

Buena Vista Lake Shrew (*Sorex ornatus relictus*)

Legal Status

State: Species of Special Concern

Federal: Endangered

Critical Habitat: The U.S. Fish and Wildlife Service (USFWS) designated critical habitat for the Buena Vista Lake Shrew in 2005. A revision of the critical habitat was pending as of January 2013.

Recovery Planning: *Recovery Plan for Upland Species of the San Joaquin Valley* (U.S. Fish and Wildlife Service 1998). In 2011, U.S. Fish and Wildlife Service (USFWS) issued the *Buena Vista Lake Shrew (Sorex ornatus relictus) 5-Year Review: Summary and Evaluation*. In the 5-Year Review, USFWS recommended no change to the federal status of the species.

Notes: No changes to status proposed or anticipated during the permit term.

Taxonomy

The Buena Vista Lake shrew is a subspecies of the ornate shrew. Ornate shrews are a small mammal with a body length average of 8.9–10.8 centimeters (cm) (3.5–4.2 inches), the tail length is about 3.2–4.4 cm (1.5–1.7 inches), and weighs 3–7grams (Jameson and Peeters 2004). The upper surface is brownish and the lower surface is smoke grey. The tail is not markedly bicolored and darkens toward the end (U.S. Fish and Wildlife Service 1998). The coloration of the Buena Vista Lake shrew is distinctly darker, more grayish black, than brown. The body size is slightly larger and the tail is slightly shorter (U.S. Fish and Wildlife Service 1998).

Distribution

General

Ornate shrews occur throughout the Central Valley and Coast Range in California. The Buena Vista Lake shrew formerly occurred in the wetlands that existed around edges of Buena Vista Lake and may have also occurred throughout the Tulare Basin (U.S. Fish and Wildlife Service 1998).

Distribution and Occurrences within the Study Area

Historical

Based on a search of the California Natural Diversity Database (CNDDDB), there are no historical Buena Vista Lake shrew occurrences (prior to 1990) within the permit area and there are two historical occurrences within the larger study area (California Department of Fish and Game 2012).

Recent

The draining of most of the wetlands in the Tulare Basin and Buena Vista Lake has greatly reduced the current distribution of the Buena Vista Lake shrew. The shrew was believed extinct for more than 50 years because its wetland habitat had been converted to agriculture and urban development. The subspecies was rediscovered at the Kern Lake Preserve in 1986 and at the Kern Wildlife Refuge in 1992 (U.S. Fish and Wildlife Service 2011).

The current distribution of the Buena Vista Lake shrew is poorly understood. There is one CNDDDB Buena Vista Lake shrew occurrence from 1990–present in the permit area and four CNDDDB occurrences within the study area and outside of the permit area (California Department of Fish and Game 2012). One of the five occurrences is presumed extirpated and four of the occurrences are presumed to be extant. Recent surveys for the shrew have been conducted at twenty-one sites and the shrew was found to be present in eight of them. These eight sites are:

- Goose Lake,
- Atwell Island,
- Main Drain Canal/Chicca & Sons Twin Farms South Field Ranch,
- Lemoore Wetlands preserve,
- Coles Levee Ecosystem Preserve,
- Kern fan water recharge area,
- the Kern National Wildlife Refuge, and
- the Kern Lake preserve (U.S. Fish and Wildlife Service 2011).

The ESRP conducted shrew trapping surveys in the Wind Wolves Preserve in 2010 and trapped 11 shrews. Genetic samples were taken of each of the shrews captured and sent to Conservation Genetics Laboratory at the Smithsonian Institution for analysis (Cypher et al. 2011).

Natural History

Habitat Requirements

The habitat requirements are generally like those of other ornate shrews, thick understory vegetation with downed logs and branches, with an abundance of leaf litter and detritus. Another important habitat feature is an abundant supply of forage species (Bolster 1998). Captures at the Kern Lake Preserve occurred in areas with dense vegetation cover and thick layer of detritus. Plant species associated with occupied habitat include Fremont cottonwood (*Populus fremontii*), willows (*Salix* sp.), Baltic rush (*Juncus balticus*), and wild-rye grass (*Elymus* sp.) (Bolster 1998). Habitat associated with captures at the Wind Wolves Preserve were characterized by moist soils, dense ground cover with stands of willow, cottonwood, or cattails (*Typha* ssp.), near running or standing water (Cypher et al. 2011).

Table 1. Habitat Associations for Buena Vista Lake Shrew

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Rationale
Wetland, Valley foothill riparian forestRiparian Complex	Foraging, breeding, nestingYear-round	Primary	Requires dense wetland and riparian habitat with abundant ground cover	Dense ground cover provides habitat for prey species and nesting habitat

Sources: Bolster 1998; Cypher et al. 2011.

Foraging Requirements

Ornate shrews possess high metabolic rates which require an individual to consume a large volume of food daily to survive. Torpor has been observed in ornate shrews and may be an adaptation which ornate shrews use to reduce the amount of food needed daily in order to survive periods of adverse weather or food shortages (Bolster 1998).

