterford Unit, Stanislaus and Tuolumne Counties (36,414 ha (89,978 ac))

This unit is proposed as critical habitat for Greene's tuctoria because it supports occurrences of the species within vernal pools and swales that maintain the necessary primary constituent elements essential for its conservation, including the only vernal pools where Greene's tuctoria is known to occur on slightly alkaline soils of the Meikle and Paulsell series (CNDDDB 2002, Holland 1998, USDA 2001). This unit contains numerous pools with occurrences and associated watersheds that contribute to the filling and drying of the vernal pool or ephemeral wetland, and that maintain suitable periods of pool inundation, water quality, and soil moisture for the germination, growth, reproduction, and dispersal of Greene's tuctoria.

Agricultural conversion presents the greatest threat to habitat for Greene's tuctoria in this unit, and several occurrences within this unit have been extirpated or have severely declined as a result of agricultural conversion and intensive grazing (CNDDDB 2002). This unit is over 200 km (120 mi) from the nearest Greene's tuctoria occurrences to the north. All occurrences in this unit are on private lands.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery, as well as elevation contours in the eastern foothill region and sub-watershed boundaries. The Waterford Unit is bordered by the Stanislaus River to the north and the Tuolumne River to the south. The City of La Grange is located southeast of the unit. County Road J9 runs west of the unit, and the Oakdale Airport is located outside of the northwest corner. The eastern boundary extends into the low elevation foothills of the Sierra Nevada. Vernal pools in the Waterford Unit are located mainly in eastern Stanislaus County, but overlap into southwestern Tuolumne County. This unit overlaps with vernal pool tadpole shrimp Unit 13, San Joaquin Valley Orcutt grass Unit 1, hairy Orcutt grass Unit 4, Colusa grass Unit 5, Hoover's spurge Unit 4, and succulent owl's-clover Unit 2. Other sensitive vernal pool species found within this unit include California tiger

salamander, western spadefoot toad, dwarf downingia, and California linderiella. Approximately 0.8 ha (2 ac) of this unit is administered by the CDFG. The remaining lands within this unit are privately owned.

Unit 7, Merced Unit, Merced, Madera, and Mariposa Counties (73,707 ha (182,127 ac))

This unit is proposed as critical for Greene's tuctoria because it contains numerous occurrences of the species within large, hydrologically intact vernal pool grassland areas (Holland 1998, Vollmar 1999), including pools Northern Hardpan vernal pools on Redding, Raynor, and Bear Creek soils (USDA 2001, EIP 1999). Over 30 percent of the extant occurrences of Greene's tuctoria are in the Merced Unit (CNDDDB 2001). This unit contains the primary constituent elements necessary for conservation of the species including germination, growth, reproduction, and dispersal. This unit represents one of only two areas throughout the species range where Greene's tuctoria occurrences are not considered to be declining (CNDDDB 2001).

Agricultural conversion presents a great threat to habitat for Greene's tuctoria, particularly in areas along the western edge of this unit on the valley floor where irrigated agriculture has encroached on lands adjacent to occupied vernal pool complexes. The proposed UC Merced Campus and associated development will also have a significant impact on the long-term sustainability of vernal pool complexes. Other significant threats to Greene's tuctoria include urban encroachment and competition with non-native plants.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. A majority of the vernal pool habitat in the Merced Unit is in Merced County. The eastern edge of the unit overlaps into Mariposa County and in the south it extends to the Chowchilla River in Madera County. The northern boundary parallels the Merced River. The entire unit is located east of Highway 99. The Merced Unit coincides with vernal pool tadpole shrimp Unit 15 and vernal pool fairy shrimp Unit 22. It also encompasses hairy Orcutt grass Unit 6, succulent owl's-clover units 3B and 4, San Joaquin Valley Orcutt grass units 2 and 3, Colusa grass Unit 7, and Conservancy fairy shrimp Unit 6. Other sensitive vernal pool species found within this unit include the California tiger salamander, shining navarretia, dwarf downingia, Bogg's Lake hedge-hyssop, western

spadefoot toad, and California linderiella. Approximately 419 ha (1,048 ac) is owned by the DOD, 3 ha (4 ac) by BLM, 10 ha (26 ac) by California State Parks. TNC has 4,513 ha (11,283 ac) of easement lands within this unit. The remaining lands within this unit are privately owned.

Unit 8, Madera Unit, Madera County (13,222 ha (32,670 ac))

This unit is proposed as critical habitat for Greene's tuctoria because the area supports occurrences of the species (CNDDDB 2002). This occurrence represents the southern extent of the species currently known range. All other historical or previously documented occurrences to the south in Fresno and Tulare counties are considered extirpated (CNDDDB 2002). Although this site is considered possibly extirpated, it is proposed as critical habitat until a determination of the current status of the occurrence can be made. Greene's tuctoria has a highly persistent soil seed bank, and it is likely that individuals exist in the soil as seeds even if adult plants have not been observed at the site in recent times. This unit contains areas that support vernal pools, swales, or other ephemeral ponds and depressions and their associated uplands. There are numerous wetland features that contain suitable inundation periods for Greene's tuctoria to germinate, grow, and reproduce. Vernal pools and their associated biota, particularly on the western edge of this unit closer to the valley floor, are progressively being degraded and replaced by irrigated agriculture and invasive plant species.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. Located in Madera County, this unit contains vernal pool habitat extending from the Chowchilla River in the north to the Fresno River in the south. All vernal pools in this unit are located east of State Highway 99 and extend into the low elevation foothill region of the Sierra Nevada. The town of Madera borders the unit on its southwest edge, Hensley Lake is east of the unit, and Eastman Lake is northeast of the unit. The Madera Unit overlaps with succulent owl's-clover Unit 4, San Joaquin Valley Orcutt grass units 3 and 4, and hairy Orcutt grass Unit 6, and vernal pool tadpole shrimp Unit 15. Other sensitive vernal pool species found within this unit include California tiger salamander and California linderiella. All the lands within this unit are privately owned.

Hairy Orcutt Grass

In proposing critical habitat units for hairy Orcutt grass, we evaluated the life history and current distribution of the species, the primary constituent elements, and the current threats to the species. This information allowed us to determine which areas are likely to contribute to the conservation of hairy Orcutt grass.

Of the 38 hairy Orcutt grass element occurrences listed by the CNDDDB (2001), not counting the misidentified population of San Joaquin Valley Orcutt grass, 24 are presumed to be extant. Nineteen of those occurrences have been confirmed as extant within the past decade (CNDDDB 2001). Currently, the main area of concentration for hairy Orcutt grass is the Vina Plains area in Tehama County. An isolated occurrence is found nearby in central Butte County. Several other occurrences are found in Madera County between the city of Madera and Millerton Lake. There are several occurrences in eastern Stanislaus County. All four extant occurrences in Glenn County occur on the Sacramento National Wildlife Refuge. Hairy Orcutt grass apparently has been extirpated from Merced County (Stone *et al.* 1988, Keeler-Wolf *et al.* 1998, CNDDDB 2001).

Historically, habitat loss was the primary factor responsible for the decline of hairy Orcutt grass. Of the 11 element occurrences considered by the CNDDDB (2002) to be extirpated, 4 in Stanislaus County were converted to almond orchards or vineyards (Stone *et al.* 1988, CNDDDB 2002). Most of the conversion occurred prior to 1976 (Crampton 1959, Crampton 1976, Medeiros 1976, Reeder 1982). Two other occurrences in Madera County were lost by development for residences and orchards. The other five occurrences, which were in Madera, Merced, and Stanislaus counties, are listed as extirpated because the habitat was being used for irrigated pasture or dry farming or had been disced when they were last visited in 1986 and 1987 (Stone *et al.* 1988). However, continued field visits are advisable because another population reappeared several years after discing (CNDDDB 2001).

Hairy Orcutt grass no longer occurs in the Glenn County pool where it was found in 1937 because the area is now a permanent pond (J. Silveira pers. comm.). Inappropriate hydrology also may be responsible for the loss of one other occurrence at the Sacramento National Wildlife Refuge (Silveira *in litt.* 2000). The population consisted of 20 plants when it was first discovered in 1993, but those plants died before

setting seed due to flooding from a summer rainstorm, and none have been seen since that time (Silveira *in litt.* 2000). The population could reappear in future years if a substantial soil seed bank exists, and thus it is presumed to be extant.

Habitat loss continues to pose a threat to the survival of hairy Orcutt grass. Agricultural and residential development are proceeding in the vicinity of the remaining Stanislaus and Madera county occurrences and may lead to the destruction of additional populations in the foreseeable future (Stone *et al.* 1988). Cattle grazing was an ongoing land use at 20 occurrences when they were last visited, including 6 where this species may already be extirpated (CNDDDB 2002). Three occurrences are believed to have been eliminated by "excessive" livestock grazing, and seven others were damaged by summer grazing or overuse. However, "moderate" grazing in spring likely is compatible (Stone *et al.* 1988) and may be beneficial. Invasion of non-native plants is an increasing problem throughout the range of hairy Orcutt grass (Stone *et al.* 1988). Several researchers (Stone *et al.* 1988, Alexander and Schlising 1997) have suggested that cattle may have carried in seeds of non-native plants, and disturbance from trampling may have facilitated their establishment. Bindweed (*Convolvulus* sp.) has increased in frequency in the Vina Plains since 1984, and cocklebur is still present. Pools where hairy Orcutt grass grows had higher frequencies of these invasive species than did other pools on the Vina Plains Preserve in 1995 and altered hydrology may have contributed to the presence of invasive plants in the pools (Alexander and Schlising 1997).

Hairy Orcutt Grass Unit Review

We conducted a regional review across the range of hairy Orcutt grass to evaluate and select areas that are essential to the conservation of the species and that may require special management. Important factors we considered were the known presence of the species and the presence of the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1, Vina Plains Unit, Tehama and Butte Counties (8,748 ha (21,617 ac))

This area is proposed as critical habitat for hairy Orcutt grass because it supports over 25 percent of all known occurrences of the species and contains large vernal pools occurring on Tuscan and Anita soils (USDA 2001, CNDDDB

2002). The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for hairy Orcutt grass germination and reproduction. This unit represents the northern extent of the species range, and is over 40 km (25 mi) from the nearest occurrence to the south. This area represents one of only two areas where large hairy Orcutt populations are protected, and where long-term monitoring of the species status has occurred.

Hairy Orcutt grass may be threatened by invasive species within this unit (Alexander and Schlising 1997). In some areas special management actions have been taken to counteract the negative effects of invasive species on hairy Orcutt grass. For example, cocklebur, an aggressive native plant, has been removed by hand from some of the Vina Plains pools (Alexander and Schlising 1997), an effort that began in 1991 using funds from the California Endangered Species Tax Check-Off Fund (CDFG 1991).

The majority of the lands included within this unit are privately owned. This unit contains TNC's 1862-ha (4,600-ac) Vina Plains preserve. The preserve contains over 300 species of plants, and diverse communities of aquatic invertebrates. Since the 1960's, the Vina Plains area has been the focus of a number of research projects, including long-term adaptive management and monitoring efforts evaluating the effects of grazing and fire on vernal pool plants, including hairy Orcutt grass (Griggs 2000). Much of the basic life history information known about hairy Orcutt grass was collected at Vina Plains (*e.g.*, Stone *et al.* 1988, Alexander and Schlising 1997). The results of this research have provided crucial information to guide management and monitoring of vernal pool ecosystems and to identify factors which influence population dynamics of a number of endangered species, including hairy Orcutt grass.

The Vina Plains is open to the public and provides excellent outreach and educational opportunities. In addition to TNC, the importance of vernal pool habitats in this area has been recognized by the CDFG, the Service, the EPA, the CNPS, the NRCS's WRP, and by researchers at the CSU at Chico, who have all supported research and conservation efforts for hairy Orcutt grass and other vernal pool species within this unit. Urban development

north of Chico and the conversion of grazed lands to more intensive agricultural uses threaten vernal pool habitat within this unit.

This unit for hairy Orcutt grass occupies the area south of Deer Creek and north of Pine Creek to near Cana Highway. State Route 99 bisects this unit and the western boundary generally parallels the Southern Pacific Railway line. This unit is included within Unit 7 for vernal pool fairy shrimp, Unit 3 for vernal pool tadpole shrimp, Unit 1 for Conservancy fairy shrimp, Unit 2 for Greene's tuctoria, Unit 1 for Hoover's spurge, and Unit 4 for slender Orcutt grass. Additional sensitive vernal pool species occurring in this unit include California linderiella and Bogg's Lake hedge-hyssop. Land ownership within this unit includes 2,264 ha (5,660 ac) by TNC and 57 ha (142 ac) of private land protected by conservation easement or agreement under the WRP. TNC has an additional 3,826 ha (9,564 ac) of conservation easements within this unit.

Unit 2, Butte Unit, Butte County, California (979 ha (2,418 ac))

This unit is proposed as critical for hairy Orcutt grass because it supports the species within vernal pools on Tuscan soils (Holland 1998, USDA 1994, 1999, CNDDDB 2002). These pool types remain inundated for sufficient periods of time to allow hairy Orcutt grass to complete its life cycle. This area and Unit 1 are the only locations where hairy Orcutt grass is found on the Tuscan soil types. This area comprises one of only three areas where this species occurs in the Sacramento Valley, and is important to maintain the species range and distribution. The northern occurrences of hairy Orcutt grass are isolated from occurrences in the southern part of the species range. This unit is over 40 km (25 mi) from the nearest units to the north and west, and over 225 km (140 mi) from the nearest unit to the south and is one of seven known occurrences of the species. This unit represents some of the last remaining lower elevation vernal pool habitats in Tehama and Butte counties.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) and EPA (1994) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for hairy Orcutt grass germination and reproduction.

This unit for hairy Orcutt grass occupies the area north of the intersection of State Route 99 and Route

149 in Butte County. The eastern boundary extends up the watershed of Clear Creek and the western boundary extends south paralleling State Route 99 to Little Dry Creek. This unit is within Unit 9 for vernal pool fairy shrimp and Unit 4 for vernal pool tadpole shrimp, and coincides with Unit 3 for Greene's tuctoria and Unit 2 for Hoover's spurge. All the lands within this unit are privately owned.

Unit 3, Sacramento Refuge Unit, Glenn and Colusa Counties (5,718 ha (14,129 ac))

This unit is proposed as critical for hairy Orcutt grass because it contains multiple occurrences of the species within alkaline vernal pools on the Willows and Riz soil series (CNDDDB 2002) and the vernal pool habitat remains inundated for sufficient periods of time to allow hairy Orcutt grass to complete its life cycle. This area is one of only three locations where hairy Orcutt grass is found in the Sacramento Valley. This area represents one of only two areas where large hairy Orcutt populations are protected, and where long-term monitoring of the species status has occurred.

Habitat for hairy Orcutt grass is greatly fragmented in this portion of its range, and this unit is over 40 km (25 mi) from the nearest unit to the east, and over 225 km (140 mi) from the nearest unit to the south. Hairy Orcutt grass is known from only 7 general areas across its entire range, and each of these locations is essential to the conservation of this species.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for hairy Orcutt grass germination and reproduction.

This unit for hairy Orcutt grass occupies the vernal pool habitat east of Interstate 5 to the Colusa Trough from Riz Road on the north and Delevan Road on the south. The area encompasses the Sacramento National Wildlife Refuge 5,126 ha (12,816 ac). This unit is also part of vernal pool fairy shrimp Unit 10, and vernal pool tadpole shrimp Unit 5, and coincides with Unit 2 for Conservancy fairy shrimp, Unit 5 for Greene's tuctoria, and Unit 3 for Hoover's spurge. Other rare vernal pool species found in the unit include pappose spikeweed, Fremont's goldfields, alkali goldfields, Scribe's popcorn flower, Hoover's downingia, folded downingia, Heckard's

peppergrass, heartscale, brittlescale, San Joaquin spearscale, Ferris' milk-vetch, spike-primrose, sessile mouse-tail, and palmate-bracted bird's beak. The remaining land within this unit is privately owned.

Unit 4, Turlock Unit, Stanislaus and Merced Counties (25,318 ha (62,560 ac))

The Turlock Unit is proposed as critical habitat for hairy Orcutt grass because it contains occurrences of the species within large vernal pools on Whitney and Meikle soils that provide the necessary timing and length of inundation essential to the conservation of this species (CNDDDB 2001, Holland 1998, USDA 2001). This unit contains the well known Hickman pools in Stanislaus County, and a high concentration of hairy Orcutt grass occurrences (CNDDDB 2001). The Hickman pool complex contains one of the largest vernal lakes in California at more than 121 ha (300 ac) and represents a unique habitat for hairy Orcutt grass. This unit contains numerous vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths to sustain hairy Orcutt grass germination, growth, and reproduction.

This unit contains large, intact vernal pool grasslands that help maintain the distribution of the species over its entire range. In vernal pool grasslands south of this unit, two hairy Orcutt grass occurrences are presumed extirpated as a result of agricultural conversion and intensive cattle grazing. Extant hairy Orcutt grass occurrences within this unit are threatened by altered hydrology, overgrazing, and competition with invasive species (CNDDDB 2002). The watershed containing the Hickman vernal pools has been breached by hundreds of acres of orchards that have been planted upstream. The integrity of the vernal pool complexes in eastern Stanislaus and Merced counties is seriously threatened by irrigated agriculture, upland housing development, and the proposed UC Merced Campus and associated development.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. The Turlock Unit is bordered by the Tuolumne River to the north and the Merced River to the south. The unit lies between the towns of La Grange and Snelling. County Road J9 runs west of the unit and the eastern edge is located in the low elevation foothills of the Sierra Nevada. Vernal pools in the Turlock Unit are located in eastern

Stanislaus and Merced counties. This unit coincides with Hoover's spurge Unit 5, Colusa grass Unit 7, Greene's tuctoria Unit 9 and succulent owl's-clover Unit 3A. It overlaps vernal pool fairy shrimp Unit 21. Land ownership within this unit includes BLM (7 ha (17 ac)) and California State Parks (25 ha (61 ac)). The remaining land within this unit is privately owned.

Unit 5, Madera Unit, Madera County (9,085 ha (22,448 ac))

This unit is proposed as critical habitat for hairy Orcutt grass because it contains occurrences of the species within vernal pools formed on Greenfield and Hanford soil series (Holland 1998, CNDDDB 2002). These soils support vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths to sustain germination, growth and reproduction of hairy Orcutt grass. To maintain the full range of ecological conditions in which this species occurs, conservation of hairy Orcutt grass populations and vernal pool habitat in the Madera Unit is important.

The Madera Unit contains a California Department of Transportation mitigation site which protects a small occurrence of hairy Orcutt grass, and is the only conservation area for this species in the Southern Sierra Foothills. However, vernal pool habitat in and adjacent to this unit is progressively being eliminated and modified. An occurrence of hairy Orcutt grass approximately 11 km (7 mi) east of Madera has been extirpated due to residential development. The development of ranch-style homes, small horse pastures, orchards and new roads poses a serious threat to at least five other occurrences in or adjacent to this unit. However, hairy Orcutt grass has successfully been introduced into created vernal pools in this unit.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. Located in Madera County, this unit contains vernal pool habitat extending from the Chowchilla River in the north to the Fresno River in the south. The Fresno River separates this unit from the Cottonwood Creek Unit to the south. All vernal pools in this unit are located east of the Atchison, Topeka, and Santa Fe Railroad and extend into the low elevation foothill region of the Sierra Nevada. Berenda Creek bisects the unit. The town of Madera is located southwest of the unit, Hensley Lake is east of the unit, and Eastman Lake is northeast of the unit. The Madera Unit

coincides with San Joaquin Valley Orcutt grass Unit 4, succulent owl's-clover Unit 4, and overlaps vernal pool fairy shrimp Unit 24A. Other sensitive vernal pool species found within this unit include California tiger salamander and California linderiella. All the land within this unit is privately owned.

Unit 6, Cottonwood Creek Unit, Madera County (15,824 ha (39,100 ac))

This area is proposed as critical habitat for hairy Orcutt grass because it supports over 15 percent of the known occurrences of the species within Northern Claypan vernal pools formed on Cometa, Greenfield, Hanford soil series (CNDDDB 2001, USDA 1994, Holland 1998). These pool types provide the necessary timing, length of inundation, water quality, and soil moisture for hairy Orcutt grass germination, growth and reproduction. The Cottonwood Creek Unit represents the southern extent of hairy Orcutt grass range. This unit contains large intact and contiguous vernal pool grassland areas that help maintain the distribution of the species through out its range.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery, as well as elevation contours in the eastern foothill region and sub-watershed boundaries. Located in Madera County, this unit contains vernal pool habitat extending from the Fresno River in the north to the San Joaquin River in the south. The Fresno River separates this unit from the Madera Unit to the north. All vernal pools in this unit are located east of the Atchison, Topeka, and Santa Fe Railroad, extending east into the low elevation foothill region of the Sierra Nevada. Highway 41 bisects the eastern portion of the unit. The Cottonwood Creek Unit overlaps succulent owl's-clover Unit 4, San Joaquin Valley Orcutt grass Unit 4, and vernal pool fairy shrimp Unit 24A. Other sensitive vernal pool species found within this unit include California linderiella, spiny-sealed button-celery, California tiger salamander, and western spadefoot toad. Approximately 4 ha (10 ac) are owned by the CDFG.

Sacramento Orcutt Grass Criteria

In proposing critical habitat units for Sacramento Orcutt grass we evaluated the life history and current distribution of the species, the primary constituent elements, and the current threats to the species. This information allowed us to determine which areas are likely to contribute to the conservation of Sacramento Orcutt grass.

Sacramento Orcutt grass is found only in Sacramento County. The species was historically known from nine occurrences. However, one entire occurrence and a portion of another have been extirpated. Thus, eight of the nine occurrences are extant. Five occurrences, comprising more than 70 percent of the occupied habitat, are concentrated into a single area of approximately 6 sq km (2.3 sq mi) east of Mather Field. Two other occurrences are adjacent to each other—Phoenix Field Ecological Reserve and the introduced population at Phoenix Park. The eighth extant occurrence is near Rancho Seco Lake (Stone *et al.* 1988, Cochrane *in litt.* 1995a, Morey *in litt.* 1996, CNDDDB 2002).