In general, shrews primarily feed on insects and other invertebrates. Shrews are indiscriminate foragers and will consume both adult and larvae of insects that are encountered during foraging bouts. Shrews will also feed on other invertebrates including snails, slugs, earthworms, and arachnids (U.S. Fish and Wildlife Service 2011).

Reproduction

The reproductive season for ornate shrews generally extend from late February through September. Up to two litters of four to six young in each litter are produced

per year (U.S. Fish and Wildlife Service 2011). The reproductive season of the Buena Vista Lake shrew is thought to begin in late autumn and end with the onset of the dry season in May or June (U.S. Fish and Wildlife Service 1998).

Table 2. Key Seasonal Periods for Buena Vista Lake Shrew

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding		✓	✓	✓	✓	✓	✓	✓	✓			

Sources: U.S. Fish and Wildlife Service 2011.

Home Range and Population Density

Little is known regarding the home ranges and territoriality of the Buena Vista Lake shrew. Other species of shrews have small home ranges in which they nest, forage, and reproduce. The vagrant shrew (*Sorex vagrans*) in the Sierra Nevada have home ranges that average 372 m² (4,000 ft²), with reproductive males having larger home ranges than reproductive females (U.S. Fish and Wildlife Service 2011). The densities of Buena Vista Lake shrews are thought to be relatively low. Trapping results suggest that population densities for Buena Vista Lake shrew range from 10–15 individuals per hectare (4–6 per acre)(U.S. Fish and Wildlife Service 1998).

Ecological Relationships

Small mammals provide prey species for many carnivores such as foxes (*Vulpes* spp.), coyotes (*Canis latrans*), long-tailed weasels (*Mustela frenata*), avian predators such as owls and other raptors. Shrews are often unpalatable to many predators because of distasteful excretions from their flank glands, though most owls have poor sense of smell and are known predators of shrews (U.S. Fish and Wildlife Service 2011).

Due to its low population numbers and the high degree of habitat fragmentation in the San Joaquin Valley the Buena Vista Lake shrews are particularly vulnerable negative impacts from changes in its environment, whether natural or anthropogenic changes, because of low population numbers and high fragmentation of occupied habitat and little connectivity of isolated populations. Therefore, there is limited gene flow between populations. Low genetic variation in a population has the capacity to limit the species ability to adapt to drastic environmental events, can result in lower breeding success and inbreeding all of which decrease the fitness and survivability of the shrew (U.S. Fish and Wildlife Service 2011).

Population Status and Trends

Global: Critically Imperiled (NatureServe 2012)

State: Declining (California Department of Fish and Game 2011)

Study Area: Same as above

The Buena Vista Lake shrew currently has a highly restricted range and there is a continuation of habitat loss and conversion. Only a small portion of the existing suitable habitat is currently protected and the locations where the species occur have small populations and are highly fragmented (U.S. Fish and Wildlife Service 2011).

Threats and Environmental Stressors

Since the 1870s, more than 95% of the original natural communities in the San Joaquin Valley have been lost to agricultural, urban, and industrial development (U.S. Fish and Wildlife Service 1998). Cultivation, irrigation infrastructures, and urban development have led to marked decrease in wetland and riparian habitats throughout the San Joaquin Valley. These activities present ongoing threats to the survival of Buena Vista Lake shrews (U.S. Fish and Wildlife Service 2011).

Conservation and Management Activities

In 1998, a recovery plan for upland species of the San Joaquin Valley was completed that included a recovery strategy for the Buena Vista Lake shrew. The recovery plan recommends that the Kern Lake site be preserved in perpetuity and that surveys be conducted in areas of suitable habitat to locate and protect other extant populations (U.S. Fish and Wildlife Service 1998). Expansion of suitable habitat, introduction efforts, and the protection of the Buena Vista Lake shrew should be an objective of any future National Wildlife Refuge and Ecological Reserve development and management plans (U.S. Fish and Wildlife Service 1998).

Data Characterization

The amount of literature that is available for the Buena Vista Lake shrew is sparse because of the secretive nature and limited habitat available for the species. The Endangered Species Recovery Program (ESRP) has conducted some surveys in outlying areas that provide suitable habitat and found the species in areas outside of the current range of the species. Data on population size, reproductive capacity, mortality, dispersal, and home-range movement patterns is lacking, although habitat characteristics and requirements are well understood.

Management and Monitoring Considerations

Because the species is restricted to riparian woodlands and the edges of wetlands, the preservation of these habitats, especially where there are known populations, is key in maintaining existing populations. Preservation, restoration, and creation of habitat is important to ensure that populations are able to increase over time.