Sacramento Orcutt grass was extirpated from its historic occurrence between Orangevale and Folsom by urban development. The species was extirpated from one pool near Grant Line Road by changes in hydrology—pool depth was increased artificially to provide a longer-lasting water source for livestock, which created conditions unsuitable for persistence of Sacramento Orcutt grass (Stone *et al.* 1988, CNDDDB 2002). Even though they have not been extirpated, extant occurrences at the Phoenix Field Ecological Reserve and the Phoenix Park Vernal Pool Preserve have been degraded by off-road vehicles and alterations to natural drainage patterns (Clark *et al.* 1998).

The remaining pools where Sacramento Orcutt grass grows are subject to a wide variety of factors that threaten the species survival. Urban encroachment and the associated increase in human activities, is the primary factor. One occurrence in the primary area of concentration could be destroyed by expansion of the county landfill (Cochrane *in litt.* 1995a); the precise area of expansion has yet to be determined. At present, trash from the landfill frequently blows into the pools (Cochrane *in litt.* 1995b). An industrial park and road widening threaten another one of the occurrences in the same area (Stone *et al.* 1988, Cochrane *in litt.* 1995a).

Competition from native plants such as pale spikerush (*Heleocharis* sp.) and mannagrass (*Glyceria* sp.) could displace Sacramento Orcutt grass (Stone *et al.* 1988, Cochrane *in litt.* 1995a, Cochrane *in litt.* 1995b, Clark *et al.* 1998). Livestock grazing during the growing season, or overstocking during winter grazing, may degrade habitat for Sacramento Orcutt grass; however, grazing may be useful in providing control of competing plants if appropriate timing and stocking rates

can be determined (Griggs 1977, Stone *et al.* 1988, Cochrane *in litt.* 1995b).

Sacramento Orcutt Grass Unit Review

We conducted a regional review across the range of Sacramento Orcutt grass to evaluate and select areas that are essential to the conservation of the species and that may require special management. Important factors we considered were the known presence of the species and the presence of the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1, Phoenix Field and Phoenix Park Unit, Sacramento County (29 ha (72 ac))

This unit is proposed as critical habitat for Sacramento Orcutt grass because it supports 25 percent of the known occurrences (2 of 8), including occurrences found within vernal pools on Red Bluff and Redding soils (CNDDDB 2002). These pool types provide the necessary timing and frequency of inundation for Sacramento Orcutt grass germination, growth, and reproduction. The unit boundary was drawn to include Sacramento Orcutt grass and the vernal pool complexes in which it occurs (Holland 1998, Sacramento County 1999). SPOT imagery was used to exclude urban and developed areas, however, the resolution of this imagery did not permit us to exclude all developed areas. This unit represents the northern extent of the species range, and one of only three areas where Sacramento Orcutt grass is known to occur.

The Phoenix Field Ecological Reserve and Phoenix Park occurrences are affected by excess runoff from lawns, baseball fields, and roads; by herbicide and fertilizer applied in adjacent areas (Griggs and Jain 1983, Holland *in litt.* 1986, Stone *et al.* 1988, Cochrane *in litt.* 1995a, Morey *in litt.* 1996, Clark *et al.* 1998); and by dumping of landscape waste (Clark *et al.* 1998). Another threat at the Phoenix Field Ecological Reserve is invasion of garden plants (Clark *et al.* 1998). Recreational activities such as rollerblading (Witham *in litt.* 2000a), biking, and horseback riding (Cochrane *in litt.* 1995a, Cochrane *in litt.* 1995b, Clark *et al.* 1998) also are damaging the Phoenix Park occurrence.

This unit is situated within the City of Fair Oaks, and lies east of Hazel Avenue and northwest of Lake Natoma. This unit is bounded by urban development except for the east side, which is adjacent to Folsom Lake State Recreation Area. The City of Fair Oak's Phoenix Park, Phoenix Field, and Jim David Park are included within the

boundaries of this unit. The unit consists primarily of public land and is frequently visited by the public. Although surrounded by development, this unit represents an important urban preserve for the species.

Unit 2, Southeast Sacramento Valley Unit, Rancho Cordova, Sacramento County (8,853 ha (21,875 ac))

This unit is proposed as critical habitat for Sacramento Orcutt grass because it contains over 50 percent of the known occurrences (4 of 8) of the species within vernal pools on Redding and Redbluff soils that contain the primary constituent elements essential for the conservation of the species (USDA 2001, Holland 1998, Sacramento County 1999, CNDDDB 2002). This unit also represents one of only three units for the species across its entire range. This unit includes relatively undisturbed, hydrologically intact vernal pool habitats as mapped by Holland (1998), that may continue to support natural vernal pool ecosystem processes and maintain suitable habitat conditions for Sacramento Orcutt grass to complete germination and reproduction.

The Southeastern Sacramento Valley Unit for Sacramento Orcutt grass occupies the area south and east of Mather Airport and Regional Park. The Cosumnes River forms part of the southern and eastern boundary of the unit. Urban areas in the cities of Sacramento and Rosemont form the western boundary. Mather Airport and the dredge tailings northeast of the airport form the northern boundary. The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for Sacramento Orcutt grass germination and reproduction.

The majority of the lands included within this unit are privately owned, including the Sunrise Douglas mitigation area, where several occurrences of Sacramento Orcutt grass are known to occur. Other vernal pool habitats in this area have been identified by the Sacramento Valley Open Space Conservancy, the CNPS, and TNC as excellent examples of vernal pool grasslands, supporting a rich and diverse community of vernal pool endemic plants and animals within Sacramento County. Vernal pool habitats in this unit are threatened by urbanization from the expanding cities of Sacramento and Elk Grove.

Conversion to intensive agriculture, particularly vineyards, is also a significant threat to Sacramento Orcutt grass habitat in this unit. The unit is bisected by the Folsom South Canal and State Highway 16. This unit is included in Unit 8 for vernal pool tadpole shrimp and Unit 13 for vernal pool fairy shrimp and coincides with Unit 6 for slender Orcutt grass. Other sensitive vernal pool species located within this unit include California linderiella, legenera, Bogg's Lake hedge-hyssop, Ahart's dwarf rush, and western spadefoot toad.

Unit 3, Rancho Seco Unit, Sacramento and Amador Counties (15,750 ha (38,918 ac))

This unit is proposed as critical habitat for Sacramento Orcutt grass because it supports occurrences of the species within high terrace vernal pools on Corning soils that contain the primary constituent elements and provide the necessary timing and frequency of ponding that allow the species to germinate and reproduce (Holland 1998, USDA 2001, Sacramento County 1999, CNDDDB 2002). This unit represents one of only three areas where this species is known to occur, and is the southern extent of the species range. All of these areas are essential to the species by improving its chances of surviving natural and environmental changes, as well as random or stochastic events. This unit includes relatively undisturbed, hydrologically intact vernal pool habitats, that may continue to support natural vernal pool ecosystem processes and maintain suitable habitat conditions for the species.

The western boundary of the unit was defined by the extent of high terrace soils in the region, including Corning and Redding soils, which generally comprise the extent of Sacramento Orcutt grass habitat. The northern and southern boundaries of this unit were delineated to exclude urban and agricultural areas. The majority of land within this unit is privately owned. Some vernal pool areas are protected in this unit on TNC's Howard Ranch Preserve and Schnider property near Meiss Road. The Clay Station Mitigation Bank and the Borden Ranch mitigation site are located within this unit, as well as a number of smaller conservation areas including the Rancho Seco Preserve and the L.V. Island Preserve. Approximately 247 ha (610 ac) is owned by the CDFG, and 3,094 ha (7,736 ac) by TNC. An additional 5 ha (11 ac) of private land is protected by WRP easements or agreements. Urban expansion and conversion to vineyards

threaten existing vernal pool habitats throughout this unit.

This unit occupies the area south of Laguna Creek and north of the Sacramento and San Joaquin county line along Dry Creek. The eastern boundary is the low elevation foothills of western Amador County. The western limit is bounded by urban and agricultural areas near the cities of Galt and Elk Grove and along the foothill region of the southeastern Sacramento Valley. This unit is a portion of Unit 13 for vernal pool tadpole shrimp and Unit 19 for vernal pool fairy shrimp. Other sensitive species found within this unit include Bogg's Lake hedge-hyssop, Ahart's dwarf rush, Henderson's bent grass, legenera, Sanford's arrowhead, pincushion navarretia, dwarf downingia, California tiger salamander, western spadefoot toad, and California linderiella.

San Joaquin Valley Orcutt Grass Criteria

In proposing critical habitat units for San Joaquin Valley Orcutt grass we evaluated the life history and current distribution of the species, the primary constituent elements, and the current threats to the species. This information allowed us to determine which areas are most likely to contribute to the conservation of this species.

San Joaquin Valley Orcutt grass is restricted to the foothills of the southern Sierra foothill region of the San Joaquin Valley. Of the 47 occurrences of San Joaquin Valley Orcutt grass ever reported, 27 are presumed to be extant; 17 are certainly extirpated and 3 others are possibly extirpated because the habitat has been modified (CNDDDB 2001). However, only 12 of the occurrences presumed extant have been revisited within the past decade, so even the most recent information is outdated. This species has been completely extirpated from Stanislaus County but remains in Fresno, Madera, Merced, and Tulare counties (Stone *et al.* 1988, CNDDDB 2001).

San Joaquin Valley Orcutt grass does not occur outside of the Southern Sierra Foothills Vernal Pool Region (Keeler-Wolf *et al.* 1998). The primary area of concentration is northeast of Merced in Merced County, with 14 occurrences (52 percent) on the Flying M Ranch and adjacent lands (EIP Associates 1999, Witham *in litt.* 2000b, CNDDDB 2001). The Lanes Bridge area of Madera and Fresno counties has the second highest concentration of San Joaquin Valley Orcutt grass, with seven occurrences (26 percent), including the introduced population. The remaining six occurrences include three in the Le

Grand area of Merced County, two on the tabletops near the San Joaquin River in Madera and Fresno counties, and one in northwestern Tulare County (Stone *et al.* 1988, Stebbins *et al.* 1995, CNDDDB 2001).

All of the habitat of San Joaquin Valley Orcutt grass in Stanislaus County and much of that in Madera and Fresno counties has been converted to irrigated agriculture, especially to almond orchards and vineyards (Stone *et al.* 1988, CNDDDB 2001). The majority of sites were converted by the late 1970's (Griggs 1980, Griggs and Jain 1983). Altered hydrology and development (residential, commercial, and recreational) eliminated several other populations (Stone *et al.* 1988, CNDDDB 2001). Dryland grain farming has modified vernal pool habitats of San Joaquin Valley Orcutt grass in Madera and Merced counties, and the species is presumed to be extirpated from those occurrences (CNDDDB 2001). However, Crampton (1959, 1976) indicated that San Joaquin Valley Orcutt grass could persist despite dryland farming, and the species was rediscovered at one such site after having been absent for several years (CNDDDB 2001). Summer livestock grazing or heavy use by cattle damaged two populations each in Madera and Merced counties (Stone *et al.* 1988, CNDDDB 2001); their current status is not known.

The primary threats facing the remaining occurrences of San Joaquin Valley Orcutt grass are altered livestock grazing regimes, agricultural conversion, and small population size (Stone *et al.* 1988, CNDDDB 2001). Most extant populations are grazed currently. According to Stone *et al.* (1988), moderate cattle grazing in spring is compatible with persistence of San Joaquin Valley Orcutt grass, and possibly beneficial, but increased stocking rates or summer or year-round grazing would be detrimental. Conversion to irrigated agriculture is most likely at sites that currently are dry-farmed. Small populations are at risk of extirpation due to chance events (Menges 1991), particularly those that fluctuate greatly from year to year (Thomas 1990). Omitting those described only as "abundant," population size has been estimated for 14 occurrences of San Joaquin Valley Orcutt grass. Three numbered fewer than 10 plants each, even in favorable years (Stone *in litt.* 1992, Stebbins *et al.* 1995, CNDDDB 2001).

Additional threats to San Joaquin Valley Orcutt grass are varied. Four of the extant occurrences in Madera County are in the path of the proposed extension of State Highway 41 (Stone *in*

litt. 1992). Three other occurrences in Madera and Fresno counties are threatened by a proposed residential development (Stone *et al.* 1988, Stebbins *et al.* 1995, CNDDDB 2001). One occurrence could be destroyed by construction of the proposed UC campus in Merced County (EIP Associates 1999). Altered hydrology, competition from other plants, and off-road vehicles are potential threats at a few sites (Stone *et al.* 1988). Foraging by grasshoppers (family Acrididae) and mice (order Rodentia) occasionally poses problems (Stebbins *et al.* 1995, CNDDDB 2001). In some years, grasshoppers (family Acrididae) consumed entire populations of San Joaquin Valley Orcutt grass before they set seed (Griggs and Jain 1983, Stone *et al.* 1988).

San Joaquin Valley Orcutt Grass Unit Review

We conducted a regional review of the known range of San Joaquin Valley Orcutt grass to evaluate and select areas that are essential to the conservation of San Joaquin Valley Orcutt grass and that may require special management. Important factors we considered were the presence of the species and the presence of the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1, Merced Unit, Merced and Mariposa Counties (45,643 ha (112,783 ac))

This unit is proposed as critical habitat for San Joaquin Valley Orcutt grass because it supports over half of the known occurrences of the species (CNDDDB 2001). This unit contains the only area where San Joaquin Valley Orcutt grass is found on vernal pools formed upon Corning and Greenfield soils, and one of only two sites where it is found on San Joaquin soils (Holland 1998, USDA 2001, EIP 1999). These pool types maintain the timing and length of inundation necessary for San Joaquin Orcutt grass germination, growth, and reproduction, and provide a diversity of habitats for the species. This unit supports some of the largest, most robust occurrences of the species (Holland 2000). The area within this unit encompasses the largest block of pristine, high density vernal pool grasslands remaining in California (Vollmar 1999).

A majority of the land in the Merced Unit is privately owned and is used to graze cattle. Two occurrences on the Flying M Ranch are protected under a conservation easement with TNC. The integrity of the vernal pool complexes in

eastern Merced is seriously threatened by irrigated agriculture, upland housing development, and the proposed UC Merced Campus and associated development. Construction of facilities to educate and serve twenty-five thousand UC students as well as faculty, staff, and their families within what is now high quality vernal pool habitat in eastern Merced County could have a major impact on species endemic to vernal pools. However, the recent draft biological opinion for the UC Merced campus and community developed environmental parameters which should reduce impacts to vernal pool habitats. Indirect and cumulative impacts of the proposed 1,673 ha (4,133 ac) campus and associated community may be minimized with the creation of a 2,036 ha (5,030 ac) preserve intended to protect sensitive vernal pool habitat, to be purchased with money donated by the Packard Foundation. Approximately 419 ha (1,048 ac) of this unit is owned by the DOD, 4 ha (8 ac) by BLM, 10 ha (26 ac) by California State Parks. TNC has 3,424 ha (8,559 ac) of easement lands within this unit. The remaining lands within this unit are privately owned.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. A majority of the vernal pool habitat in the Merced Unit is in Merced County, although the eastern edge of the unit overlaps into Mariposa County in the low elevation foothills of the Sierra Nevada. The northern boundary parallels the Merced River, and Bear Creek serves as the southern border. The entire unit is located east of State Highway 99. The Merced Unit coincides with vernal pool tadpole shrimp Unit 15 and vernal pool fairy shrimp Unit 22. It also overlaps hairy Orcutt grass Unit 6, Greene's tuctoria Unit 7, succulent owl's-clover Unit 3B, Colusa grass Unit 6, and Conservancy fairy shrimp Unit 6. Other sensitive vernal pool species found within this unit include the California tiger salamander, shining navaretia, dwarf downingia, Bogg's Lake hedge-hyssop, western spadefoot toad, and California linderiella.

Unit 2, Le Grand Unit, Merced, Mariposa, and Madera Counties (21,495 ha (53,114 ac))

This unit is proposed as critical habitat for San Joaquin Valley Orcutt grass because it supports occurrences of the species within vernal pools formed on alluvial terraces on Raynor clay soils (CNDDDB 2001). The Le Grand Unit is essential for the conservation of San

Joaquin Valley Orcutt grass because it contains large intact and contiguous vernal pool grassland areas that provide connectivity between units to the north and south. This unit contains vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths and the adjacent upland margins of these depressions that sustain San Joaquin Orcutt grass germination, growth, reproduction, and dispersal. This unit is important to maintain the range of habitats in which the species is known to occur.

This unit contains an area where San Joaquin Valley Orcutt grass was introduced into six created pools; it germinated and flowered in five of them during the 2 years following its introduction (Durgarian 1995, Stebbins *et al.* 1995) and was still present in 2000 (Faubion *in litt.* 2000). This site is now treated as an occurrence by the CNDDDB (2001). The Madera Irrigation District manages the property, which is owned by the BOR (Stebbins *et al.* 1995). The integrity of vernal pool complexes and their associated watersheds in the Le Grand Unit is threatened by altered hydrology, competition from other plants, irrigated agricultural conversion, particularly orchards and vineyards, and urban encroachment. Several occurrences in this unit have been extirpated as a result of intensive agriculture.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. A majority of the vernal pool habitat in the Le Grand Unit is in Merced County. The eastern edge of the unit overlaps into Mariposa County and in the south it extends to the Madera County line. Bear Creek serves as the northern boundary. The entire unit is located east of State Highway 99. The towns of Le Grand and Planada are adjacent to the western edge of the unit. The Le Grand Unit overlaps with vernal pool tadpole shrimp Unit 15, Greene's tuctoria Unit 6, Conservancy fairy shrimp Unit 6, and succulent owl's-clover Unit 6. Other sensitive vernal pool species found within this unit include California tiger salamander, shining navaretia, and western spadefoot toad. TNC has 428 ha (1,070 ac) of easement lands within this unit. The remaining lands within this unit are privately owned.

Unit 3, Madera Unit, Madera County (20,937 ha (51,733 ac))

This unit is proposed as critical habitat for San Joaquin Valley Orcutt grass because it supports occurrences of the species within alluvial terrace

vernal pools that provide the necessary timing and length of inundation for San Joaquin Valley Orcutt grass germination, growth, and reproduction (CNDDDB 2001). This area is the only location where the species is found on Cometa and San Joaquin soils (USDA 2001).

San Joaquin Valley Orcutt grass is known from only eight general areas along the eastern margin of the San Joaquin Valley. Historically, vernal pools spanned from the low elevation Sierra Nevada foothills to the valley floor where they connected with other large vernal pool complexes. Today, only a fraction of the vernal pool habitat that was historically in the greater watershed area remains. The integrity of vernal pool complexes and their associated watersheds in the Madera Unit is threatened by altered hydrology, competition from other plants, irrigated agricultural conversion, particularly orchards and vineyards, and urban encroachment.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. Located in Madera County, this unit contains vernal pool habitat south of the Chowchilla River and abutting the Fresno River. Berenda Creek is located northwest of the unit. Habitat within this unit is located east of the Atchison, Topeka, and Santa Fe Railroad and extends into the low elevation foothill region of the Sierra Nevada. The town of Madera borders the unit on its southwest edge, Hensley Lake is east of the unit, and Eastman Lake is northeast of the unit. The Madera Unit coincides with hairy Orcutt grass Unit 7, Greene's tuctoria Unit 7, succulent owl's-clover Unit 4 and vernal pool fairy shrimp Unit 24A. Other sensitive vernal pool species found within this unit include California tiger salamander and California linderiella. All the land within this unit is privately owned.

Unit 4, Fresno Unit, Fresno County (3,233 ha (7,990 ac))

This unit is proposed as critical habitat for San Joaquin Valley Orcutt grass because it contains occurrences of the species growing within vernal pools formed on Fallbrook, Ramona, San Joaquin, Vista, and Pollasky soil series (CNDDDB 2002). This unit contains vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths and the adjacent upland margins of these depressions that sustain San Joaquin Orcutt grass germination, growth, and reproduction. This unit is significant geographically, as it may contribute to

dispersal to vernal pool habitats north and south of it. The diversity of vernal pool types found within the Fresno Unit contributes to the range of ecological conditions in which San Joaquin Valley Orcutt grass occurs.

Due to edaphic variation, vernal pool habitat in this unit is less dense than habitat in units further north. Vernal pools within this unit have been destroyed by conversion to irrigated agriculture, as well as urban encroachment from the cities of Fresno and Clovis. Several known occurrences of San Joaquin Valley Orcutt grass within this unit have been extirpated due to either hydrologic modifications off-site, or land use modifications such as leveling of "hog wallows" for urban development such as near State Route 41 near Woodward Park in Fresno.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery. Located in Fresno County, this unit contains vernal pool habitat south of Millerton Lake and east of the San Joaquin River. The unit is located north of Copper Road and the city of Fresno is southwest of the unit. The eastern boundary parallels the low elevation foothill region of the Sierra Nevada. Auberry Road is east of the northern portion of the unit and passes through the southern portion of the unit. CDFG has approximately 0.4 ha (1 ac) of land within this unit. The Fresno Unit overlaps San Joaquin Valley Orcutt grass Unit 5 and vernal pool fairy shrimp Unit 24B. Other sensitive vernal pool species found within this unit include California linderiella, California tiger salamander, and western spadefoot toad.

Unit 5 A and B, Table Mountain Unit, Fresno and Madera Counties, (1,723 ha (4,258ac))

This area is proposed as critical habitat for San Joaquin Valley Orcutt grass because it supports occurrences of the species within Northern Basalt Flow vernal pools (Holland 1998, Keeler-Wolf *et al.* 1998, CNDDDB 2002). This is the only area where San Joaquin Valley Orcutt grass is known to occur within these pool types (CNDDDB 2001). Northern Basalt Flow vernal pool complexes are an extremely rare vernal pool habitat occurring only on ancient terraces and hilltops above the surrounding low-lying terrain. They typically contain small, irregularly clustered pools with "flashy hydrology" (Keeler-Wolf *et al.* 1998). The Kennedy Table occurrence of San Joaquin Valley Orcutt grass was described as containing

millions of plants in 1995 (CNDDDB 2001).

This unit contains protected lands at the Big Table Mountain Ecological Reserve. A cooperative group consisting of CDFG, California Department of Parks and Recreation, Sierra Foothill Conservancy, BLM, and BOR has developed a management and monitoring plan for Big Table Mountain. BLM owns approximately 15 ha (370 ac) of land and TNC has 260 ha (650 ac) of conservation easements within this unit. Initial efforts will focus on grazing as a means to control non-native grasses while comparing population trends of threatened and endangered species in grazed and ungrazed portions of the tableland (Griggs *in litt.* 2000a). This unit also contains an occurrence of San Joaquin Valley Orcutt grass that is partially on public land administered by the BLM. The pool supports the second-largest population of the species known to be extant. The BLM and conservation groups are hoping to acquire the adjacent land to protect the entire pool (CNDDDB 2001).

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery, as well as elevation contours in the eastern foothill region and sub-watershed boundaries. Unit 5 for San Joaquin Orcutt grass is comprised of two subunits. Both subunits are located east of Millerton Lake on basalt mesas above the San Joaquin River. Subunit 5B is located on Kennedy Table in Madera County, and Subunit 5A is directly south of this unit across the San Joaquin River on Table Mountain in Fresno County. The Table Mountain Rancheria is south of this unit. Unit 5 coincides with vernal pool fairy shrimp Unit 25, vernal pool tadpole shrimp Unit 17, and succulent owl's-clover units 6A and 6B. Other sensitive vernal pool species found within this unit include Bogg's lake hedge-hyssop and California linderiella.

Unit 6A and B, Tulare Unit, Tulare County (8,028 ha (19,836 ac))

This unit is proposed as critical for San Joaquin Valley Orcutt grass because it contains occurrences of the species within vernal pools on Madera and Greenfield soils that provide the primary constituent elements essential to the conservation of the species (USDA 2001, CNDDDB 2001). This unit represents the southern extent of San Joaquin Valley Orcutt grass range. San Joaquin Valley Orcutt grass occurs on CDFG land at Sequoia Fields Ecological Reserve (199 ha, (491 ac)); however, most of the area within this unit is

privately owned. This unit contains vernal pools and other ephemeral wetlands and depressions of appropriate sizes and depths and the adjacent upland margins of these depressions that sustain San Joaquin Valley Orcutt grass germination, growth and reproduction. Agricultural conversion of range or barren land and urban development have greatly reduced the amount of vernal pool habitat in this area.

The unit boundary was drawn to include species occurrences and the vernal pool complexes in which they occur as mapped by Holland (1998) and as visible on SPOT imagery, as well as elevation contours in the eastern foothill region and sub-watershed boundaries. There are two subunits within the Tulare Unit. This westernmost subunit, subunit A, is located east of J19. Road 63 cuts through its eastern edge. St. Johns River is south of the subunit and the Southern Pacific Railroad runs northeast of the unit. Subunit B is located east of Road 63 and Road 201 passes through it. It extends into the low elevation foothills of the Sierra Nevada. Colvin Mountain is located within the southwest boundary. Road 245 bisects subunit B and the south side of Red Mountain is within the northeast boundary of this unit. The Tulare Unit coincides with Hoover's spurge Unit 7, and it overlaps with vernal pool tadpole shrimp Unit 18 and vernal pool fairy shrimp Unit 26. Other sensitive vernal pool species found within this unit include California tiger salamander, spiny-sepal button-celery, and the western spadefoot toad.

Slender Orcutt Grass Criteria

In proposing critical habitat units for slender Orcutt Grass we evaluated the life history and current distribution of the species described in the background section of this rule, the primary constituent elements described in the primary constituent element section of this rule, and the current threats to the species described below. This information allowed us to determine which areas are likely to contribute to the conservation of this species and to delineate units so that threats to this species might be minimized.

Slender Orcutt grass is currently known from 79 occurrences, of which 73 are presumed to be extant (Corbin *in litt.* 1999, CNDDDB 2001); occurrences are presumed to be extant until the CNDDDB receives documentation that they have been extirpated. The primary area of concentration for slender Orcutt grass is in the vicinity of Dales, Tehama County. A secondary area of concentration for slender Orcutt grass is

the Modoc Plateau Vernal Pool Region in Lassen, Plumas, Shasta, and Siskiyou counties. Additional occurrences of the species are found in Shasta, Lake, and Sacramento counties.

Urban development in the vicinity of Redding has extirpated or caused the severe decline of five slender Orcutt grass occurrences through construction activities and hydrological alterations (Griggs and Jain 1983, CNDDDB 2001). Agricultural conversion apparently eliminated the species from the type locality. Although the exact location of the type collection is not known, the general area was being used for crop fields and both irrigated and dry pastures as of 1987 (Stone *et al.* 1988). Urban development is continuing in the vicinity of Redding and could eliminate the remaining populations in that area.

A variety of other factors are contributing to the continued decline of slender Orcutt grass including off-road vehicle use, inappropriate livestock grazing, altered hydrology, and competition from other plants (Stone *et al.* 1988, Corbin and Schoolcraft 1989). Off-road vehicle use is a particular problem near Redding and in forested areas of the Modoc Plateau. According to Stone *et al.* (1988), "moderate" livestock grazing in spring is compatible with slender Orcutt grass but overstocking, summer grazing, and trampling pose threats to several occurrences. However, grazing may be necessary to control aggressive competitors such as the native species, pale spikerush (Witham *in litt.* 2000a). Altered hydrology contributes to the decline of slender Orcutt grass by creating conditions unsuitable for its germination, growth, or reproduction, and by promoting the growth of competing plant species.

Slender Orcutt Grass Unit Review

We conducted a regional review across the range of slender Orcutt grass to evaluate and select areas that are essential to the conservation of the species and that may require special management. Important factors we considered were the known presence of the species and the presence of the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1 A, B, C, D, E, F, G, H, and I, Modoc Plateau Unit, Plumas, Lassen, Shasta, Modoc, and Siskiyou Counties (23,266 ha (57,490 ac))

This unit is proposed as critical habitat for slender Orcutt grass because it contains almost 25 percent of all known occurrences of the species and

the vernal pool habitat remains inundated for sufficient periods of time to allow slender Orcutt grass to complete its life cycle. The species is found growing within Northern Basalt Flow vernal pools occurring on Gooval, Lasvar, Lasvar-Pitvar, and Nosoni soils that provide the primary constituent elements essential to the conservation of the species (CNDDDB 2002). These occurrences are all found on the Modoc Plateau, where they are located at higher elevations, and experience the coldest climatic conditions of any other areas throughout the species range. The occurrences are on Northern Basalt Flow vernal pools (CNDDDB 2002). This area represents the northern-most extent of the range of slender Orcutt grass, and is over 50 km (32 mi) from the nearest occupied areas to the south.

The boundaries of this unit were delineated by using SPOT imagery and elevation contours to include the open flat area associated with the vernal pool including the adjacent uplands that contribute to the filling and drying of the vernal pool where slender Orcutt grass occurs. The unit designates an area sufficient to maintain suitable periods of pool inundation, water quality, and soil moisture for slender Orcutt grass to germinate, grow, and reproduce.

The Modoc Plateau area is not threatened by urban development at this time due to its remote location, however off-road vehicle use and overgrazing may threaten some occurrences in this area (CNDDDB 2001). Additional sensitive species found within this unit include Bogg's Lake hedge-hyssop, and profuse flowered pogogyne (*Pogogyne floribunda*). Although the majority of land within this unit is located either on USFS (15,500 ha (38,750 ac)), NPS (58 ha (144 ac)), or BLM lands (2,754 ha (6,886 ac)). The California State Parks also has land within this unit (37 ha (92 ac)).

This unit for slender Orcutt grass consists of nine subunits largely within the volcanic plateau of northeastern California. The nine subunits are identified as the Lake Almanor, Crater Lake Mountain, Poison Lake, Badger Mountain, Lost Creek, Goose Valley, Long Valley, Cayton Creek, and Timbered Crater subunits. The Lake Almanor subunit is located in Plumas County, on the southwestern part of Lake Almanor along Humbug Humboldt Cross Road and State Route 89. The area extends from near the shoreline upslope to the watershed boundary. The land is owned by the USDA and managed by the USFS. The Crater Lake Mountain subunit is located along Route 44 and encompasses the northwestern portion of Crater Lake Mountain as well as

Grays and Harvey valleys. The watershed boundary was used to determine the extent of this subregion. The Poison Lake subunit north of State Route 44 near Pittville Road adjacent to South Cabin Reservoir and Ebey Lake. The western boundary is near Halls Flat Road. The Badger Mountain subunit is located north of Badger Mountain and east of State Route 89 and South of Potato Butte. Little Bunch Grass Meadow is included in this unit. The Lost Creek subunit is located south of Cinder Butte and west of the Hat Creek Rim. Lost Creek near Wilcox Road is within this subunit. The Goose Valley subunit is located in Shasta County northwest of the intersection of State Route 299 and Route 89 in Goose Valley north of Burney, California. The Long Valley subunit is located in Long Valley west of Black Ranch Road south of Long Valley Mountain and east of Lookout Mountain. The Cayton Creek subunit is located in Shasta County north of Cayton Valley and Lake Britton east of Route 89. The area includes the northwestern portion of the watershed boundary for Fort Mountain along Red Mountain Road. The subunit is located in the Shasta National Forest. The Timbered Crater subunit is located on the Shasta/Modoc/Siskiyou county border near Little Hot Springs Valley. The subunit includes the area adjacent to Timbered Crater up to the Whitehorse Mountains and Day Road. The Timbered Crater subunit includes an area which has been proposed to be designated by the BLM as a Research Natural Area for vernal pools.

Unit 2 A, B, and C, Stillwater Plains Unit, Shasta County (5,100 ha (12,601 ac))

This unit is proposed as critical habitat because it contains many occurrences of slender Orcutt grass (CNDDDB 2001) living within large vernal pool grassland areas that support aggregations or systems of hydrologically interconnected pools, swales, and other ephemeral wetlands and depressions within a matrix of surrounding uplands that together form hydrologically and ecologically functional units (EPA 1994, Holland 1998, Shasta County 2001).

This area is comprised of old alluvial terraces above the Sacramento River associated with Igo, Tuscan, Moda, and Redding soils (CNDDDB 2001), which provide vernal pool habitat for the species. These pool types provide the necessary timing and duration of inundation necessary for slender Orcutt grass growth, germination, and reproduction. This unit represents the northern extent of the species range in

the Sacramento Valley. The majority of the lands included within this unit are privately owned. Urban expansion from the city of Redding has greatly affected existing vernal pool habitats throughout this unit.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for slender Orcutt grass germination and reproduction. The BLM owns 33 ha (81 ac) in the unit, while the NRCS holds conservation easements or agreements on an additional 52 ha (130 ac) through its WRP program.

The Stillwater Plains Unit 2 contains three subunits. These are located in the area east and south of the city of Redding near the Redding Municipal Airport encompassing Stillwater Plains to the confluence of the Sacramento River and Cow Creek. This unit is also part of vernal pool fairy shrimp Unit 5 and vernal pool tadpole shrimp Unit 1. Other sensitive species occurring within this unit include Red Bluff dwarf rush, California linderiella, and Henderson's bent grass.

Unit 3, Inskip Hill, Tehama and Shasta Counties (20,446 ha (50,522 ac))

This unit is proposed as critical habitat for slender Orcutt grass because it supports occurrences of the species within vernal pools on Guenon, Inskip, Inks, and Toomes soils (CNDDDB 2002). The vernal pool habitats remain inundated for sufficient periods of time to allow the species to germinate, grow, and produce seed. The area supports over 40 percent of the known occurrences the species (CNDDDB 2002) and is important in maintaining a diversity of habitats for slender Orcutt grass. This unit contains large vernal pool complexes that represent some of the last remaining lower elevation vernal pool habitats in the northern Sacramento Valley. These habitats are important to maintain the geographical distribution of slender Orcutt grass in the area.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for slender Orcutt grass germination and reproduction.

Land ownership within this unit includes BLM (6,226 (15,384 ac)), CDFG

(52 ha (130 ac)), State Land Commission (380 ha (950 ac)). The CDFG administers approximately 17 ha (42 ac) and the TNC has conservation easements on 6,230 (15,575 ac) within this unit. The remaining lands included within this unit are privately owned and urban development east of Redding threatens the vernal pool habitats within this area. This unit occupies the area south of the Tehama/Shasta county line south to Sevenmile Creek near the Tuscan Buttes. The eastern boundary encompasses the vernal pool habitats along the lower elevation bordering the Sacramento River. The western boundary roughly follows the Sacramento River. Table Mountain west of the Sacramento River north of Paynes Creek and Red Bluff is included in this unit. This unit coincides within Unit 2 for vernal pool tadpole shrimp.

Unit 4, Vina Plains Unit, Tehama and Butte Counties (11,673 ha (28,845 ac))

This unit is proposed as critical habitat for slender Orcutt grass because it supports occurrences of the species within vernal pools on Tuscan loam and Inks soils (CNDDDB 2002) and the vernal pool habitats provide the necessary timing and length of inundation for slender Orcutt grass germination, growth, and reproduction. This area is over 160 km (100 mi) from the nearest area occupied by slender Orcutt grass to the south.

The boundaries of this unit were delineated by using SPOT imagery and elevation contours to include the open flat area associated with the vernal pool including the adjacent uplands that contribute to the filling and drying of the vernal pools where slender Orcutt grass occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for slender Orcutt grass to germinate and reproduce.

The majority of the lands included within this unit are privately owned. This unit contains TNC's 1862 ha (4,600 ac) Vina Plains preserve. The preserve contains over 300 species of plants, and diverse communities of aquatic invertebrates. Since the 1960s, the Vina Plains area has been the focus of a number of research projects, including long-term adaptive management and monitoring efforts evaluating the effects of grazing and fire on vernal pool plants (Griggs 2000). Much of the basic life history information known about slender Orcutt grass was collected at Vina Plains (e.g., Stone *et al.* 1988, Alexander and Schlising 1997). The results of this research have provided crucial information to guide management and monitoring of vernal

pool ecosystems and to identify factors which influence population dynamics of a number of endangered species, including slender Orcutt grass. In addition to TNC, the importance of vernal pool habitats in this area has been recognized by the CDFG, the Service, the EPA, the CNPS, the NRCS's WRP, and by researchers at the CSU at Chico, who have all supported research and conservation efforts for slender Orcutt grass and other vernal pool species within this unit. Property ownership and protection within this unit includes CDFG (0.4 ha (1 ac)), CDFG administered land (0.4 ha (1 ac)), TNC (77 ha (192 ac)), TNC easements (4,661 ha (11,653)), and private land under WRP easements or agreements (57 ha, 142 ac).

This unit for slender Orcutt grass occupies the area south of Toomes Creek, and north of Pine Creek and the Cana Highway. State Route 99 bisects this unit and the western boundary generally parallels the Southern Pacific Railway line. This unit is within Unit 7 for vernal pool fairy shrimp and Unit 3 for vernal pool tadpole shrimp, and includes part of Unit 1 for Conservancy fairy shrimp and Unit 1 for Hoover's spurge. The unit coincides with Unit 1 for hairy Orcutt grass and Unit 2 for Greene's tuctoria. Additional sensitive vernal pool species occurring in this unit include California linderiella, and Bogg's Lake hedge-hyssop.

Unit 5A and B, Bogg's Lake Unit, Clear Lake Area, Lake County (1,696 ha (4,191 ac))

This unit is proposed as critical habitat for slender Orcutt grass because it supports occurrences of the species within Northern Volcanic Ashflow vernal pools (Keeler-Wolf *et al.* 1998, CNDDDB 2002). This area represents the western extent of the slender Orcutt grass's range, and some of the last remaining vernal pool habitats in Lake County. This unit is over 135 km (84 mi) from the nearest units to the north and west. Isolated and peripheral populations such as this may have genetic characteristics essential to the overall long-term conservation of the species (*i.e.*, they may be different from other populations in other parts of its range) (Lesica and Allendorf 1995). This is the only unit which contains examples of Northern Volcanic Ash Flow vernal pools and has occurrences of slender Orcutt grass.

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species

occur, and maintain suitable periods of pool inundation, water quality, and soil moisture for slender Orcutt grass germination and reproduction.

The majority of lands within this unit are privately owned. TNC has protected the area around Bogg's Lake south of Clear Lake, but most of the area is not protected. Property ownership and protection within this unit includes CDFG (5 ha (13 ac)) and TNC (77 ha (192 ac)) lands. Threats to these subunits include conversion of rangeland to vineyards, overgrazing, erosion, draining, and urban expansion.

This unit consists of two subunits that are both located south of Clear Lake. The southernmost subunit includes Little High Valley. Other sensitive species found within this unit include Loch Lomond button-celery (*Eryngium constancei*), Burke's goldfields (*Lasthenia burkei*), Bogg's Lake hedge-hyssop, many-flowered navarretia (*Navarretia leucocephala* ssp. *pliantha*), few-flowered navarretia, and legeneere.

Unit 6, Southeast Sacramento Valley Unit, Rancho Cordova, Sacramento County (8,853 ha (21,875 ac))

This unit is proposed as critical habitat for slender Orcutt grass because it supports occurrences of the species within vernal pools on Redding soils and is the southern extent of the species range (CNDDDB 2001, Holland 1998). This unit is over 170 km (105 mi) from the nearest units to the north, and 100 km (62 mi) from the nearest unit to the west. Isolated and peripheral populations such as this may have genetic characteristics essential to the overall long-term conservation of the species (*i.e.*, they may be different from more central populations) (Lesica and Allendorf 1995).

The boundaries of this unit were delineated to include the interconnected pools, swales, and associated uplands mapped by Holland (1998) that contribute to the filling and drying of the vernal pools where the species occur, and to maintain suitable periods of pool inundation, water quality, and soil moisture for slender Orcutt grass germination and reproduction.

This unit occupies the area southeast of Mather Field of Laguna Creek and north of the Sacramento and San Joaquin county line along Dry Creek. The eastern boundary is near Scott Road. The western limit is bounded by urban and agricultural areas near the cities of Galt and Elk Grove. This unit also is included in Unit 8 for vernal pool tadpole shrimp and Unit 13 for vernal pool fairy shrimp and coincides with Unit 2 for Sacramento Orcutt grass.

Other sensitive vernal pool species located within this unit include California linderiella, legeneere, Bogg's Lake hedge-hyssop, Ahart's dwarf rush, and western spadefoot toad. All the lands within this unit are privately owned.

Solano Grass Criteria

In proposing critical habitat units for Solano Grass we evaluated the life history and current distribution of the species, the primary constituent elements, and the current threats to the species. This information allowed us to determine which areas are likely to contribute to the conservation Solano grass.

Solano grass is only known from two locations, Jepson Prairie in Solano County, (consisting of two CNDDDB occurrences, including the type locality) and the Davis Communications Annex in Yolo County. Solano grass is presumed to remain extant at the type locality, although only four individual plants have been found within the last decade, all in 1993 (CNDDDB 2001). The decline of this species at Olcott Lake is attributed to two primary causes—hydrological alterations (Griggs *in litt.* 2000) and over collection (K. Fuller USFWS pers. comm. 1998). Competition, livestock grazing, and off-road vehicle activity may have contributed to its decline (Service 1985c, Witham *in litt.* 1992, CNDDDB 2001). The hydrology has been affected by the nearby road, Cook Lane, which functions like a dam to hold water in the lake, artificially increasing the water level and duration of inundation (Griggs *in litt.* 2000). The Yolo County habitat has been damaged by application of herbicides and salt (Witham *in litt.* 2000a). An undetermined number of Solano grass occurrences are presumed to have been extirpated by agricultural conversion before they were documented (Service 1985c, CDFG 1991).

Competition from aggressive plants poses a potential threat to Solano grass at all three known sites. The primary competitors are lippia at Olcott Lake (Witham *in litt.* 2000a), alkali mallow and swamp grass at the other site in Solano County (CNDDDB 2001), and broad-leaved pepper-weed (*Lepidium latifolium*) in Yolo County (K. Fuller 2002 pers. comm.). Grazing apparently is detrimental to Solano grass but likely depends on the number and type of livestock and the season of use. Exclusion of horses from the Olcott Lake site was followed by an increase in population size (Service 1985c). At last report, sheep still grazed the other Solano County population (CNDDDB 2001).

A number of factors threaten the Yolo County population in addition to competition, including herbicide runoff and soil disturbance from the creation and maintenance of fire breaks and borrow pits (CNDDDB 2001, Witham *in litt.* 2000a). The site is not protected but does occur on DOD land.

Solano Grass Unit Review

We conducted a regional review across the range of Solano grass to evaluate and select areas that are essential to the conservation of the species and that may require special management. Important factors we considered were the known presence of the species and the presence of the primary constituent elements essential to the conservation of the species. A specific description of each area is outlined below.

Unit 1, Davis Communications Annex and Grasslands Area Unit, Yolo County (192 ha (474 ac))

This unit is proposed as critical habitat for Solano grass because it supports the largest extant occurrence of the species within Northern Claypan vernal pools on Pescadero soils (CNDDDB 2002). The unit boundary was drawn to include the vernal pool complex mapped by Holland (1998) and Yolo County Parks (2001) where Solano grass is known to occur. This vernal pool complex maintains suitable periods of pool inundation, water quality, and soil moisture for Solano grass germination, growth and reproduction, and dispersal, but not necessarily every year. This unit represents the northern extent of the range of Solano grass, and is one of only two areas where the species is known to occur. Solano grass in this unit is threatened by altered hydrology, contamination, competition with invasive plant species, and surface disturbances such as discing. This unit is designated to encourage that special management actions be taken, such as grazing, fencing, and the implementation of a targeted management and monitoring plan be implemented to prevent the decline of Solano grass at this location (Yolo County Parks 2001).

This unit is located southeast of the City of Davis and south of the South Fork of Putah Creek. This unit's western boundary lies along the border between Solano and Yolo counties. This unit represents Unit 2 for Colusa grass and Unit 10 for vernal pool tadpole shrimp. Other rare vernal pool species found in this unit include alkali milk-vetch. This area is currently being addressed by local conservation planning efforts and

contains land owned by Yolo County and the DOD (130 ha (321 ac)).

Unit 2, Jepson Prairie Unit, Solano County (7,153 ha (17,675 ac))

This unit is designated as critical habitat for Solano grass because it supports occurrences of the species within large playa vernal pools on the Pescadero soil series which provide habitat for Solano grass (USDA 2001, Holland 1998, Solano County Water Agency 2000, Solano County Farmlands and Open Space 2000, CNDDDB 2002). This area represents the largest contiguous area of habitat remaining for the species, and contains two of the three known occurrences of Solano grass, although one of these occurrences has not been observed since 1993. Vernal pool habitats within the greater Jepson Prairie grassland area that are not likely to support Solano grass occurrences were not included within this unit. This unit represents the southern extent of Solano grass range.