Predicted Species Distribution in the Study Area

Model Description

Primary Habitat

Land cover types that provide suitable habitat and that were used in the habitat model include:

- Valley foothill riparian forest Riparian Complex
- Wetland

Buena Vista Lake shrews are found in wetlands and riparian habitat with an abundance of leaf litter and detritus. Captures at the Kern Lake Preserve occurred in areas with dense vegetation cover and thick layer of detritus (Bolster 1998). Habitat associated with captures at the Wind Wolves Preserve were characterized by moist soils, dense ground cover with stands of willow, cottonwood, or cattails (*Typha* spp.), near running or standing water (Cypher et al. 2011). Therefore, wetlands, ~~valley foothill riparian~~, and riparian complex were considered primary habitat for Buena Vista Lake shrew.

Model Results

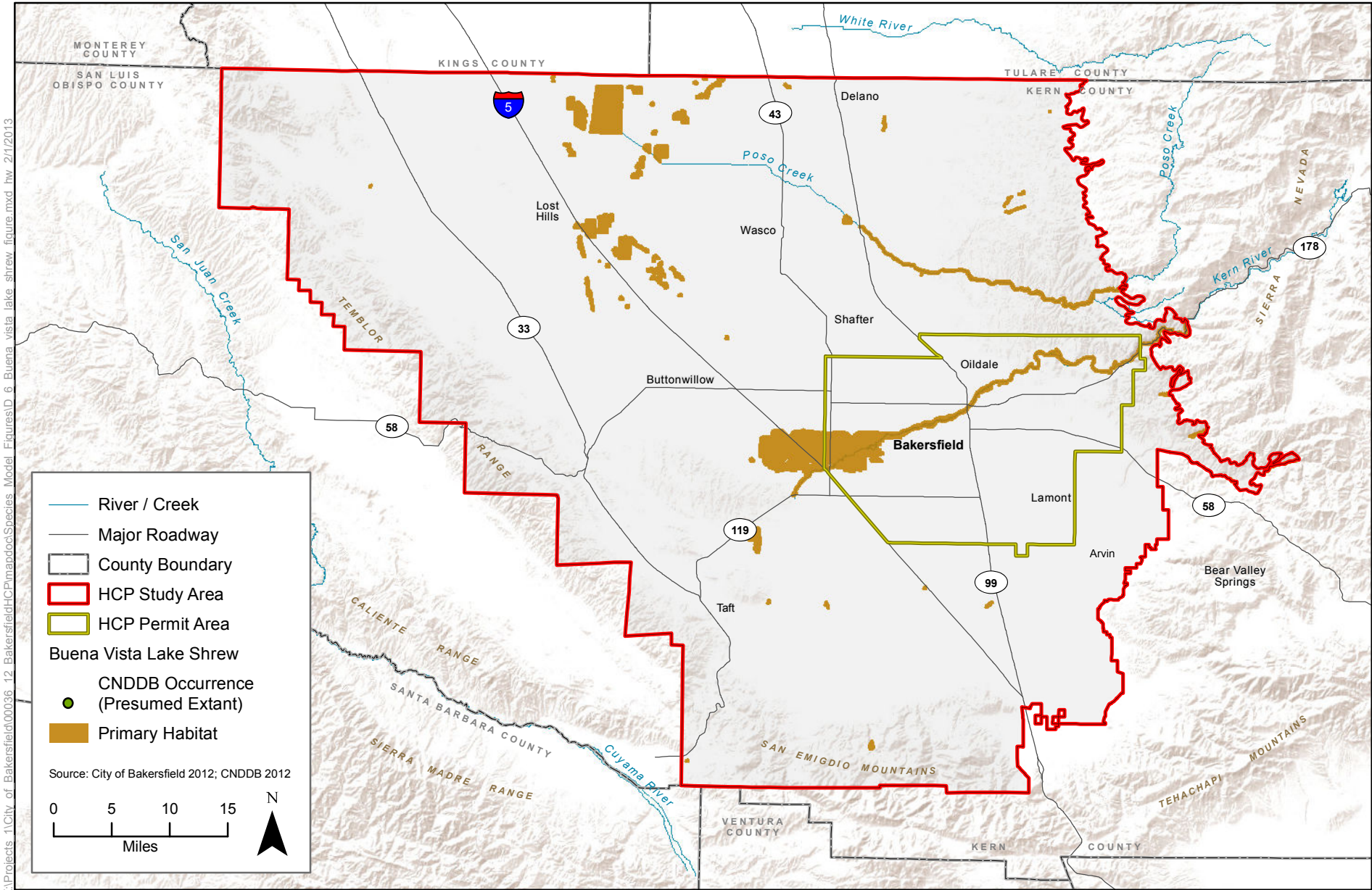
Figure D-6 shows the modeled primary habitat for Buena Vista Lake shrew within the Plan Area and the Study Area. Two of the six CNDDDB occurrences of this species match the modeled habitat. The CNDDDB occurrences that fall outside of the modeled habitat are historical records that occurred in habitat that was converted to agriculture. More surveys are necessary to determine if modeled habitat is occupied.

Literature Cited

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Bakersfield Conservation Plan



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Figure D-6
Buena Vista Lake Shrew Modeled Habitat