The Jepson Prairie Unit for Solano grass is a portion of the greater Jepson Prairie grassland area, one of the most pristine, intact vernal pool ecosystems remaining in the State of California. Jepson Prairie contains large, playa-like vernal pools which may be over several acres in size, including the 32 ha (80 ac) Olcott Lake. These larger pools often occur in complexes with smaller pools and hogwallow depressions. This unit includes the Jepson Prairie Preserve, jointly managed by the Solano County Farmlands and Open Space Foundation and the UC Reserve System. Jepson Prairie is the target of ongoing conservation planning and active management. As part of the UC Reserve System, this area also provides critical research opportunities for scientists to study vernal pool species, including Solano grass. Solano grass has experienced unexplained declines at Olcott Lake in Jepson Prairie, and research investigating the cause of this decline is essential to ensure the recovery of Solano grass. The unit also contains Ecological Reserves totaling 248 ha (620 ac) owned and approximately 64 ha (161 ac) administered by CDFG. Additional lands are owned by the Travis Air Force Base (93 ha (233 ac)), and the State Land Commission (7 ha (17 ac)). NRCS also holds conservation easements or agreements on 436 ha (1,090 ac) of private land in the unit through the WRP program. Within the greater Jepson Prairie grassland area, existing vernal pools are threatened by agricultural conversion, landfill expansion, power plant construction, and utility maintenance.

This unit is situated east of the City of Fairfield, south of the City of Dixon, and north of the Montezuma Hills and the confluence of the Sacramento and San Joaquin rivers. This unit coincides with Unit 2 for Colusa grass. This unit is encompassed by Unit 3 for Conservancy fairy shrimp, Unit 11 for vernal pool tadpole shrimp and Unit 16 for vernal pool fairy shrimp. This unit also supports a diverse community of plants and animals, including the only known occurrence of delta green ground beetle, and occurrences of California tiger salamander, alkali milk-vetch, Bogg's Lake hedge-hyssop, legenerie, California linderiella, and midvalley fairy shrimp.

Additional Considerations

In defining critical habitat boundaries, we made an effort to avoid developed areas, such as towns and other similarly developed lands, and intensively farmed lands that are unlikely to contribute to conservation of the species. However, the resolution of the SPOT imagery and the vernal pool and species occurrence information we used did not allow us to identify these areas at a sufficiently fine scale to exclude all developed areas, such as towns, housing developments, or other lands unlikely to contain the primary constituent elements. Existing features and structures within the boundaries of the mapped units, such as buildings, roads, aqueducts, railroads, airport runways, other paved areas, lawns, landscaped areas, and most intensively farmed areas, and other urban areas, will not contain one or more of the primary constituent elements. Federal actions limited to those areas, therefore, would not trigger section 7 consultation, unless they affect the species and/or primary constituent elements in adjacent critical habitat.

Effects of Critical Habitat Designation

Section 7 Consultation

Section 7(a) of the Act requires Federal agencies, including the Service, to ensure that actions they fund, authorize, permit, or carry out do not destroy or adversely modify critical habitat. Destruction or adverse modification of critical habitat occurs when a Federal action directly or indirectly alters critical habitat to the extent it appreciably diminishes the value of critical habitat for the conservation of the species. Individuals, organizations, States, local governments, and other non-Federal entities are affected by the designation of critical habitat only if their actions occur on Federal lands, require a Federal permit,

license, or other authorization, or involve Federal funding.

Section 7(a) of the Act requires Federal agencies, including the Service, to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened, and with respect to its critical habitat, if any is designated or proposed. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with us on any action that is likely to jeopardize the continued existence of a species proposed for listing, or result in destruction or adverse modification of proposed critical habitat. Conference reports provide conservation recommendations to assist the action agency in eliminating conflicts that may be caused by the proposed action. The conservation measures in a conference report are advisory.

We may issue a formal conference report, if requested by the Federal action agency. Formal conference reports include an opinion that is prepared according to 50 CFR 402.14, as if the species was listed or critical habitat designated. We may adopt the formal conference report as the biological opinion when the species is listed or critical habitat designated, if no substantial new information or changes in the action alter the content of the opinion (50 CFR 402.10(d)).

If a species is listed or critical habitat is designated, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Through this consultation, the Federal action agency would ensure that the permitted actions do not destroy or adversely modify critical habitat.

If we issue a biological opinion concluding that a project is likely to result in the destruction or adverse modification of critical habitat, we also provide "reasonable and prudent alternatives" to the project, if any are identifiable. Reasonable and prudent alternatives are defined at 50 CFR 402.02 as alternative actions identified during consultation that can be implemented in a manner consistent with the intended purpose of the action, that are consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and

technologically feasible, and that the Director believes would avoid the likelihood of jeopardizing the continued existence of listed species, or resulting in the destruction or adverse modification of critical habitat. Reasonable and prudent alternatives can vary from slight project modification to extensive redesign or relocation of the project.

Regulations at 50 CFR 402.16 require Federal agencies to reinitiate consultation on previously reviewed actions under certain circumstances, including instances where critical habitat is subsequently designated and the Federal agency has retained discretionary involvement, or control has been retained, or is authorized by law. Consequently, some Federal agencies may request reinitiation of consultation or conference with us on actions for which formal consultations have been completed, if those actions may affect designated critical habitat or adversely modify or destroy proposed critical habitat.

Activities on Federal lands that may jeopardize vernal pool crustaceans or vernal pool plants or adversely modify their critical habitat will require section 7 consultation. Activities on private lands that require a permit from a Federal agency, such as a permit from the Corps under section 404 of the Clean Water Act (33 U.S.C. 1344 *et seq.*), a section 10(a)(1)(B) of the Act permit from the Service, or any other activity requiring Federal action (*i.e.*, funding or authorization from the Federal Highways Administration or Federal Emergency Management Agency) will also continue to be subject to the section 7 consultation process. Federal actions not affecting listed species or critical habitat, and actions on non-Federal lands that are not federally funded, authorized, or permitted do not require section 7 consultation. Not all of the areas within these units are capable of supporting vernal pool crustaceans or vernal pool plants or their primary constituent elements, and such areas would not be subject to section 7 consultation.

To properly portray the effects of critical habitat designation, we must first compare the section 7 requirements for actions that may affect critical habitat with the requirements for actions that may affect a listed species. Section 7 ensures that actions funded, authorized, or carried out by Federal agencies are not likely to jeopardize the continued existence of a listed species, or destroy or adversely modify the listed species' critical habitat. Actions likely to jeopardize the continued existence of a species are those that would

appreciably reduce the likelihood of the species' survival and recovery. Actions likely to "destroy or adversely modify" critical habitat are those that would appreciably reduce the value of critical habitat for the survival and recovery of the listed species.

Common to both definitions is an appreciable detrimental effect on the recovery of a listed species. Given the similarity of these definitions, actions likely to destroy or adversely modify critical habitat would almost always result in jeopardy to the species concerned, particularly when the species is present in the area of the proposed action. When the species is present in an area, designation of critical habitat for vernal pool crustaceans or vernal pool plants is not likely to result in regulatory requirements above those already in place due to the presence of the listed species. When the species is not present in an area, designation of critical habitat for vernal pool crustaceans or vernal pool plants may result in an additional regulatory burden when a Federal nexus exists.

Section 4(b)(8) of the Act requires us to evaluate briefly and describe, in any proposed or final regulation that designates critical habitat, those activities involving a Federal action that may adversely modify such habitat or that may be affected by such designation. Activities that may destroy or adversely modify critical habitat would be those that alter the primary constituent elements to the extent that the value of critical habitat for the conservation of vernal pool crustaceans or vernal pool plants is appreciably reduced. We note that such activities may also jeopardize the continued existence of the species.

Activities that, when carried out, funded, or authorized by a Federal agency may directly or indirectly destroy or adversely modify critical habitat for vernal pool crustaceans or vernal pool plants include, but are not limited to—

(1) Any activity, including the regulation of activities by the Corps under section 404 of the Clean Water Act or activities carried out by or authorized by the EPA, that could alter the suitability of the watershed or water quality or quantity to support vernal pool crustaceans or vernal pool plants, or any activity that adversely affects the natural hydrologic function of the vernal pool system and/or ephemeral pond or depression;

(2) Road construction and maintenance, right-of-way designation, and regulation of agricultural activities, or any activity funded or carried out by

the Department of Transportation or Department of Agriculture that results in discharge of dredged or fill material, excavation, or mechanized land clearing of ephemeral and/or vernal pool basins;

(3) Sale or exchange of lands by a Federal agency to a non-Federal entity which could foreseeably impact the primary constituent elements of critical habitat;

(4) Regulation, relicensing, and operation of damming or other water impoundments by the BOR, Corps, or Federal Energy Regulatory Commission (FERC) that inundate critical habitat for vernal pool crustaceans;

(5) Regulation by the Federal Aviation Administration (FAA) of airport improvement or maintenance activities that could foreseeably impact the primary constituent elements of critical habitat;

(6) Licensing of construction of communication sites by the Federal Communications Commission (FCC) on lands containing critical habitat;

(7) Funding of construction or development activities by the Department of Housing and Urban Development (HUD) or other agencies that destroy, fragment, or degrade suitable critical habitat;

(8) Military training and maneuvers on applicable DOD lands which could foreseeably impact the primary constituent elements of critical habitat;

(9) Signing of contracts to deliver water by the BOR in situations where those deliveries could foreseeably impact the primary constituent elements of critical habitat; and

(10) Promulgation of a land use plan by a Federal agency such as the BLM, USFS, or DOD that may alter management practices for critical habitat.

If you have questions regarding whether specific activities will constitute adverse modification of critical habitat in California, contact the Field Supervisor, Sacramento Fish and Wildlife Office (see **ADDRESSES** section). If the critical habitat occurs in Oregon, contact the Field Supervisor, Oregon Fish and Wildlife Office, 2600 S.E. 98th Avenue, Portland, OR 97266. Requests for copies of the regulations on listed wildlife, and inquiries about prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Branch of Endangered Species, 911 N.E. 11th Ave, Portland, OR 97232 (telephone 503/231-2063; facsimile 503/231-6243).

Section 3(5)(A) Special Management Considerations

Section 3(5)(A) of the Act defines critical habitat to be (among other

things) areas within the current range of the species "which may require special management considerations".

Accordingly, areas which will not require such special considerations are not critical habitat. For areas in the current range of the species, we first determine whether the area contains the physical and biological features essential to the conservation of the species and then determine whether the area has or needs special management or protection. Additional special management is not required if adequate management or protection is already in place. Adequate special management or protection is provided by a legally operative plan or agreement that addresses the maintenance and improvement of the primary constituent elements important to the species, and manages for the long-term conservation of the species. We use the following three criteria to determine if a plan provides adequate special management or protection: (1) A current plan or agreement must be complete and provide sufficient conservation benefit to the species, (2) the plan or agreement must provide assurances that the conservation management strategies will be implemented, and (3) the plan or agreement must provide assurances that the conservation management strategies will be effective, *i.e.*, provide for periodic monitoring and revisions as necessary. If all of these criteria are met, then the lands covered under the plan would no longer meet the definition of critical habitat.

The Sikes Act Improvements Act of 1997 (Sikes Act) requires each military installation that includes land and water suitable for the conservation and management of natural resources to complete, by November 17, 2001, an Integrated Natural Resources Management Plan (INRMP). An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found there. Each INRMP includes an assessment of the ecological needs on the installation, including needs to provide for the conservation of listed species; a statement of goals and priorities; a detailed description of management actions to be implemented to provide for these ecological needs; and a monitoring and adaptive management plan. We consult with the military on the development and implementation of INRMPs for installations with listed species. We believe military bases that have completed and approved INRMPs that address the needs of the species generally do not meet the definition of

critical habitat discussed above, as they require no additional special management or protection.

We evaluated the status of INRMPs on DOD lands that were within the proposed critical habitat to determine whether any INRMPs met the special management criteria. To date, no DOD installation has completed a final INRMP that provides for sufficient conservation management and protection for the vernal pool crustaceans and plants. All DOD lands that contain the physical and biological features essential for the conservation of one of the vernal pool species have been included in the proposed designation of critical habitat for that species. Although no INRMPs for the vernal pool crustaceans and plants are currently in place on DOD lands within the proposed critical habitat, we will continue to work with the military bases to develop INRMPs to meet the special management criteria to preclude the final designation of critical habitat on their lands.

Exclusions Under Section 4(b)(2)

Subsection 4(b)(2) of the Act allows us to exclude from critical habitat designation areas where the benefits of exclusion outweigh the benefits of designation, provided the exclusion will not result in the extinction of the species. However, prior to excluding these areas from critical habitat, we believe that it is best to fully and specifically describe the areas in the proposed designation, discuss our intent and rationale as to why we believe the areas should be excluded from designated critical habitat, and solicit public comment on the exclusion of these areas.

We believe the proposed Skunk Hollow critical habitat (Unit 35) in Riverside County may warrant exclusion from the final designation of critical habitat under section 4(b)(2) of the Act based on the special management considerations and protections afforded the vernal pool habitat through several approved and legally operative HCPs. We believe that in most instances the benefits of excluding legally operative HCPs from the critical habitat designations will outweigh the benefits of including them. The following represents our rationale for proposing to exclude the Skunk Hollow critical habitat unit (Unit 35) from the final designated critical habitat.

(1) Benefits of Exclusion

The benefits of excluding HCPs include relieving landowners, communities and counties of any

additional regulatory burden that might be imposed by critical habitat. This benefit is particularly compelling given the past representations on the part of the Service that once an HCP is negotiated and approved by us after public comment, activities consistent with the plan will satisfy the requirements of the Endangered Species Act. Many HCPs, particularly large regional HCPs, take many years to develop and, upon completion, become regional conservation plans that are consistent with the recovery of covered species. Imposing an additional regulatory review after HCP completion may jeopardize conservation efforts and partnerships in many areas and could be viewed as a disincentive to those developing HCPs. Excluding HCPs provides the Service an opportunity to streamline regulatory compliance, and provides regulatory certainty for HCP participants.

Another critical benefit of excluding HCPs is that it would encourage the continued development of partnerships with HCP participants, including states, local governments, conservation organizations, and private landowners, that together can implement conservation actions we would be unable to accomplish. By excluding areas covered by HCPs from critical habitat designation, we clearly maintain our commitments, preserve these partnerships, and, we believe, set the stage for more effective conservation actions in the future.

(2) Benefits of Inclusion

The benefits of including HCPs in critical habitat are normally small. The principal benefit of any designated critical habitat is that activities in such habitat that may affect it require consultation under section 7 of the Act. Such consultation would ensure that adequate protection is provided to avoid adverse modification of critical habitat. Where HCPs are in place, our experience indicates that this benefit is small or non-existent. Currently approved and permitted HCPs are already designed to ensure the long-term survival of covered species within the plan area. Where we have an approved HCP, lands that we ordinarily would define as critical habitat for covered species will normally be protected in reserves and other conservation lands by the terms of the HCPs and their Implementing Agreements. These HCPs and Implementing Agreements include management measures and protections for conservation lands designed to protect, restore, and enhance their value as habitat for covered species.

In addition, an HCP application must itself be consulted upon. While this consultation will not look specifically at the issue of adverse modification of critical habitat, unless critical habitat has already been designated within the proposed plan area, it will look at the very similar concept of jeopardy to the listed species in the plan area. Because HCPs, particularly large regional HCPs, address land use within the plan boundaries, habitat issues within the plan boundaries will have been thoroughly addressed in the HCP and through the consultation on the HCP. Our experience is also that, under most circumstances, consultations under the jeopardy standard will reach the same result as consultations under the adverse modification standard. Implementing regulations (50 CFR 402.02) define "jeopardize the continued existence of" and "destruction or adverse modification of" in virtually identical terms. "Jeopardize the continued existence of" means to engage in an action "that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species." Destruction or adverse modification means an "alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species." Common to both definitions is an appreciable detrimental effect on both survival and recovery of a listed species, in the case of critical habitat, by reducing the value of the habitat so designated. Thus, actions satisfying the standard for adverse modification are nearly always found to also jeopardize the species concerned, and the existence of a critical habitat designation does not materially affect the outcome of consultation. Additional measures to protect the habitat from adverse modification are not likely to be required.

Further, HCPs typically provide for greater conservation benefits to a covered species than section 7 consultations because HCPs assure the long-term protection and management of a covered species and its habitat, and funding for such management through the standards found in the 5 Point Policy for HCPs (64 FR 35242) and the HCP No Surprises regulation (63 FR 8859). Such assurances are typically not provided by section 7 consultations which, in contrast to HCPs, often do not commit the project proponent to long-term special management or protections. Thus, a consultation typically does not accord the lands it covers the extensive benefits an HCP provides. The

development and implementation of HCPs provide other important conservation benefits, including the development of biological information to guide conservation efforts and assist in species recovery, and the creation of innovative solutions to conserve species while allowing for development. The education benefits of critical habitat, including informing the public of areas that are important for long-term survival and conservation of the species, are essentially the same as those that would occur from the public notice and comment procedures required to establish an HCP, as well as the public participation that occurs in the development of many regional HCPs. For these reasons, then, we believe, that designation of critical habitat has little benefit in areas covered by HCPs, provided that the HCP and its associated Implementing Agreement are legally operative, and that the HCP specifically and adequately covers the species for which critical habitat is being designated.

We have reviewed and evaluated HCPs currently approved and being properly and legally implemented within the areas being proposed for critical habitat for the vernal pool crustaceans and plants. Based on this evaluation, we find that the benefits of exclusion outweigh the benefits of designating the Skunk Hollow vernal pool (Unit 35) as critical habitat. The Skunk Hollow vernal pool basin consists of a single, large vernal pool and its essential associated watershed in western Riverside County. Several federally listed species have been documented from the Skunk Hollow vernal pool basin. These include the threatened vernal pool fairy shrimp (*Simovich in litt* 2001), the endangered Riverside fairy shrimp (*Streptocephalus woottoni*) (Service 2001), the threatened spreading navarretia (*Navarretia fossalis*), and the endangered California Orcutt grass (*Orcuttia californica*) (Service 1998). The vernal pool complex and watershed is currently protected as part of a reserve established within an approved mitigation bank in the Rancho Bella Vista HCP area and as part of the conservation measures contained in the Assessment District 161 Subregional HCP. While neither HCP include vernal pool fairy shrimp as a covered species, both HCPs provide protection for the vernal pool complex and its associated watershed in perpetuity. Further, the HCPs address the endangered Riverside fairy shrimp as a covered species. We believe that the management and protections afforded the vernal pool complex and the Riverside fairy shrimp

are adequate for the long-term conservation of this complex and this species, and to preserve the partnerships that we have developed with the local jurisdiction and project proponents in the development of these HCPs, we excluded the Skunk Hollow vernal pool complex from critical habitat for the Riverside fairy shrimp. We did not and still do not believe that this exclusion from critical habitat will result in the extinction of this Riverside fairy shrimp.

Even though the two HCPs do not have vernal pool fairy shrimp listed as a covered species, we believe that the protections and management afforded the Skunk Hollow vernal pool complex and the other listed vernal pool species through the terms and conditions of those HCPs are adequate to ensure the long-term conservation of vernal pool fairy shrimp as well. Therefore, as with the Riverside fairy shrimp, we believe that the benefits of the exclusion of the Skunk Hollow vernal pool complex from critical habitat for vernal pool fairy shrimp outweighs the benefit of its inclusion. Additionally, we do not believe that this exclusion would result in the extinction of vernal pool fairy shrimp.

Several HCP efforts are now under way that will address the conservation needs of the vernal pool crustaceans and plants in areas we propose as critical habitat. We have worked and continue to work closely with the HCP proponents to adequately address the conservation needs of these species within the boundaries of the HCPs. In the event that future HCPs, covering any of the vernal pool crustaceans or plants are developed within the boundaries of designated critical habitat, we will work with applicants to ensure that the HCPs provide for protection and management of habitat areas essential for the conservation of those species by either directing development and habitat modification to nonessential areas or appropriately modifying activities within essential habitat areas so that such activities will not destroy or adversely modify the primary constituent elements. The HCP development process provides an opportunity for more intensive data collection and analysis regarding the use of particular habitat areas by vernal pool crustaceans and plants. The process also enables us to conduct detailed evaluations of the importance of such lands to the long-term survival of these species in the context of constructing a biologically configured system of interlinked habitat blocks. We fully expect that HCPs undertaken by local jurisdictions (*e.g.*, counties, cities)

and other parties will identify, protect, and provide appropriate management for those specific lands within the boundaries of the plans that are essential for the long-term conservation of the species. We believe and fully expect that our analyses of these proposed HCPs and proposed permits under section 7 of the Act will show that covered activities carried out in accordance with the provisions of the HCPs and biological opinions will not result in destruction or adverse modification of critical habitat. We will provide technical assistance and work closely with applicants with respect to HCPs currently under development and future HCPs to identify lands essential for the long-term conservation of the vernal pool crustaceans and plants and appropriate management for those lands. The minimization and mitigation measures provided under these HCPs are expected to protect the essential habitat lands proposed as critical habitat in this rule. If an HCP that addresses any vernal pool crustacean or plant as a covered species is ultimately approved, we will reassess the critical habitat boundaries in light of the HCP. We intend to undertake this review when the HCP is approved, but funding and priority constraints may influence the timing of such a review. Should additional information become available that changes our analysis of the benefits of excluding any of these (or other) areas compared to the benefits of including them in the critical habitat designation, we may revise this proposed designation accordingly. Similarly, if new information indicates any areas we are proposing now should not be included in the critical habitat designation because they no longer meet the definition of critical habitat, we may revise this proposed critical habitat designation.

Economic Analysis

Section 4(b)(2) of the Act requires us to designate critical habitat on the basis of the best scientific and commercial data available, and to consider the economic and other relevant impacts of designating a particular area as critical habitat. We may exclude areas from critical habitat upon a determination that the benefits of such exclusions outweigh the benefits of specifying such areas as critical habitat. We cannot exclude such areas from critical habitat when such exclusion will result in the extinction of the species. We will conduct an analysis of the economic impacts of designating these areas as critical habitat prior to a final determination. When completed, we will announce the availability of the

draft economic analysis with a notice in the **Federal Register**, and we will open a public comment period on the draft economic analysis and re-open the comment period on the proposed rule at that time.

Public Comments Solicited

We intend that any final action resulting from this proposal will be as accurate and effective as possible. Therefore, we solicit comments or suggestions from the public, other concerned governmental agencies, the scientific community, industry, or any other interested party concerning this proposed rule. We particularly seek comments concerning:

(1) The reasons why any habitat should or should not be determined to be critical habitat as provided by section 4 of the Act, including whether the benefits of designation will outweigh any threats to the species due to designation and whether areas under consideration require additional special management;

(2) Specific information on the amount and distribution of any of the vernal pool crustaceans or vernal pool plants and what habitat is essential to the conservation of these species and why;

(3) Land use designations and current or planned activities in the subject areas and their possible impacts on proposed critical habitat; in particular, in Oregon, we seek information related to potential of selected parcels to contribute to the species recovery, considering their zoning, adjacent land uses, watershed integrity, and potential for edge effects (related to shape of parcel);

(4) Any foreseeable economic or other impacts resulting from the proposed designation of critical habitat, in particular, any impacts on small entities or families;

(5) Economic and other values associated with designating critical habitat for vernal pool crustaceans and vernal pool plants such as those derived from non-consumptive uses (*e.g.*, hiking, camping, bird-watching, enhanced watershed protection, improved air quality, increased soil retention, "existence values," and reductions in administrative costs);

(6) Whether any areas should be excluded pursuant to section 4(b)(2); and

(7) Whether our approach to critical habitat designation could be improved or modified in any way to provide for greater public participation and understanding, or to assist us in accommodating public concern and comments.

If you wish to comment on this proposed rule, you may submit your comments and materials by any one of several methods (see **ADDRESSES**). Please submit electronic mail comments as an ASCII file and avoid the use of special characters and any form of encryption. Please also include "Attn: [RIN number]" and your name and return address in your electronic message. Please note that the electronic address fw1_vernalpool@fws.gov will be closed out at the termination of the public comment period. If you do not receive a confirmation from the system that we have received your electronic message, contact us directly by calling our Sacramento Fish and Wildlife Office at phone number 916/414-6600.

Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the rulemaking record, which we will honor to the extent allowable by law. In some circumstances, we would withhold from the rulemaking record a respondent's identity, as allowable by law. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. However, we will not consider anonymous comments. To the extent consistent with applicable law, we will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety. Comments and materials received will be made available for public inspection, by appointment, during normal business hours at the above address.

Peer Review

In accordance with our policy published on July 1, 1994 (59 FR 34270), we will solicit the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of such review is to ensure listing decisions are based on scientifically sound data, assumptions, and analyses. We will send these peer reviewers copies of this proposed rule immediately following publication in the **Federal Register**. We will invite these peer reviewers to comment, during the public comment period, on the specific assumptions and conclusions regarding the proposed designation of critical habitat.

We will consider all comments and information received during the 120-day public comment period on this proposed rule during preparation of a

final rulemaking. Accordingly, the final decision may differ from this proposal.

Public Hearings

The Act provides for one or more public hearings on this proposal, if requested. Requests for public hearings must be made at least 15 days prior to the close of the public comment period. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings in the **Federal Register** and local newspapers at least 15 days before the first hearing is held.

Clarity of the Rule

Executive Order 12866 requires each agency to write regulations and notices that are easy to understand. We invite your comments on how to make this proposed rule easier to understand, including answers to questions such as the following: (1) Are the requirements in the proposed rule clearly stated? (2) Does the proposed rule contain technical language or jargon that interferes with the clarity? (3) Does the format of the proposed rule (grouping and order of sections, use of headings, paragraphing, etc.) aid or reduce its clarity? (4) Is the description of the proposed rule in the **SUPPLEMENTARY INFORMATION** section of the preamble helpful in understanding the proposed rule? What else could we do to make the proposed rule easier to understand?

Send a copy of any comments that concern how we could make this rule easier to understand to: Office of Regulatory Affairs, Department of Interior, Room 7229, 1849 C Street, NW., Washington, DC 20240. You may e-mail your comments to this address: Exsec@ios.doi.gov.

Required Determinations

Regulatory Planning and Review

In accordance with Executive Order 12866, this document is a significant rule and was reviewed by the Office of Management and Budget (OMB). The Service is preparing a draft economic analysis of this proposed action. The Service will use this analysis to meet the requirement of section 4(b)(2) of the ESA to determine the economic consequences of designating the specific areas as critical habitat and excluding any area from critical habitat if it is determined that the benefits of such exclusion outweigh the benefits of specifying such areas as part of the critical habitat, unless failure to designate such area as critical habitat will lead to the extinction of any of the vernal pool species included in this rule. This analysis will be available for public comment before finalizing this

designation. The availability of the draft economic analysis will be announced in the **Federal Register**.

Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*)

This discussion is based upon the information regarding potential economic impact that is available to the Service at this time. This assessment of economic effect may be modified prior to final rulemaking based upon development and review of the economic analysis being prepared pursuant to section 4(b)(2) of the ESA and E.O. 12866. This analysis is for the purposes of compliance with the Regulatory Flexibility Act and does not reflect the position of the Service on the type of economic analysis required by *New Mexico Cattle Growers Assn. v. U.S. Fish & Wildlife Service* 248 F.3d 1277 (10th Cir. 2001).

Under the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (*i.e.*, small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. SBREFA amended the Regulatory Flexibility Act to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities. SBREFA also amended the RFA to require a certification statement. We are hereby certifying that this proposed rule will not have a significant economic impact on a substantial number of small entities. The following discussion explains our rationale for making this assertion.

According to the Small Business Administration (<http://www.sba.gov/size/>), small entities include small organizations, such as independent non-profit organizations, and small governmental jurisdictions, including school boards and city and town governments that serve fewer than 50,000 residents, as well as small businesses. Small businesses include manufacturing and mining concerns with fewer than 500 employees, wholesale trade entities with fewer than 100 employees, retail and service

businesses with less than \$5 million in annual sales, general and heavy construction businesses with less than \$27.5 million in annual business, special trade contractors doing less than \$11.5 million in annual business, and agricultural businesses with annual sales less than \$750,000. To determine if potential economic impacts to these small entities are significant, we consider the types of activities that might trigger regulatory impacts under this rule as well as the types of project modifications that may result. In general, the term "significant economic impact" is meant to apply to a typical small business firm's business operations.

In determining whether this rule could "significantly affect a substantial number of small entities", the economic analysis first determines whether critical habitat could potentially affect a "substantial number" of small entities in counties supporting critical habitat areas. While SBREFA does not explicitly define "substantial number," the Small Business Administration, as well as other Federal agencies, have interpreted this to represent an impact on 20 percent or greater of the number of small entities in any industry. In some circumstances, especially with critical habitat designations of limited extent, we may aggregate across all industries and consider whether the total number of small entities affected is substantial. In estimating the numbers of small entities potentially affected, we also considered whether their activities have any Federal involvement. Designation of critical habitat only affects activities conducted, funded, or permitted by Federal agencies. Some kinds of activities are unlikely to have any Federal involvement and so will not be affected by critical habitat designation.

Designation of critical habitat only affects activities conducted, funded, or permitted by Federal agencies; non-Federal activities are not affected by the designation. In areas where the species are present, Federal agencies are already required to consult with us under section 7 of the Act on activities that they fund, permit, or implement that may affect vernal pool crustaceans and plants for whom designation of critical habitat is proposed. If this critical habitat designation is finalized, Federal agencies also must ensure, also through consultation with us, that their activities do not destroy or adversely modify designated critical habitat. However, for the reasons discussed above, we do not believe this will result in any additional regulatory burden on Federal agencies or their applicants.

In areas that we are proposing to designate as critical habitat where occupancy status is currently unknown, but is presumed to be likely, a potential does exist that designation as critical habitat would trigger additional Federal review for activities having a Federal nexus (*e.g.*, funded, permitted, authorized, *etc.*). We base this determination upon the present and ongoing regulatory framework in which the Corps consults with us under section 7 of the Act in the vast majority of cases where their actions may affect vernal pools. These section 7 consultations are currently precipitated by either the known or presumed occupancy of one or more of the vernal pool crustaceans or plants addressed in this rule. In those rare circumstances where the Corps does not consult with us under section 7 of the Act, we believe that an HCP would still be required, based on known or a high likelihood of occupancy. Any change or deviation in the present regulatory climate is purely speculative at this time. Therefore, we do not expect the final designation of critical habitat as proposed in this rule to substantially increase the regulatory or economic burden on project proponents beyond that which is presently required through the likely presence of one or more listed species, where the necessary primary constituent elements are present. As a result of this minimal increase in the regulatory or economic burdens on any project proponents, we do not believe that this proposed designation of critical habitat for the vernal pool crustaceans and plants will cause a significant economic impact on a substantial number of small entities.

We note that for actions on non-Federal property that do not have a Federal connection (such as funding or authorization), the current restrictions concerning take of the species remain in effect, and that this proposed rule will place no additional restrictions on such activities.

Therefore, based on the above evaluation, we are certifying that this proposed designation of critical habitat for the vernal pool crustaceans and plants is not expected to have a significant economic impact on a substantial number of small entities, and that an initial regulatory flexibility analysis is not required. However, should the economic analysis of this proposed rule indicate that there may be significant economic impacts on a substantial number of small entities, we will revisit this determination.

Executive Order 13211

On May 18, 2001, the President issued an Executive Order (EO 13211) on regulations that significantly affect energy supply, distribution, and use. Executive Order 13211 requires agencies to prepare Statements of Energy Effects when undertaking certain actions. Although this rule is a significant regulatory action under Executive Order 12866, it is not expected to significantly affect energy supplies, distribution, or use. Therefore, this action is not a significant energy action and no Statement of Energy Effects is required.

Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq.*)

The Service will use the economic analysis to evaluate consistency with the Unfunded Mandates Reform Act (2 U.S.C. 1501 *et seq.*).

Takings

In accordance with Executive Order 12630 ("Government Actions and Interference with Constitutionally Protected Private Property Rights"), we have analyzed the potential takings implications of designating critical habitat for these 15 vernal pool species in a preliminary takings implications assessment. This preliminary assessment concludes that this proposed rule does not pose significant takings implications. However, we have not yet completed the economic analysis for this proposed rule. Once the economic analysis is available, we will review and revise this preliminary assessment as warranted.

Federalism

In accordance with Executive Order 13132, the rule does not have significant Federalism effects. A Federalism assessment is not required. In keeping with Department of the Interior policy, we requested information from, and coordinated development of this critical habitat proposal with appropriate State resource agencies in California. We will continue to coordinate any future designation of critical habitat for the vernal pool crustaceans and vernal pool plants with the appropriate State agencies. The designation of critical habitat in areas currently occupied by the vernal pool crustaceans and vernal pool plants imposes no additional restrictions to those currently in place and, therefore, has little incremental impact on State and local governments and their activities. The designation may have some benefit to these governments in that the areas essential to the conservation of the species are more clearly defined, and the primary constituent elements of the habitat

necessary to the survival of the species are specifically identified. While making this definition and identification does not alter where and what federally sponsored activities may occur, it may assist these local governments in long range planning rather than waiting for case by case section 7 consultations to occur.

Civil Justice Reform

In accordance with Executive Order 12988, the Office of the Solicitor has determined that the rule does not unduly burden the judicial system and meets the requirements of sections 3(a) and 3(b)(2) of the Order. We designate critical habitat in accordance with the provisions of the Act. The rule uses standard property descriptions and identifies the primary constituent elements within the designated areas to assist the public in understanding the habitat needs of the vernal pool crustaceans or vernal pool plants.

Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)

This rule does not contain any new collections of information that require approval by OMB under the Paperwork Reduction Act. This rule will not impose new record keeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number.

National Environmental Policy Act

We have determined that an Environmental Assessment or an Environmental Impact Statement as defined by the National Environmental Policy Act of 1969 need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Act. A notice outlining our reason for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244). This proposed rule does not constitute a major Federal action significantly affecting the quality of the human government.

Government to Government Relationship With Tribes

In accordance with the President's memorandum of April 29, 1994, "Government-to-Government Relations with Native American Tribal Governments" (59 FR 22951), E.O. 13175, and Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government to government basis. We have determined that there are no Tribal lands essential for the conservation of the vernal pool crustaceans and plants addressed in this proposed rule because they do not support populations or suitable habitat. Therefore, critical habitat for these species has not been proposed for designation on Tribal lands.

References Cited

A complete list of all references cited herein, as well as others, is available

upon request from the Sacramento Fish and Wildlife Office (see **ADDRESSES** section).

Authors

The primary authors of this notice are the staff of the Sacramento Fish and Wildlife Office (see **ADDRESSES** section).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the code of Federal Regulations as set forth below:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500; unless otherwise noted.

2. In § 17.11(h) revise the entry for "Fairy shrimp, Conservancy," "Fairy shrimp, longhorn," "Fairy shrimp, vernal pool," and "Tadpole shrimp, vernal pool" under "CRUSTACEANS" to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *
(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
* * * * *							
CRUSTACEANS							
* * * * *							
Fairy shrimp, Conservancy.	<i>Branchinecta conservatio.</i>	U.S.A. (CA)	Entire	E	552	17.95(h)	NA
Fairy shrimp, longhorn.	<i>Branchinecta longiantenna.</i>	U.S.A. (CA)	Entire	E	552	17.95(h)	NA
* * * * *							
Fairy shrimp, vernal pool.	<i>Branchinecta lynchi</i>	U.S.A. (CA, OR)	Entire	T	552	17.95(h)	NA
Tadpole shrimp, vernal pool.	<i>Lepidurus packardii</i>	U.S.A. (CA)	Entire	E	552	17.95(h)	NA
* * * * *							

3. In § 17.12(h) revise the entry for *Castilleja campestris* ssp. *succulenta* (succulent (or fleshy) owl's-clover), *Chamaesyce hooveri* (Hoover's spurge),

Lasthenia conjugens (Contra Costa goldfields), *Limnanthes floccosa* ssp. *californica* (Butte County meadowfoam), *Neostapfia colusana* (Colusa grass),

Orcuttia inaequalis (San Joaquin Valley Orcutt grass), *Orcuttia pilosa* (hairy Orcutt grass), *Orcuttia tenuis* (slender Orcutt grass), *Orcuttia viscida*

(Sacramento Orcutt grass), *Tuctoria greenei* (Greene's tuctoria), and *Tuctoria mucronata* (Solano grass) under "FLOWERING PLANTS" to read as follows—

§ 17.12 Endangered and threatened plants.
* * * * *
(h) * * *

Species		Historic range	Family	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						
FLOWERING PLANTS							
* <i>Castilleja campestris</i> ssp. <i>succulenta</i> .	* Fleshy owl's clover	* U.S.A. (CA)	* Scrophulariaceae	* T	* 611	* 17.96(a)	* NA
* <i>Chamaesyce hooveri</i>	* Hoover's spurge	* U.S.A. (CA)	* Euphorbiaceae	* T	* 611	* 17.96(a)	* NA
* <i>Lasthenia conjugens</i>	* Contra Costa gold-fields.	* U.S.A. (CA)	* Asteraceae	* E	* 619	* 17.96(a)	* NA
* <i>Limnanthes floccosa</i> ssp. <i>californica</i> .	* Butte County meadowfoam.	* U.S.A. (CA)	* Limnanthaceae	* E	* 471	* 17.96(a)	* NA
* <i>Neostapfia colusana</i>	* Colusa grass	* U.S.A. (CA)	* Poaceae	* T	* 611	* 17.96(a)	* NA
* <i>Orcuttia inaequalis</i> ...	* San Joaquin Valley Orcutt grass.	* U.S.A. (CA)	* Poaceae	* T	* 611	* 17.96(a)	* NA
* <i>Orcuttia pilosa</i>	* Hairy Orcutt grass ..	* U.S.A. (CA)	* Poaceae	* E	* 611	* 17.96(a)	* NA
* <i>Orcuttia tenuis</i>	* Slender Orcutt grass.	* U.S.A. (CA)	* Poaceae	* T	* 611	* 17.96(a)	* NA
* <i>Orcuttia viscida</i>	* Sacramento Orcutt grass.	* U.S.A. (CA)	* Poaceae	* E	* 611	* 17.96(a)	* NA
* <i>Tuctoria greenei</i>	* Greene's tuctoria	* U.S.A. (CA)	* Poaceae	* E	* 611	* 17.96(a)	* NA
* <i>Tuctoria mucronata</i>	* Solano grass	* U.S.A. (CA)	* Poaceae	* E	* 44	* 17.96(a)	* NA

4. In § 17.95 add critical habitat for Conservancy fairy shrimp (*Branchinecta conservatio*), longhorn fairy shrimp (*Branchinecta longiantenna*), vernal pool fairy shrimp (*Branchinecta lynchi*), and vernal pool tadpole shrimp (*Lepidurus packardii*) under paragraph (h) in the same alphabetical order as this species occurs in § 17.11(h), to read as follows:

§ 17.95 Critical habitat—fish and wildlife.

* * * * *
(h) *Crustaceans.*
* * * * *

Conservancy fairy shrimp (*Branchinecta conservatio*)

(1) Critical habitat units are depicted for Tehama, Butte, Glenn, Colusa, Solano, Stanislaus, Merced, Mariposa and Ventura counties, California, on the map below.

(2) The primary constituent elements of critical habitat for *Branchinecta conservatio* are the habitat components that provide—

(i) Vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths that typically become inundated during winter rains and hold water for sufficient lengths of time necessary for conservancy fairy shrimp incubation, reproduction, dispersal, feeding, and sheltering, including but not limited to large, playa vernal pools often on basin rim landforms and alkaline soils, but which are dry during the summer and do not necessarily fill with water every year; and

(ii) The geographic, topographic, and edaphic features that support aggregations or systems of hydrologically interconnected pools, swales, and other ephemeral wetlands and depressions within a matrix of surrounding uplands that together form hydrologically and ecologically functional units called vernal pool complexes. These features contribute to the filling and drying of the vernal pool, and maintain suitable periods of pool inundation, water quality, and soil moisture for vernal pool crustacean

hatching, growth and reproduction, and dispersal, but not necessarily every year.

(3) Existing man-made features and structures, such as buildings, roads, railroads, airports, runways, other paved areas, lawns, and other urban landscaped areas do not contain one or more of the primary constituent elements. Federal actions limited to those areas, therefore, would not trigger a consultation under section 7 of the Act unless they may affect the species and/or primary constituent elements in adjacent critical habitat.

(4) *Unit 1:* Butte and Tehama Counties, California.

(i) From USGS 1:24,000 quadrangle maps Acorn Hollow, Campbell Mound, Foster Island, Nord, Richardson Springs, Richardson Springs NW, and Vina, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 595500, 4408200; 594300, 4408200; 594100, 4408300; 594000, 4408400; 593600, 4408500; 593400, 4408200; 592600, 4408200; 592500, 4408700; 592100, 4408500; 592000, 4408700; 591400, 4408700; 590700,

4408700; 590400, 4408300; 589900, 4408300; 589000, 4408600; 589000, 4409300; 589100, 4409900; 588900, 4410200; 588200, 4410300; 588200, 4411000; 587900, 4411400; 587900, 4412000; 587900, 4412400; 587600, 4412700; 587600, 4413400; 584200, 4413400; 583100, 4413100; 582900, 4413400; 582900, 4415900; 582000, 4418300; 581800, 4419200; 582000, 4419500; 581400, 4420000; 581400, 4420400; 581800, 4420700; 581600, 4421000; 583200, 4422600; 583500, 4423600; 585200, 4424500; 586000, 4424500; 587500, 4426100; 588200, 4426500; 588600, 4429100; 588800, 4430200; 589500, 4429500; 589500, 4428600; 591400, 4425800; 592600, 4424100; 593400, 4422300; 594200, 4421100; 595900, 4417800; 595800, 4417300; 595800, 4416600; 596100, 4416600; 596400, 4416800; 596600, 4416800; 597100, 4416400; 597100, 4415600; 596800, 4415200; 597100, 4415000; 597800, 4415500; 598100, 4415200; 597600, 4414600; 597600, 4414400; 597300, 4413800; 597300, 4413300; 598200, 4413900; 598400, 4413900; 598400, 4413600; 597400, 4411900; 597600, 4411900; 598300, 4412700; 598500, 4413300; 598900, 4413300; 598900, 4411800; 599400, 4411700; 599800, 4411700; 599800, 4411000; 597700, 4409400; 596200, 4408600; 595900, 4408800; 595700, 4408800; returning to 595500, 4408200.

(5) *Unit 2: Colusa and Glenn Counties, California.*

(i) From USGS 1:24,000 quadrangle maps Logandale, Maxwell, Moulton Weir, and Princeton, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 572900, 4357400; 571200, 4357400; 571200, 4358200; 570400, 4358200; 570400, 4359000; 569600, 4359000; 569500, 4360500; 569300, 4362200; 569500, 4363300; 569500, 4367200; 570000, 4367200; 569900, 4368400; 570300, 4368400; 571000, 4367600; 571000, 4367800; 570700, 4368500; 570900, 4368800; 571500, 4368800; 571900, 4368300; 571900, 4367600; 572100, 4367600; 572400, 4368100; 572400, 4368400; 572600, 4368900; 572800, 4368900; 573000, 4368100; 573400, 4368000; 573800, 4367600; 574100, 4367300; 574400, 4367200; 574500, 4366400; 574900, 4366400; 574900, 4365600; 574700, 4365500; 574400, 4364100; 575200, 4363900; 575600, 4363600; 575100, 4362400; 575600, 4361400; 575100, 4360700; 576000, 4359600; 575500, 4358900; 575700, 4358300; 575900, 4357700; 575300, 4357800; 575000, 4357700; 574700, 4357700; 573600, 4357800; 573500, 4358200; 572900, 4358200; returning to 572900, 4357400.

(6) *Unit 3: Solano County, California.*

(i) From USGS 1:24,000 quadrangle maps Birds Landing, Denverton, Dozier, and Elmira, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 596700, 4230400; 596200, 4230400; 595900, 4230500; 595700, 4230600; 594500, 4231200; 593800, 4231200; 593600, 4230500; 589300, 4230700; 589000, 4231200; 589100, 4231300; 589100, 4231700; 588900, 4232300; 588900, 4233000; 590200, 4233600; 590500, 4233700; 591000, 4233700; 590900, 4233200; 591100, 4233100; 591300, 4233100; 592000, 4233700; 592500, 4233900; 593500, 4234200; 594800, 4235500; 594900, 4235800; 595600, 4236300; 595600, 4236800; 596500, 4237600; 596300, 4237700; 595500, 4237100; 595200, 4237700; 595200, 4238200; 598800, 4238200; 598500, 4239100; 598000, 4239700; 598000, 4241000; 598800, 4241000; 598800, 4240600; 600400, 4240600; 602800, 4240600; 604300, 4239400; 605200, 4240600; 605300, 4239700; 605500, 4239000; 605400, 4238300; 604500, 4238100; 604500, 4237500; 605200, 4237200; 605700, 4235200; 605400, 4234900; 605000, 4233900; 604600, 4233700; 604200, 4233300; 604100, 4232500; 603800, 4231500; 602300, 4230800; 601400, 4230700; 600700, 4230600; 600400, 4230900; 600400, 4231700; 601100, 4232300; 601200, 4233200; 598400, 4233200; 598200, 4232100; 597800, 4231800; 597400, 4230900; returning to 596700, 4230400.

(7) *Unit 4: Solano County, California.*

(i) From USGS 1:24,000 quadrangle maps Antioch North and Honker Bay, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 600900, 4215500; 599300, 4215500; 598400, 4216900; 598316, 6875000, 4217900; 598400, 4217900; 598800, 4218100; 598800, 4218600; 599000, 4219000; 599200, 4219300; 599400, 4219500; 600600, 4216900; returning to 600900, 4215500.

(8) *Unit 5: Stanislaus County, California.*

(i) From USGS 1:24,000 quadrangle map Ripon, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 660800, 4167200; 660000, 4167200; 659500, 4168800; 661600, 4168800; 661600, 4169400; 662400, 4169400; 662400, 4168300; 661600, 4168000; 661600, 4168300; 660300, 4167800; 660600, 4167500; returning to 660800, 4167200.

(9) *Unit 6: Mariposa and Merced Counties, California.*

(i) From USGS 1:24,000 quadrangle maps Atwater, Haystack Mtn., Illinois Hill, Indian Gulch, Le Grand, Merced, Merced Falls, Owens Reservoir,

Plainsburg, Planada, Raynor Creek, Snelling, Winton, and Yosemite Lake, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 750200, 4121400; 747800, 4121400; 747800, 4121900; 747500, 4122400; 747500, 4123900; 747000, 4124700; 746900, 4125100; 743600, 4125000; 743600, 4127000; 742700, 4127000; 742600, 4126600; 742300, 4126300; 741700, 4126300; 741200, 4126800; 741200, 4128600; 740400, 4128600; 740400, 4130300; 739000, 4130300; 739000, 4130600; 738400, 4131100; 737500, 4131200; 737800, 4131700; 737700, 4132600; 737700, 4132900; 737100, 4132900; 737100, 4134200; 736700, 4134200; 736100, 4133900; 735600, 4133300; 734700, 4133300; 734700, 4133700; 734100, 4133900; 733100, 4133900; 733100, 4134600; 732700, 4134600; 732600, 4135000; 732300, 4135500; 730300, 4135400; 729900, 4135700; 729900, 4136500; 726500, 4136500; 726400, 4136100; 725900, 4136100; 725900, 4135300; 725600, 4135100; 725500, 4135100; 725300, 4135500; 725100, 4135400; 725000, 4135400; 725000, 4135600; 724800, 4135700; 724600, 4135700; 724600, 4134700; 724200, 4134700; 724200, 4135500; 723400, 4135500; 723400, 4135600; 722800, 4135600; 722800, 4135000; 722600, 4135000; 722500, 4134700; 722200, 4137900; 722800, 4137900; 722800, 4139300; 721900, 4139300; 721900, 4140200; 721000, 4140200; 721000, 4140900; 717800, 4140900; 717800, 4137700; 717100, 4137700; 717000, 4138200; 714500, 4140900; 714100, 4141300; 714100, 4142200; 713600, 4142400; 713200, 4143000; 713000, 4143900; 713100, 4144300; 713700, 4144600; 714500, 4145300; 714500, 4145700; 715800, 4145800; 717000, 4145800; 718000, 4145400; 718200, 4145900; 718200, 4147600; 719700, 4148400; 720600, 4148600; 720600, 4149200; 719600, 4149200; 719600, 4149800; 720300, 4149800; 721300, 4150700; 721700, 4150700; 724400, 4153300; 725000, 4153500; 725500, 4154200; 725800, 4154800; 727200, 4155900; 727800, 4155900; 728500, 4155600; 730200, 4155600; 731600, 4155500; 732400, 4155400; 732600, 4155200; 733200, 4154700; 734100, 4154900; 734600, 4154800; 735600, 4156000; 735900, 4156000; 737100, 4155400; 737800, 4155000; 738200, 4154200; 738300, 4153300; 739000, 4152800; 739100, 4152200; 740200, 4151800; 740800, 4151500; 740800, 4150300; 741100, 4149900; 741700, 4149400; 742100, 4148500; 742100, 4147100; 743400, 4146100; 744000, 4145600; 744400,

4144600; 744300, 4143900; 743900, 4142700; 744000, 4142000; 744200, 4141700; 745500, 4140300; 746100, 4139500; 746800, 4138500; 747700, 4137700; 748500, 4135800; 748700, 4135100; 749500, 4134000; 750100, 4132800; 750700, 4131700; 751600, 4130500; 752000, 4130200; 752800, 4130100; 753300, 4130400; 753500, 4130400; 753900, 4130200; 754000, 4129300; 753400, 4128400; 753900, 4127700; 754400, 4127700; 754600, 4127400; 755300, 4128400; 755400, 4128400; 755600, 4127700; 756900, 4126400; 757800, 4125800; 758400, 4126300; 758500, 4126300; 758600, 4126000; 757900, 4125100; 757400, 4125100; 756500, 4123700; 753500, 4122400; 750200, 4122400; returning to 750200, 4121400.

(10) *Unit 7*: Merced County, California.

(i) From USGS 1:24,000 quadrangle maps Arena, Atwater, Gustine, Ingomar, Los Banos, San Luis Ranch, Sandy Mush, Stevinson, and Turner Ranch, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 697300, 4104500; 696100, 4104500; 695700, 4105000; 695700, 4106600; 694700, 4107900; 693500, 4107900; 693700, 4109100; 692900, 4109100; 692900, 4109800; 693100, 4110200; 693800, 4110200; 693800, 4111800; 692500, 4111800; 692400, 4110600; 691800, 4110600; 691600, 4110200; 690800, 4110300; 690000, 4110300; 690000, 4111400; 689700, 4111800; 689200, 4111800; 689200, 4111300; 688400, 4111300; 688400, 4112100; 686700, 4112100; 686500, 4112900; 686500, 4113700; 686000, 4113700; 686000, 4116100; 684500, 4116100; 684400, 4114200; 682200, 4114200; 682100, 4113000; 681100, 4113000; 681100, 4111800; 680600, 4111700; 679600, 4110900; 678800, 4110900; 678200, 4111800; 678300, 4113600; 677900, 4114400; 679400, 4114400; 679400, 4115200; 680000, 4115200; 680300, 4116000; 681800, 4116100; 682800, 4116600; 683600,

4116500; 683600, 4117100; 681200, 4117100; 681000, 4124500; 680800, 4124900; 679800, 4124900; 679800, 4125700; 680700, 4125700; 680600, 4126400; 680300, 4126700; 680300, 4127200; 678900, 4127800; 679000, 4129000; 679300, 4129200; 680100, 4129400; 679700, 4130700; 679400, 4130200; 678600, 4130200; 678000, 4131200; 678500, 4132100; 678800, 4132400; 679000, 4131800; 679200, 4131800; 680200, 4132200; 680700, 4131700; 681600, 4132800; 681200, 4133100; 681200, 4133600; 681600, 4134100; 681700, 4134200; 681900, 4134200; 682300, 4134000; 682700, 4133800; 683400, 4133100; 683600, 4132600; 683600, 4132300; 683100, 4131800; 683100, 4131500; 683400, 4131500; 684300, 4130400; 684700, 4130000; 685500, 4130700; 686000, 4130700; 686200, 4130900; 686400, 4130900; 688800, 4131400; 690300, 4131400; 690500, 4130600; 691600, 4130600; 691600, 4130000; 692900, 4130000; 692800, 4131700; 692400, 4131800; 692400, 4133500; 693000, 4133000; 694400, 4133100; 694400, 4132000; 693700, 4132000; 693700, 4129800; 693700, 4127500; 694500, 4127000; 694800, 4127000; 695200, 4127700; 695200, 4129800; 695200, 4130300; 695700, 4130300; 695900, 4130000; 696100, 4129500; 696100, 4129100; 696900, 4129100; 696900, 4130200; 697200, 4130200; 698300, 4128600; 698600, 4128200; 700100, 4127600; 700500, 4129200; 700500, 4130600; 701700, 4130600; 701800, 4129200; 703300, 4129200; 703300, 4128800; 703900, 4128800; 703900, 4129000; 704200, 4129000; 705600, 4128500; 705600, 4127800; 705300, 4127000; 705400, 4126200; 705900, 4125700; 706800, 4125400; 707200, 4125400; 707900, 4126100; 708300, 4126100; 708300, 4125400; 709100, 4125400; 709900, 4125700; 709900, 4126000; 710200, 4126200; 711500, 4126200; 711500, 4124600; 708000, 4124500; 706700, 4124500; 706700, 4122100; 711500, 4122200; 711500,

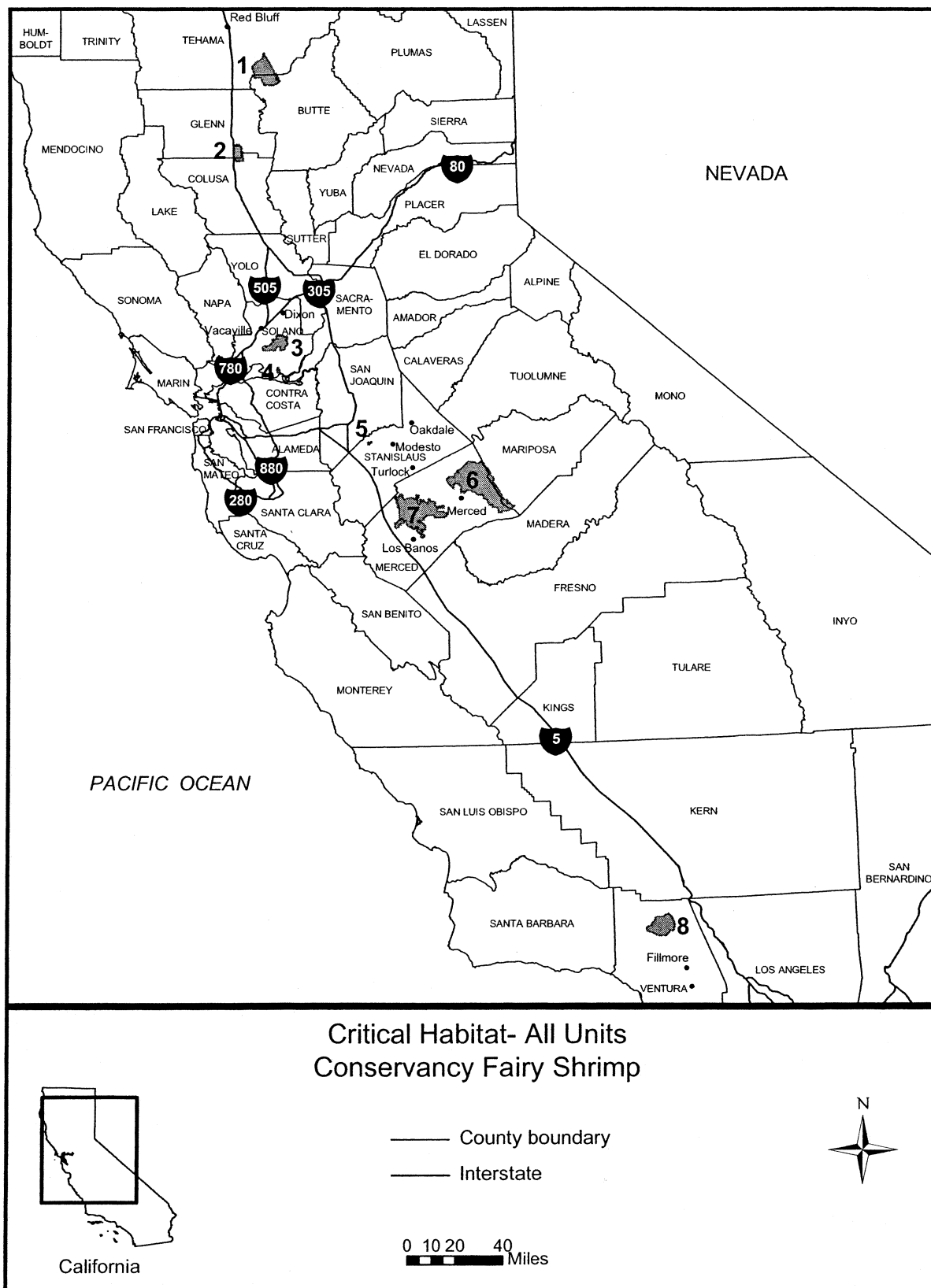
4121700; 712100, 4121400; 713200, 4121400; 713200, 4118700; 711600, 4118700; 711600, 4118100; 707300, 4118100; 705000, 4118100; 704500, 4119600; 699400, 4119500; 699300, 4118700; 698800, 4118700; 698500, 4118500; 698200, 4117700; 697600, 4117700; 697800, 4116500; 693700, 4116200; 694200, 4115100; 694400, 4114600; 694800, 4114600; 695000, 4115100; 695800, 4115100; 696300, 4114300; 697600, 4114200; 697900, 4113900; 697900, 4113100; 698900, 4112500; 698800, 4109800; 695700, 4109800; 695700, 4109000; 697300, 4109000; 697300, 4108100; 696400, 4108100; 696400, 4107300; 696700, 4106600; 697600, 4106600; 698200, 4105800; 698200, 4105300; returning to 697300, 4104500.

(11) *Unit 8*: Ventura County, California.

(i) From USGS 1:24,000 quadrangle maps Alamo Mountain, Lion Canyon, Lockwood Valley, San Guillermo, and Topatopa Mountains, California, land bounded by the following UTM 11 NAD 83 coordinates (E, N): 310100, 3830500; 309400, 3831000; 308400, 3830900; 307200, 3830600; 306000, 3831200; 304700, 3831300; 303400, 3832100; 302100, 3832600; 301600, 3833600; 300400, 3833600; 299200, 3834000; 298200, 3834400; 297700, 3835300; 297900, 3837300; 299500, 3837500; 301200, 3838400; 301500, 3839300; 303400, 3841000; 303800, 3842700; 304900, 3843600; 305800, 3843600; 307700, 3843400; 309500, 3843400; 310500, 3844200; 311900, 3844600; 313400, 3845400; 314500, 3844100; 315200, 3843800; 315700, 3842400; 316500, 3841100; 317200, 3838100; 317200, 3837000; 316500, 3833900; 315700, 3833300; 315200, 3834100; 314000, 3834100; 313100, 3832200; 311500, 3830800; returning to 310100, 3830500.

(12) Map follows of all critical habitat units for Conservancy fairy shrimp (*Branchinecta conservatio*).

BILLING CODE 4310-55-P



BILLING CODE 4310-55-C

Longhorn Fairy Shrimp (*Branchinecta longiantenna*)

(1) Critical habitat units are depicted for Alameda, Contra Costa, Merced and San Luis Obispo counties, California, on the map below.

(2) The primary constituent elements of critical habitat for *Branchinecta longiantenna* are the habitat components that provide:

(i) Vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths that typically become inundated during winter rains and hold water for sufficient lengths of time necessary for Longhorn fairy shrimp incubation, reproduction, dispersal, feeding, and sheltering, including but not limited to large, playa vernal pools often on basin rim landforms and alkaline soils, but which are dry during the summer and do not necessarily fill with water every year; and

(ii) The geographic, topographic, and edaphic features that support aggregations or systems of hydrologically interconnected pools, swales, and other ephemeral wetlands and depressions within a matrix of surrounding uplands that together form hydrologically and ecologically functional units called vernal pool complexes. These features contribute to the filling and drying of the vernal pool, and maintain suitable periods of pool inundation, water quality, and soil moisture for vernal pool crustacean hatching, growth and reproduction, and dispersal, but not necessarily every year.

(3) Existing man-made features and structures, such as buildings, roads, railroads, airports, runways, other paved areas, lawns, and other urban landscaped areas do not contain one or more of the primary constituent elements. Federal actions limited to those areas, therefore, would not trigger a consultation under section 7 of the Act unless they may affect the species and/or primary constituent elements in adjacent critical habitat.

(4) *Subunit 1A*: Contra Costa County, California.

(i) From USGS 1:24,000 quadrangle map Byron Hot Springs, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 614700, 4184000; 614600, 4184000; 614600, 4184500; 614900, 4185000; 614600, 4185300; 614600, 4185900; 614700, 4185900; 614800, 4185400; 615100, 4185200; 615100, 4185500; 615400, 4185200; 615600, 4184900; 615800, 4184900; 616000, 4184800; 616000, 4184700; 615800, 4184500; 615700, 4184500; 615500, 4184200; 615100, 4184200; 614800, 4184200; returning to 614700, 4184000.

(5) *Subunit 1B*: Alameda County, California.

(i) From USGS 1:24,000 quadrangle map Byron Hot Springs, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 616200, 4179000; 616100, 4179000; 615900, 4179200; 615900, 4179400; 615700, 4179600; 615500, 4180100; 615100, 4180500; 614800, 4180800; 614400, 4180900; 614100, 4181100; 614600, 4181500; 614700, 4181500; 614700, 4181700; 614900, 4181700; 615200, 4181400; 615400, 4181300; 615500, 4181200; 615500, 4181100; 615600, 4181100; 615700, 4181300; 615800, 4181200; 616000, 4180600; 616000, 4180500; 616200, 4180200; 616300, 4180000; 616200, 4179900; 615900, 4179900; 615900, 4179700; 616200, 4179500; returning to 616200, 4179000.

(6) *Unit 2*: Merced County, California.

(i) From USGS 1:24,000 quadrangle maps Gustine, Ingomar, Los Banos, San Luis Ranch, and Stevinson, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 681200, 4117100; 681000, 4124500; 680800, 4124900; 679800, 4124900; 679800, 4125700; 680600, 4126400; 680300, 4126700; 680300, 4127200; 678900, 4127800; 679000, 4129000; 679300, 4129200; 680100, 4129400; 679700, 4130700; 679400, 4130200; 678600, 4130200; 678000, 4131200; 678500, 4132100; 678800, 4132400; 679000, 4131800; 679200, 4131800; 680200, 4132200; 680700, 4131700; 681600, 4132800; 681200, 4133100; 681200, 4133600; 681600, 4134100; 681700, 4134200; 681900, 4134200; 682300, 4134000; 682700, 4133800; 683400, 4133100; 683600, 4132600; 683600, 4132300; 683100, 4131800; thence south to x-coordinate 683100 on the San Joaquin River; thence southeast along to San Joaquin River to y-coordinate 4118400; thence west to 698400, 4118400; 698200, 4117700; 697600, 4117700; 697800, 4116500; 693700, 4116200; 694200, 4115100; 694400, 4114600; 694800, 4114600; 695000, 4115100; 695800, 4115100; 696300, 4114300; 697600, 4114200; 697900, 4113900; 697900, 4113100; 698900, 4112500; 698800, 4109800; 695700, 4109800; 695700, 4109000; 697300, 4109000; 697300, 4108100; 696400, 4108100; 696400, 4107300; 696700, 4106600; 697600, 4106600; 698200, 4105800; 698200, 4105300; 697300, 4104500; 696100, 4104500;

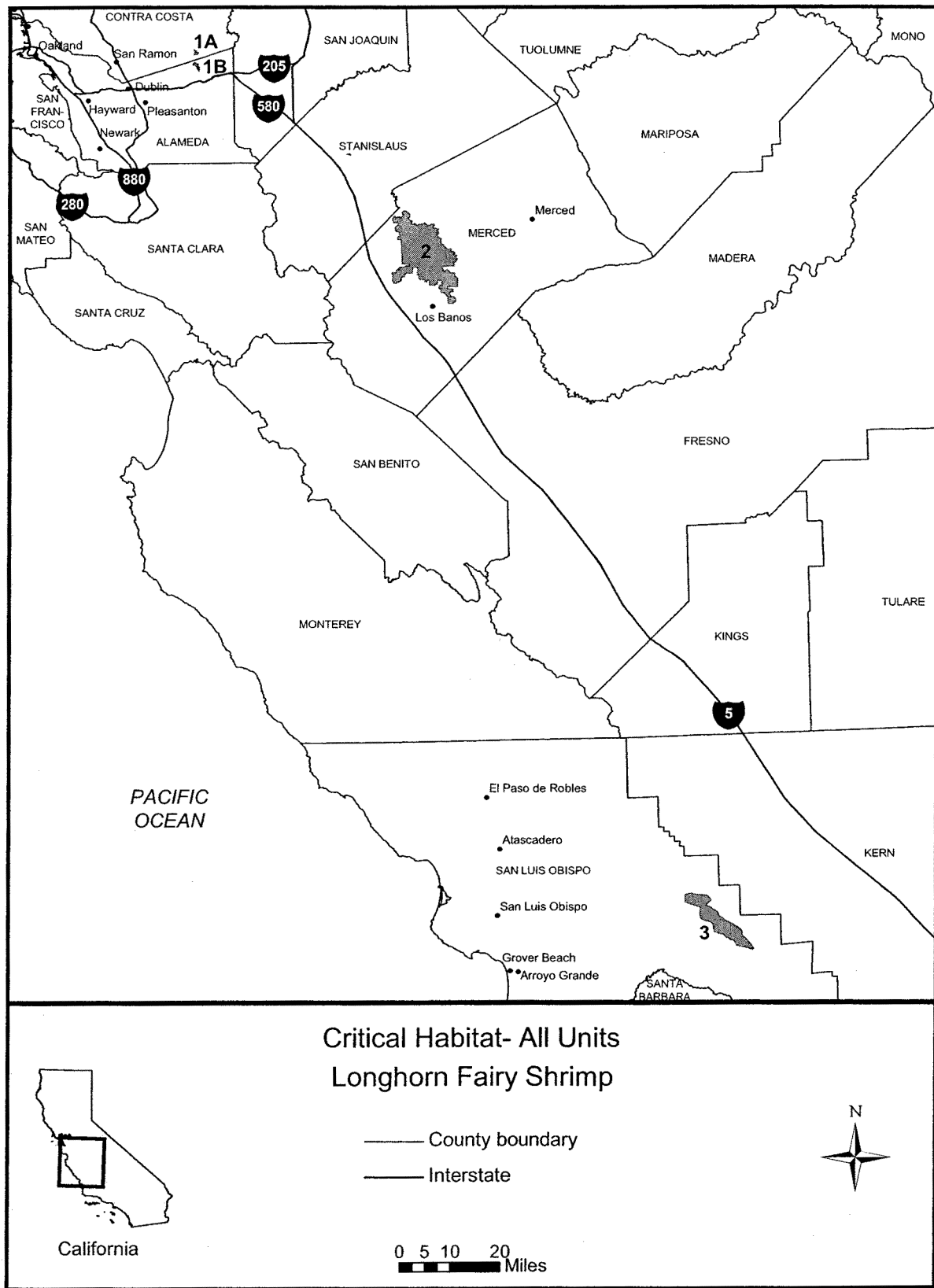
695700, 4105000; 695700, 4106600; 694700, 4107900; 693500, 4107900; 693700, 4109100; 692900, 4109100; 692900, 4109800; 693100, 4110200; 693800, 4110200; 693800, 4111800; 692500, 4111800; 692400, 4110600; 691800, 4110600; 691600, 4110200; 690800, 4110300; 690000, 4110300; 690000, 4111400; 689700, 4111800; 689200, 4111800; 689200, 4111300; 688400, 4111300; 688400, 4112100; 686700, 4112100; 686500, 4112900; 686500, 4113700; 686000, 4113700; 686000, 4116100; 684500, 4116100; 684400, 4114200; 682200, 4114200; 682100, 4113000; 681100, 4113000; 681100, 4111800; 680600, 4111700; 679600, 4110900; 678800, 4110900; 678200, 4111800; 678300, 4113600; 677900, 4114400; 679400, 4114400; 679400, 4115200; 680000, 4115200; 680300, 4116000; 681800, 4116100; 682800, 4116600; 683600, 4116500; 683600, 4117100; returning to 681200, 4117100.

(7) *Unit 3*: San Luis Obispo County, California.

(i) From USGS 1:24,000 quadrangle map Byron Hot Springs, California, land bounded by the following UTM 11 NAD 83 coordinates (E, N): 247900, 3894600; 245800, 3895500; 243500, 3896000; 242700, 3896400; 242200, 3897600; 240100, 3898900; 239500, 3899300; 239300, 3899600; 238300, 3900400; 237900, 3900300; 236100, 3901000; 235800, 3901300; 235800, 3902300; 235500, 3903500; 234800, 3904400; 233000, 3904900; 231800, 3905800; 231600, 3907000; 231900, 3908800; 231800, 3909400; 229400, 3910200; 227200, 3911200; 227300, 3913400; 228100, 3913800; 229000, 3913900; 231900, 3913200; 233300, 3913200; 234300, 3912900; 235100, 3912100; 235300, 3911200; 233900, 3910100; 233700, 3909700; 235300, 3909000; 235700, 3908500; 237200, 3907500; 237700, 3906300; 238200, 3905800; 239100, 3905200; 239100, 3904900; 242800, 3902600; 244400, 3901300; 244400, 3901000; 244700, 3900700; 244800, 3899100; 245400, 3898800; 247200, 3896600; 248200, 3895000; returning to 247900, 3894600.

(8) Map follows of all critical habitat units for longhorns fairy shrimp (*Branchinecta longiantenna*):

BILLING CODE 4310-55-P



BILLING CODE 4310-55-P

Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)

(1) Critical habitat units are depicted for Jackson County, Oregon; Shasta, Butte, Tehama, Glenn, Colusa, Placer, Sacramento, Solano, Napa, Contra

Costa, Alameda, Amador, San Joaquin, Stanislaus, Merced, Mariposa, Madera, Fresno, Tulare, Kings, San Benito, Monterey, San Luis Obispo, Santa

Barbara, Ventura and Riverside counties, California on the map below:

(2) The primary constituent elements of critical habitat for *Branchinecta lynchi* are the habitat components that provide—

(i) Vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths that typically become inundated during winter rains and hold water for sufficient lengths of time necessary for vernal pool fairy shrimp incubation, reproduction, dispersal, feeding, and sheltering, including but not limited to Northern Hardpan, Northern Claypan, Northern Volcanic Mud Flow, and Northern Basalt Flow vernal pools formed on a variety of geologic formations and soil types, but which are dry during the summer and do not necessarily fill with water every year; and

(ii) The geographic, topographic, and edaphic features that support aggregations or systems of hydrologically interconnected pools, swales, and other ephemeral wetlands and depressions within a matrix of surrounding uplands that together form hydrologically and ecologically functional units called vernal pool complexes. These features contribute to the filling and drying of the vernal pool, and maintain suitable periods of pool inundation, water quality, and soil moisture for vernal pool crustacean hatching, growth and reproduction, and dispersal, but not necessarily every year.

(3) Existing man-made features and structures, such as buildings, roads, railroads, airports, runways, other paved areas, lawns, and other urban landscaped areas do not contain one or more of the primary constituent elements. Federal actions limited to those areas, therefore, would not trigger a consultation under section 7 of the Act unless they may affect the species and/or primary constituent elements in adjacent critical habitat.

(4) *Subunit 1A*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle map Shady Cove, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 513900, 4709700; 513600, 4709700; 513600, 4709800; 513500, 4709800; 513500, 4710000; 513700, 4710000; 513700, 4710300; 513200, 4710300; 513200, 4710600; 513100, 4710600; 513100, 4710800; 514300, 4710800; 514300, 4710300; 514100, 4710300; 514100, 4709900; 513900, 4709900; returning to 513900, 4709700.

(5) *Subunit 1B*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle map Shady Cove, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 513900, 4707000; 513600, 4707000; 513600, 4707300; 513700, 4707300; 513700, 4707400; 513800, 4707400; 513800, 4707500; 513400, 4707500; 513400, 4708000; 514700, 4708000; 514700, 4707700; 514600, 4707700; 514600, 4707600; 514200, 4707600; 514200, 4707500; 514100, 4707500; 514100, 4707300; 514000, 4707300; 514000, 4707200; 513900, 4707200; returning to 513900, 4707000.

(6) *Subunit 1C*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle map Shady Cove, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 512000, 4706600; 511800, 4706600; 511800, 4706700; 511300, 4706700; 511300, 4706800; 511200, 4706800; 511200, 4706900; 511100, 4706900; 511100, 4707000; 511000, 4707000; 511000, 4707200; 511100, 4707200; 511100, 4707300; 511200, 4707300; 511200, 4707400; 511100, 4707400; 511100, 4707500; 511200, 4707500; 511200, 4707600; 511400, 4707600; 511400, 4707700; 511600, 4707700; 511600, 4707800; 511800, 4707800; 511800, 4707300; 511900, 4707300; 511900, 4706800; 512000, 4706800; returning to 512000, 4706600.

(7) *Subunit 1D*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle maps Eagle Point and Shady Cove, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 515900, 4706700; 515900, 4707000; 516200, 4707000; 516200, 4706900; 516300, 4706900; 516300, 4706700; 516400, 4706700; 516400, 4706800; 516500, 4706800; 516500, 4707000; 516700, 4707000; 516700, 4706900; 516900, 4706900; 516900, 4707000; 517000, 4707000; 517000, 4707100; 517100, 4707100; 517100, 4706900; 517400, 4706900; 517400, 4706700; 517300, 4706700; 517300, 4706500; 517200, 4706500; 517200, 4706400; 517100, 4706400; 517100, 4706300; 516700, 4706300; 516700, 4705600; 516500, 4705600; 516500, 4705500; 516600, 4705500; 516600, 4705400; 516700, 4705400; 516700, 4704800; 516600, 4704800; 516600, 4704600; 516300, 4704600; 516300, 4704500; 516400, 4704500; 516400, 4704400; 516500, 4704400; 516500, 4704300; 515800, 4704300; 515800, 4704600; 516000, 4704600; 516000, 4704700; 515500, 4704700; 515500, 4704800; 515400, 4704800; 515400, 4705100; 515500, 4705100; 515500, 4705200; 515700, 4705200; 515700, 4705300;

515800, 4705300; 515800, 4705900; 515700, 4705900; 515700, 4706200; 515600, 4706200; 515600, 4706400; 515500, 4706400; 515500, 4706500; 515100, 4706500; 515100, 4706700; 515000, 4706700; 515000, 4706900; 514700, 4706900; 514700, 4707000; 514600, 4707000; 514600, 4707200; 514700, 4707200; 514700, 4707300; 515000, 4707300; 515000, 4707200; 515100, 4707200; 515100, 4707100; 515200, 4707100; 515200, 4707000; 515300, 4707000; 515300, 4706800; 515400, 4706800; 515400, 4706700; 515500, 4706700; 515500, 4706600; 515600, 4706600; 515600, 4706700; returning to 515900, 4706700; excluding land bounded by 515900, 4706700; 515900, 4706500; 516000, 4706500; 516000, 4706400; 516100, 4706400; 516000, 4706600; 516000, 4706700; 515900, 4706700.

(8) *Subunit 1E*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle maps Boswell Mountain and Shady Cove, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 510500, 4706000; 510400, 4706000; 510400, 4706100; 510300, 4706100; 510300, 4706300; 510100, 4706300; 510100, 4706400; 510000, 4706400; 510000, 4706500; 509800, 4706500; 509800, 4706700; 510000, 4706700; 510000, 4706900; 510100, 4706900; 510100, 4707000; 510200, 4707000; 510200, 4706900; 510500, 4706900; 510500, 4707000; 510600, 4707000; 510600, 4707100; 510800, 4707100; 510800, 4706900; 511000, 4706900; 511000, 4706500; 510700, 4706500; 510700, 4706300; 510500, 4706300; returning to 510500, 4706000.

(9) *Subunit 1F*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle maps Eagle Point and Shady Cove, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 511400, 4704800; 511200, 4704800; 511200, 4705000; 511000, 4705000; 511000, 4705200; 510900, 4705200; 510900, 4705300; 510800, 4705300; 510800, 4705900; 511000, 4705900; 511000, 4706000; 511300, 4706000; 511300, 4705900; 511500, 4705900; 511500, 4705100; 511400, 4705100; returning to 511400, 4704800; excluding land bounded by 511300, 4705300; 511300, 4705500; 511200, 4705500; 511200, 4705300; 511300, 4705300.

(10) *Subunit 1G*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle map Eagle Point, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 517700, 4704000; 517200, 4704000; 517200, 4704100; 517100, 4704100; 517100, 4704300;

517000, 4704300; 517000, 4704700;
516900, 4704700; 516900, 4704900;
517000, 4704900; 517000, 4705000;
517100, 4705000; 517100, 4705100;
517600, 4705100; 517600, 4705000;
517800, 4705000; 517800, 4704900;
517900, 4704900; 517900, 4704800;
519100, 4704800; 519100, 4704700;
519300, 4704700; 519300, 4704600;
519400, 4704600; 519400, 4704300;
519100, 4704300; 519100, 4704200;
518600, 4704200; 518600, 4704100;
517900, 4704100; 517900, 4704200;
517700, 4704200; returning to 517700,
4704000.

(11) *Unit 2A*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle map Eagle Point, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 514300, 4698400; 513400, 4698400; 513400, 4698500; 513300, 4698500; 513300, 4698600; 513400, 4698600; 513400, 4698700; 513500, 4698700; 513500, 4698800; 513700, 4698800; 513700, 4699000; 513800, 4699000; 513800, 4699100; 513900, 4699100; 513900, 4699200; 514200, 4699200; 514200, 4698800; 514300, 4698800; 514300, 4698900; 514400, 4698900; 514400, 4699000; 514900, 4699000; 514900, 4698800; 515100, 4698900; 515100, 4699100; 515200, 4699100; 515200, 4699000; 515500, 4699000; 515500, 4698800; 515600, 4698800; 515600, 4699000; 515700, 4699000; 515700, 4698900; 515800, 4698900; 515800, 4698500; 515500, 4698500; 515500, 4698700; 515400, 4698700; 515400, 4698600; 515300, 4698600; 515300, 4698500; 515100, 4698500; 515100, 4698600; 514900, 4698600; 514900, 4698500; 514400, 4698500; 514400, 4698600; 514300, 4698600; returning to 514300, 4698400.

(12) *Subunit 2B*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle maps Brownsboro and Eagle Point, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 520800, 4694400; 520700, 4694400; 520700, 4694500; 520500, 4694500; 520500, 4694600; 520400, 4694600; 520400, 4694700; 520300, 4694700; 520300, 4694800; 519900, 4694800; 519900, 4694900; 519500, 4694900; 519500, 4695200; 519400, 4695200; 519400, 4695600; 519300, 4695600; 519200, 4695800; 519200, 4695900; 519100, 4695900; 519100, 4696000; 519000, 4696000; 519000, 4696200; 519300, 4696200; 519300, 4696300; 519100, 4696300; 519100, 4696400; 518900, 4696400; 518900, 4696500; 518800, 4696500; 518800, 4696400; 518600, 4696400; 518600, 4696700; 518500, 4696700; 518500, 4696800; 518400, 4696800;

518400, 4696900; 518300, 4696900;
518300, 4697000; 518200, 4697000;
518200, 4697100; 518100, 4697100;
518100, 4697200; 517600, 4697200;
517600, 4697300; 517300, 4697300;
517300, 4697400; 517100, 4697400;
517100, 4697600; 517000, 4697600;
517000, 4697800; 516900, 4697800;
516900, 4698400; 517300, 4698400;
517300, 4698300; 517500, 4698300;
517500, 4698200; 517600, 4698200;
517600, 4698300; 517900, 4698300;
517900, 4697800; 518500, 4697800;
518500, 4697700; 518600, 4697700;
518600, 4697600; 518800, 4697600;
518800, 4697700; 519100, 4697700;
519100, 4697600; 519300, 4697600;
519300, 4697500; 519400, 4697500;
519400, 4697400; 519500, 4697400;
519500, 4697300; 519700, 4697300;
519700, 4697200; 519800, 4697200;
519800, 4697100; 520000, 4697100;
520000, 4696800; 519900, 4696800;
519900, 4696700; 520400, 4696700;
520400, 4696600; 520500, 4696600;
520500, 4696300; 520400, 4696300;
520400, 4696100; 520500, 4696100;
520500, 4696200; 520600, 4696200;
520600, 4696100; 520700, 4696100;
520700, 4695900; 520600, 4695900;
520600, 4695800; 520500, 4695800;
520500, 4695500; 520700, 4695500;
520700, 4695400; 520800, 4695400;
returning to 520800, 4694400.

(13) *Subunit 2C*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle map Eagle Point, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 516100, 4697400; 515000, 4697400; 515000, 4697800; 515200, 4697800; 515200, 4697700; 515300, 4697700; 515300, 4697800; 516100, 4697800; returning to 516100, 4697400.

(14) *Subunit 2D*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle map Eagle Point, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 516200, 4696200; 515900, 4696200; 515900, 4696900; 516100, 4696900; 516100, 4697000; 516500, 4697000; 516500, 4697100; 516800, 4697100; 516800, 4697200; 517000, 4697200; 517000, 4697100; 517200, 4697100; 517200, 4697000; 517300, 4697000; 517300, 4696900; 517400, 4696900; 517400, 4696600; 517200, 4696600; 517200, 4696700; 516800, 4696700; 516800, 4696600; 516300, 4696600; 516300, 4696500; 516200, 4696500; returning to 516200, 4696200.

(15) *Subunit 2E*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle map Eagle Point, Oregon, land bounded by the following UTM 10 NAD 83

coordinates (E, N): 515200, 4695800;
515000, 4695800; 515000, 4695900;
514500, 4695900; 514500, 4695800;
514300, 4695800; 514300, 4695900;
514200, 4695900; 514200, 4696000;
514100, 4696000; 514100, 4695900;
514000, 4695900; 514000, 4695800;
513900, 4695800; 513900, 4695900;
513800, 4695900; 513800, 4696600;
513500, 4696600; 513500, 4696800;
515600, 4696800; 515600, 4696600;
515500, 4696600; 515500, 4696400;
515100, 4696400; 515100, 4696300;
515200, 4696300; returning to 515200,
4695800; excluding land bounded by
514700, 4696300; 514700, 4696500;
514500, 4696500; 514500, 4696400;
514300, 4696400; 514300, 4696500;
514200, 4696500; 514200, 4696400;
514100, 4696400; 514100, 4696300;
514700, 4696300.

(16) *Subunit 3A*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle map Eagle Point, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 511600, 4698900; 511600, 4699000; 511400, 4699000; 511400, 4699100; 511100, 4699100; 511100, 4699200; 510700, 4699200; 510700, 4699300; 510600, 4699300; 510600, 4699500; 510900, 4699500; 510900, 4699600; 511200, 4699600; 511200, 4699700; 511300, 4699700; 511300, 4699900; 511400, 4699900; 511400, 4700000; 511500, 4700000; 511500, 4699900; 511600, 4699900; 511600, 4699800; 511700, 4699800; 511700, 4699900; 511900, 4699900; 511900, 4698900; returning to 511600, 4698900.

(17) *Subunit 3B*: Jackson County, Oregon.

(i) From USGS 1:24,000 quadrangle maps Eagle Point and Sams Valley, Oregon, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 511600, 4698900; 511600, 4698600; 511300, 4698600; 511300, 4698700; 511200, 4698700; 511200, 4698600; 511000, 4698600; 511000, 4698500; 510700, 4698500; 510700, 4698600; 510500, 4698600; 510500, 4698500; 509600, 4698500; 509600, 4698100; 509400, 4698100; 509400, 4698000; 509200, 4698000; 509200, 4697800; 509300, 4697800; 509300, 4697600; 509400, 4697600; 509400, 4697200; 509500, 4697200; 509500, 4697000; 510100, 4697000; 510100, 4697100; 511700, 4697100; 511700, 4697000; 511900, 4697000; 511900, 4696400; 510800, 4696400; 510800, 4696300; 510600, 4696300; 510600, 4696400; 510300, 4696400; 510300, 4696500; 509700, 4696500; 509700, 4696600; 509600, 4696600; 509600, 4696500; 508900, 4696500; 508900, 4696600; 508600, 4696600; 508600, 4696700;

508400, 4696700; 508400, 4696800;
 508300, 4696800; 508300, 4696900;
 508200, 4696900; 508200, 4697000;
 508100, 4697000; 508100, 4697100;
 508000, 4697100; 508000, 4697300;
 508100, 4697300; 508100, 4697600;
 508400, 4697600; 508400, 4697700;
 508600, 4697700; 508600, 4697800;
 508500, 4697800; 508500, 4698000;
 508400, 4698000; 508400, 4698400;
 508500, 4698400; 508500, 4698500;
 508800, 4698500; 508800, 4698600;
 508900, 4698600; 508900, 4698300;
 509000, 4698300; 509000, 4698400;
 509100, 4698400; 509100, 4698600;
 509200, 4698600; 509200, 4698700;
 509500, 4698700; 509500, 4698900;
 509800, 4698900; 509800, 4699000;
 510100, 4699000; 510100, 4699100;
 511000, 4699100; 511000, 4699000;
 511300, 4699000; 511300, 4698900;
 returning to 511600, 4698900; excluding
 land bounded by 508600, 4697100;
 508600, 4697300; 508500, 4697300;
 508500, 4697100; 508600, 4697100; and
 land bounded by 509100, 4697700;
 509100, 4697800; 508800, 4697800;
 508800, 4697700; 509100, 4697700.

(18) *Subunit 3C*: Jackson County,
 Oregon.

(i) From USGS 1:24,000 quadrangle
 map Sams Valley, Oregon, land
 bounded by the following UTM 10 NAD
 83 coordinates (E, N): 508300, 4695000;
 507800, 4695000; 507800, 4695200;
 507400, 4695200; 507400, 4695400;
 506900, 4695400; 506900, 4695800;
 506800, 4695800; 506800, 4695900;
 506400, 4695900; 506400, 4695800;
 505600, 4695800; 505600, 4696000;
 505800, 4696000; 505800, 4696700;
 506200, 4696700; 506200, 4696800;
 506100, 4696800; 506100, 4697300;
 506200, 4697300; 506200, 4697600;
 506800, 4697600; 506800, 4697500;
 506900, 4697500; 506900, 4697300;
 506800, 4697300; 506800, 4697200;
 506700, 4697200; 506700, 4697000;
 507000, 4697000; 507000, 4697000;
 506900, 4697000; 506900, 4697200;
 507000, 4697200; 507000, 4697400;
 507100, 4697400; 507100, 4697500;
 507200, 4697500; 507200, 4697400;
 507300, 4697400; 507300, 4697300;
 507400, 4697300; 507400, 4697100;
 507500, 4697100; 507500, 4697000;
 507600, 4697000; 507600, 4696900;
 507700, 4696900; 507700, 4696700;
 507900, 4696700; 507900, 4696000;
 508300, 4696000; returning to 508300,
 4695000.

(19) *Subunit 4A*: Jackson County,
 Oregon.

(i) From USGS 1:24,000 quadrangle
 map Sams Valley, Oregon, land
 bounded by the following UTM 10 NAD
 83 coordinates (E, N): 508600, 4701300;
 508400, 4701300; 508400, 4701500;
 508300, 4701500; 508300, 4701900;

508200, 4701900; 508200, 4702000;
 508100, 4702000; 508100, 4702100;
 508000, 4702100; 508000, 4702200;
 507900, 4702200; 507900, 4702300;
 507800, 4702300; 507800, 4702400;
 507700, 4702400; 507700, 4702500;
 507600, 4702500; 507600, 4702400;
 507500, 4702400; 507500, 4702300;
 507300, 4702300; 507300, 4702200;
 507400, 4702200; 507400, 4702100;
 507600, 4702100; 507600, 4702000;
 507700, 4702000; 507700, 4701800;
 507800, 4701800; 507800, 4701700;
 507900, 4701700; 507900, 4701400;
 507700, 4701400; 507700, 4701500;
 507600, 4701500; 507600, 4701600;
 507300, 4701600; 507300, 4701700;
 507100, 4701700; 507100, 4701800;
 507000, 4701800; 507000, 4701900;
 506900, 4701900; 506900, 4702000;
 506800, 4702000; 506800, 4702200;
 506700, 4702200; 506700, 4702400;
 506600, 4702400; 506600, 4702500;
 506500, 4702500; 506500, 4702700;
 506600, 4702700; 506600, 4702900;
 506700, 4702900; 506700, 4703100;
 506800, 4703100; 506800, 4703400;
 507000, 4703400; 507000, 4703500;
 507200, 4703500; 507200, 4703400;
 507300, 4703400; 507300, 4703300;
 507800, 4703300; 507800, 4703200;
 507900, 4703200; 507900, 4703100;
 508000, 4703100; 508000, 4703000;
 508100, 4703000; 508100, 4702900;
 508200, 4702900; 508200, 4702800;
 508300, 4702800; 508300, 4702700;
 508400, 4702700; 508400, 4702500;
 508500, 4702500; 508500, 4702300;
 508600, 4702300; 508600, 4701900;
 508800, 4701900; 508800, 4701500;
 508700, 4701500; 508700, 4701400;
 508600, 4701400; returning to 508600,
 4701300.

(20) *Subunit 4B*: Jackson County,
 Oregon.

(i) From USGS 1:24,000 quadrangle
 map Sams Valley, Oregon, land
 bounded by the following UTM 10 NAD
 83 coordinates (E, N): 504000, 4698900;
 503800, 4698900; 503800, 4699000;
 503700, 4699000; 503700, 4699400;
 503800, 4699400; 503800, 4699800;
 503700, 4699800; 503700, 4700900;
 503800, 4700900; 503800, 4700800;
 503900, 4700800; 503900, 4700700;
 504000, 4700700; 504000, 4700600;
 504300, 4700600; 504300, 4700500;
 504400, 4700500; 504400, 4699500;
 504200, 4699500; 504200, 4699200;
 504100, 4699200; 504100, 4699100;
 504000, 4699100; returning to 504000,
 4698900.

(21) *Unit 5*: Shasta County, California.

(i) From USGS 1:24,000 quadrangle
 maps Balls Ferry, Cottonwood,
 Enterprise, and Palo Cedro, California,
 land bounded by the following UTM 10
 NAD 83 coordinates (E, N): 564200,
 4480800; 564000, 4480800; 563600,

4480900; 563300, 4481000; 563100,
 4480900; 562900, 4480900; 562500,
 4481200; 562400, 4481500; 562400,
 4481700; 562300, 4482400; 562000,
 4482500; 561900, 4482800; 561800,
 4483300; 561500, 4483700; 561000,
 4484000; 560700, 4485400; 560700,
 4486500; 560800, 4486700; 561000,
 4486900; 561200, 4487000; 561300,
 4487600; 561600, 4487900; 562000,
 4487900; 562500, 4487400; 562700,
 4487100; 562900, 4487200; 563200,
 4487200; 563300, 4487000; 563300,
 4486700; 563800, 4486400; 564300,
 4484700; 564300, 4484400; 564700,
 4483800; 564900, 4483600; 564900,
 4483400; 564500, 4483000; 564500,
 4482800; 564600, 4482700; 564600,
 4482400; 564400, 4482100; 564500,
 4481700; 564500, 4481000; returning to
 564200, 4480800.

(22) *Unit 6*: Tehama County,
 California.

(i) From USGS 1:24,000 quadrangle
 maps Corning, Gerber, Henleyville, Red
 Bluff East, Red Bluff West, and West of
 Gerber, California, land bounded by the
 following UTM 10 NAD 83 coordinates
 (E, N): 555600, 4423000; 555100,
 4423000; 554600, 4424900; 555100,
 4425600; 557200, 4426300; 557800,
 4426800; 558300, 4426500; 559500,
 4428300; 558200, 4428200; 557800,
 4428500; 557400, 4429300; 558000,
 4429900; 558600, 4430000; 558600,
 4431100; 560000, 4431600; 559200,
 4431900; 558300, 4432000; 557400,
 4432200; 557400, 4432600; 558400,
 4433100; 558400, 4433600; 557800,
 4433600; 557500, 4433800; 557300,
 4434400; 555100, 4434800; 555100,
 4435400; 557000, 4436200; 557900,
 4439000; 557000, 4439000; 554600,
 4437400; 553200, 4437000; 553200,
 4437600; 554500, 4438100; 555400,
 4439700; 556500, 4439800; 556500,
 4441800; 558500, 4442600; 558500,
 4443000; 557400, 4442900; 557000,
 4443000; 556800, 4443400; 557500,
 4444300; 558000, 4443700; 558400,
 4443700; 559900, 4444000; 559900,
 4444700; 559800, 4444700; 559800,
 4445400; 560900, 4446100; 562200,
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 4436800; 565100, 4435800; 563900,

4434600; 563900, 4432900; 563500, 4432100; 567300, 4431600; 567900, 4427300; 566300, 4426600; 565000, 4425900; 563700, 4425800; 562000, 4424700; 560400, 4424700; 558600, 4423800; returning to 555600, 4423000.

(23) *Unit 7*: Butte and Tehama counties, California.

(i) From USGS 1:24,000 quadrangle maps Balls Ferry, Cottonwood, Enterprise, and Palo Cedro, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 602400, 4401600; 601900, 4401800; 601800, 4402000; 601500, 4401900; 601000, 4401900; 600400, 4402100; 599600, 4402100; 599400, 4403400; 599100, 4403200; 598300, 4403400; 597100, 4403700; 596400, 4404200; 596300, 4404800; 595100, 4405000; 595100, 4405600; 595400, 4406000; 595400, 4407100; 595500, 4407100; 595700, 4407300; 595700, 4407400; 596100, 4407400; 596400, 4408000; 596400, 4408100; 596100, 4408200; 596100, 4408400; 596200, 4408600; 595900, 4408800; 595700, 4408800; 595500, 4408200; 594300, 4408200; 594100, 4408300; 594000, 4408400; 593600, 4408500; 593400, 4408200; 592600, 4408200; 592500, 4408700; 592100, 4408500; 592000, 4408700; 591400, 4408700; 590700, 4408700; 590400, 4408300; 589900, 4408300; 589000, 4408600; 589000, 4409300; 589100, 4409900; 588900, 4410200; 588200, 4410300; 588200, 4411000; 587900, 4411400; 587900, 4412000; 587900, 4412400; 587600, 4412700; 587600, 4413400; 584200, 4413400; 583100, 4413100; 582900, 4413400; 582900, 4415900; 582000, 4418300; 581800, 4419200; 582000, 4419500; 581400, 4420000; 581400, 4420400; 581800, 4420700; 581600, 4421000; 583200, 4422600; 583500, 4423600; 585200, 4424500; 586000, 4424500; 587500, 4426100; 588200, 4426500; 588600, 4429100; 588800, 4430200; 589500, 4429500; 589500, 4428600; 591400, 4425800; 592600, 4424100; 593400, 4422300; 594200, 4421100; 595900, 4417800; 595800, 4417300; 595800, 4416600; 596100, 4416600; 596400, 4416800; 596600, 4416800; 597100, 4416400; 597100, 4415600; 596800, 4415200; 597100, 4415000; 597800, 4415500; 598100, 4415200; 597600, 4414600; 597600, 4414400; 597300, 4413800; 597300, 4413300; 598200, 4413900; 598400, 4413900; 598400, 4413600; 597400, 4411900; 597600, 4411900; 598300, 4412700; 598500, 4413300; 598900, 4413300; 598900, 4411800; 599400, 4411700; 599800, 4411700; 599800, 4411000; 597700, 4409400; 597000, 4408500; 596800, 4408300; 596800, 4407500; 597300, 4407500; 597300, 4408000; 597900,

4407500; 598100, 4407500; 598100, 4407100; 597700, 4406800; 597800, 4406700; 597500, 4406500; 597300, 4406700; 597100, 4406600; 597500, 4406100; 597100, 4405900; 597600, 4405100; 598000, 4405300; 598400, 4404700; 598500, 4404800; 598200, 4405300; 599000, 4405800; 598900, 4406100; 598700, 4406000; 598500, 4406000; 598500, 4407200; 598300, 4407200; 598300, 4407500; 598200, 4407800; 598700, 4408400; 599900, 4409000; 600100, 4409000; 600300, 4408800; 600300, 4408400; 600000, 4408100; 600400, 4407600; 599500, 4406700; 599500, 4406200; 600300, 4406000; 601200, 4405600; 601800, 4405600; 602000, 4405500; 602200, 4405200; 602500, 4405200; 602700, 4404900; 603300, 4404700; 604500, 4404200; 605200, 4404200; 605600, 4404000; 605600, 4403600; 605100, 4403300; 604700, 4403400; 604500, 4403300; 604400, 4402800; 603600, 4402100; 602900, 4402100; returning to 602400, 4401600.

(24) *Unit 8*: Glenn and Tehama counties, California.

(i) From USGS 1:24,000 quadrangle maps Black Butte Dam and Kirkwood, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 560000, 4405200; 559200, 4405700; 558600, 4405800; 558600, 4406400; 558600, 4408000; 558900, 4408700; 559100, 4408700; 559400, 4407000; 560600, 4407400; 561000, 4407400; 561000, 4411400; 561800, 4411400; 565600, 4411400; 565600, 4410600; 568400, 4410600; 568400, 4411400; 570500, 4411400; 570800, 4411700; 571400, 4411500; 571500, 4411000; 572100, 4410900; 572100, 4410100; 571800, 4409600; 570500, 4409000; 570200, 4409000; 570200, 4409300; 569700, 4409300; 569700, 4409000; 569800, 4407700; 569900, 4407000; 569800, 4406100; 569800, 4405500; 569400, 4405500; 568600, 4405900; 568300, 4405900; 567500, 4405500; 567200, 4405500; 565000, 4405500; 564600, 4405800; 564100, 4405800; 563700, 4405600; 563400, 4405400; 562000, 4405700; 561100, 4405900; 560300, 4405900; 560200, 4405300; returning to 560000, 4405200.

(25) *Unit 9*: Butte County, California.

(i) From USGS 1:24,000 quadrangle maps Chico and Hamlin Canyon, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 604600, 4395600; 604000, 4395700; 603900, 4396700; 603600, 4396800; 603600, 4398000; 602900, 4398200; 603000, 4398800; 603100, 4399000; 602600, 4399400; 602600, 4399600; 603500, 4399800; 604700, 4400200; 605100, 4399600; 606500,

4399500; 607200, 4399100; 607400, 4399100; 607700, 4398100; 607700, 4397800; 606200, 4396500; 606200, 4395800; returning to 604600, 4395600.

(26) *Unit 10*: Colusa and Glenn counties, California.

(i) From USGS 1:24,000 quadrangle maps Logandale, Maxwell, Moulton Weir, and Princeton, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 572900, 4357400; 571200, 4357400; 571200, 4358200; 570400, 4358200; 570400, 4359000; 569600, 4359000; 569500, 4360500; 569300, 4362200; 569500, 4363300; 569500, 4367200; 570000, 4367200; 569900, 4368400; 570300, 4368400; 571000, 4367600; 571000, 4367800; 570700, 4368500; 570900, 4368800; 571500, 4368800; 571900, 4368300; 571900, 4367600; 572100, 4367600; 572400, 4368100; 572400, 4368400; 572600, 4368900; 572800, 4368900; 573000, 4368100; 573400, 4368000; 573800, 4367600; 574100, 4367300; 574400, 4367200; 574500, 4366400; 574900, 4366400; 574900, 4365600; 574700, 4365500; 574400, 4364100; 575200, 4363900; 575600, 4363600; 575100, 4362400; 575600, 4361400; 575100, 4360700; 576000, 4359600; 575500, 4358900; 575700, 4358300; 575900, 4357700; 575300, 4357800; 575000, 4357700; 574700, 4357700; 573600, 4357800; 573500, 4358200; 572900, 4358200; returning to 572900, 4357400.

(27) *Unit 11*: Yuba County, California.

(i) From USGS 1:24,000 quadrangle maps Browns Valley and Wheatland, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 636300, 4327700; 635600, 4327700; 635300, 4327800; 635300, 4328800; 634800, 4329000; 634800, 4329700; 634600, 4329900; 633800, 4329900; 633600, 4330100; 633500, 4330100; 632800, 4329700; 632700, 4328800; 631300, 4328800; 631300, 4329300; 631400, 4329300; 631400, 4330600; 632400, 4330700; 632800, 4330700; 633000, 4330900; 633000, 4331300; 633100, 4331500; 633500, 4331700; 633800, 4331500; 633800, 4332300; 631500, 4332200; 631500, 4333900; 632400, 4333900; 632400, 4335400; 633300, 4335800; 633700, 4336300; 634100, 4336400; 634900, 4336700; 635100, 4336600; 635200, 4336400; 635700, 4336400; 636000, 4336400; 636100, 4335900; 635900, 4335800; 636000, 4335200; 636500, 4335100; 637100, 4335300; 637400, 4334700; 637800, 4334700; 637700, 4333600; 638200, 4333400; 638200, 4332600; 637600, 4332600; 637600, 4331900; 636900, 4332100; 636700, 4332300; 636600, 4332500; 636100, 4334000; 636700, 4334300; 636600,

4334500; 636000, 4334200; 635400, 4336000; 634500, 4336000; 634500, 4335100; 634400, 4334700; 635100, 4332600; 636000, 4330500; 636400, 4330300; 636500, 4329300; 637100, 4328800; 636900, 4327900; returning to 636300, 4327700.

(28) *Unit 12*: Placer and Sacramento counties, California.

(i) From USGS 1:24,000 quadrangle maps Citrus Heights, Gold Hill, Lincoln, Pleasant Grove, Rio Linda, Rocklin, Roseville, and Sheridan, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 636500, 4287700; 635700, 4287700; 635100, 4288300; 634500, 4288300; 634100, 4288500; 633600, 4288700; 632800, 4288700; 632800, 4289200; 633100, 4289200; 634100, 4289900; 634100, 4290500; 634400, 4290600; 634100, 4290800; 633700, 4290800; 633500, 4291200; 633700, 4291500; 634600, 4291400; 634900, 4291200; 634900, 4290500; 635700, 4290400; 637100, 4290400; 638100, 4290700; 637900, 4292300; 638300, 4293000; 638800, 4293000; 638900, 4294200; 637100, 4294200; 637100, 4295500; 638100, 4295500; 638300, 4295900; 638900, 4295900; 639100, 4295400; 640000, 4295800; 639300, 4296200; 639200, 4296700; 639100, 4296900; 639000, 4298300; 638600, 4297500; 637500, 4297400; 636900, 4297100; 636300, 4296900; 635600, 4297200; 635100, 4297200; 634300, 4297100; 633500, 4297100; 633500, 4297800; 635100, 4297900; 635100, 4298400; 635800, 4298600; 635800, 4300000; 636000, 4300100; 636000, 4301000; 637800, 4300900; 637800, 4300300; 639200, 4300300; 639200, 4301000; 639800, 4301000; 639800, 4301500; 637600, 4301500; 637600, 4301900; 638400, 4302200; 639100, 4302300; 639900, 4302200; 640000, 4301800; 640800, 4301800; 640800, 4302500; 641200, 4302700; 641500, 4302700; 641600, 4302200; 641900, 4301900; 642200, 4302300; 642800, 4301900; 643400, 4301400; 643700, 4302100; 644300, 4302300; 644400, 4302600; 644400, 4302800; 643400, 4302800; 642600, 4303500; 642800, 4304000; 643500, 4304400; 644000, 4304700; 644000, 4306700; 642400, 4306700; 642800, 4306900; 643600, 4307100; 643900, 4307100; 644100, 4307100; 644100, 4307000; 644500, 4307000; 644800, 4306800; 645000, 4306800; 645400, 4307100; 645500, 4307100; 645500, 4307300; 645500, 4308300; 643900, 4308300; 643900, 4307400; 643700, 4307400; 643300, 4308900; 643100, 4308400; 642800, 4308100; 642600, 4307500; 642300, 4307400; 642000, 4307000; 641500, 4307000; 641500, 4307600; 642300, 4307600;

642300, 4308200; 641500, 4308300; 641400, 4310400; 640500, 4310400; 640600, 4306700; 640600, 4306200; 640200, 4306000; 640000, 4306100; 639900, 4306300; 639900, 4306700; 639300, 4306700; 638700, 4306300; 638300, 4306300; 638100, 4307000; 638000, 4307100; 637500, 4307100; 637500, 4308400; 638800, 4308400; 639000, 4309700; 639300, 4309700; 639300, 4310500; 639800, 4310500; 639900, 4310300; 640500, 4310700; 640500, 4311000; 640900, 4311000; 641100, 4311700; 642000, 4311700; 642300, 4311000; 642200, 4310800; 642200, 4310500; 643200, 4310800; 643700, 4310500; 644100, 4311100; 644900, 4311100; 645100, 4310900; 645400, 4310900; 645700, 4310600; 645800, 4310700; 645800, 4311300; 646400, 4311900; 646800, 4311900; 646800, 4313700; 647300, 4314200; 648500, 4314200; 648000, 4313200; 648000, 4310000; 649000, 4309800; 649100, 4309200; 647400, 4309200; 647200, 4308900; 646900, 4308900; 646700, 4308600; 646300, 4308600; 646300, 4308300; 646500, 4308100; 646700, 4307900; 647000, 4307900; 647000, 4308100; 647100, 4308400; 648000, 4308400; 648200, 4308300; 648200, 4307600; 648600, 4307600; 648600, 4307200; 648800, 4307200; 648800, 4306800; 648400, 4306800; 648300, 4307100; 647100, 4307100; 647100, 4307400; 646900, 4307600; 646400, 4308000; 646400, 4307100; 646600, 4307100; 646600, 4306500; 646400, 4306500; 646200, 4306500; 646200, 4306000; 644800, 4306000; 644700, 4305900; 644700, 4305400; 645500, 4305400; 645600, 4305100; 646200, 4305100; 646400, 4304700; 647000, 4304700; 647200, 4304400; 647700, 4304500; 648700, 4304200; 648800, 4304600; 648800, 4304800; 649200, 4305300; 649500, 4305300; 649700, 4305600; 650300, 4305700; 650600, 4305100; 650800, 4304800; 650800, 4304300; 651700, 4304200; 651700, 4303600; 653100, 4303600; 654200, 4303200; 654200, 4303500; 654900, 4304200; 655600, 4304200; 657900, 4305100; 658500, 4304600; 659200, 4304400; 659200, 4304100; 658800, 4303900; 657800, 4303900; 657100, 4303200; 656700, 4303200; 656700, 4303800; 656600, 4303800; 656100, 4303600; 655200, 4303000; 655000, 4303200; 654700, 4303000; 654500, 4302700; 652500, 4302700; 652400, 4302600; 652700, 4302100; 652900, 4301500; 653300, 4301800; 653300, 4302400; 653600, 4302400; 653900, 4302000; 654400, 4302300; 654700, 4302100; 654600, 4301900; 654400, 4301400; 654500, 4300800; 654700, 4300800;

654500, 4300500; 654300, 4300500; 654100, 4300700; 653800, 4301300; 653500, 4301100; 653900, 4300600; 653900, 4300300; 653200, 4299800; 652900, 4300000; 653000, 4301100; 652600, 4301200; 652100, 4301000; 651700, 4300800; 651700, 4300300; 651100, 4299700; 651100, 4299200; 650800, 4298900; 648900, 4298800; 649200, 4298100; 649600, 4298100; 649700, 4297900; 649100, 4297300; 649000, 4297100; 648800, 4297100; 648300, 4296900; 647800, 4296400; 647600, 4296000; 647000, 4296000; 647100, 4295600; 647500, 4295400; 647500, 4295100; 647200, 4295000; 646900, 4294300; 646500, 4294300; 646600, 4295100; 646800, 4295200; 646800, 4295700; 646500, 4295700; 646300, 4296500; 647600, 4296500; 647600, 4297100; 648500, 4297700; 648500, 4297900; 647600, 4297900; 647600, 4299300; 646400, 4299300; 646400, 4297200; 645800, 4297200; 645800, 4295400; 643800, 4295400; 643200, 4295000; 642500, 4295000; 642600, 4291900; 642600, 4290400; 642600, 4290000; 642400, 4289800; 641600, 4289500; 640900, 4289500; 640500, 4289200; 637500, 4289200; 637500, 4288700; 637400, 4288400; 636700, 4288400; 636700, 4287800; returning to 636500, 4287700.

(29) *Unit 13*: Sacramento County, California.

(i) From USGS 1:24,000 quadrangle maps Buffalo Creek, Carmichael, Elk Grove, Folsom SE and Sloughhouse, California, land bounded by the following UTM 10 NAD 83 coordinates (E, N): 650400, 4257200; 650200, 4257200; 650200, 4258300; 649600, 4258300; 649600, 4257400; 649400, 4257400; 649400, 4259000; 649100, 4259000; 649100, 4258500; 648500, 4258500; 648500, 4257400; 648200, 4257400; 648100, 4258300; 647700, 4258600; 647700, 4258900; 648000, 4259300; 647700, 4259600; 646800, 4259200; 646500, 4258800; 646500, 4258700; 645800, 4258700; 646100, 4259000; 646100, 4260000; 646400, 4260100; 646600, 4260400; 646100, 4260800; 645300, 4261200; 645000, 4260700; 644800, 4260700; 644400, 4261400; 644400, 4262400; 643800, 4262400; 643600, 4262800; 643200, 4262800; 643200, 4263300; 643500, 4263300; 643700, 4263200; 643700, 4263800; 645200, 4263800; 645200, 4262800; 644800, 4262700; 644800, 4262300; 645300, 4262300; 645300, 4261900; 645000, 4261700; 645300, 4261500; 645400, 4261700; 646000, 4262100; 645800, 4262400; 646000, 4262700; 646400, 4262600; 646700, 4262700; 646600, 4263900; 647400, 4263900; 647600, 4263700; 647800, 4264300; 648100, 4264300; 648300,