

Least Bell's Vireo (*Vireo bellii pusillus*)

Legal Status

State: Endangered

Federal: Endangered; protected under the Migratory Bird Treaty Act

Critical Habitat: Critical habitat for Least Bell's vireo was established by U. S. Fish and Wildlife Service (USFWS) in a final rule on February 2, 1994 (59 Federal Register [FR] 4945–4867). There are 38,000 total acres 15,378 hectares) of critical habitat designated for Least Bell's vireo in California (59 FR 4945--4867), none of which are within the permit area.

Recovery Planning: USFWS developed a draft recovery plan in 1986 though it was never finalized (U.S. Fish and Wildlife Service 1986).

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

Taxonomy

Four subspecies are recognized; *Vireo bellii bellii*, *V. b. medius*, *V. b. arizonae*, and *V. b. pusillus*. *V. b. pusillus* (described by Coues in 1866), breeds from central California south to northern Baja California and winters in southern Baja California Sur, with some winter records north to southwestern California. Like *V. b. arizonae* but dorsum largely gray, with only rump and uppertail coverts washed olive, and ventrum nearly white, with only faint yellow on flanks; and the wing and tail average length are longer. There is no debate over the existence of these four subspecies (Kus et al. 2010).

Distribution

General

Historically the breeding range of this species was widespread throughout California, including the Sacramento and San Joaquin Valleys. At the time of its listing in 1986 more than 99% of vireos were located in southern California with more than half located within San Diego County (U.S. Fish and Wildlife Service 2006). Though this subspecies still mostly resides in southern California there have been significant increases in population numbers (U.S. Fish and Wildlife Service 2006) and between 2005 and 2007 Least Bell's vireo was observed in the Central Valley at the San

Joaquin River National Wildlife Refuge (NWR), though successful nesting was only confirmed in 2005 and 2006 (PRBO Conservation Science 2011). Additionally, recent (2010) nesting occurrences have been reported in the southern San Joaquin Valley at Wind Wolves Preserve (Fiehler et al. 2010).

Distribution and Occurrences within the Study Area

Historical

Based on a search of the California Natural Diversity Database (CNDDDB), there are no historical least Bell's vireo occurrences (prior to 1990) for this species within the permit area or within the larger study area (California Department of Fish and Game 2012).

Recent

There are no recent CNDDDB occurrences (1990 to present) of this species within the permit area (California Department of Fish and Game 2012). There is one recent occurrence from 2010 of this species within the study area along Emigdio Creek about 12.8 miles west southwest of Highway 166 at Interstate 5 on Wildlands Conservancy lands. The record is for five advertising males detected on May 16, 2010 and for one advertising male associated with a second adult and two fledged dependent juveniles on July 11, 2010. (Cypher et al. 2011).

Natural History

Habitat Requirements

Vireos use a wide variety of shrubs and small trees for habitat and nest-building. Typically vireos utilize dense, low, shrubby vegetation characteristic of early successional stages in riparian areas and are also known to commonly use oak woodland and scrub, coastal chaparral, and mesquite brushlands. Dense shrub layer 0.6–3.0 meters (m) above ground has been found to be a critical habitat component for Least Bell's vireo (Kus et al. 2010).

Table 1. Habitat Associations for Least Bell's Vireo

Land Cover Type	Land Cover Use	Habitat Designation	Habitat Parameters	Supporting Information
Riparian	Breeding, migration, and foraging	Primary	Dense shrub layer 0.6–3.0 m above ground	Kus et al. 2010
Woodland	Migration	Primary	Same as above	Kus et al. 2010
Coastal Scrub	Migration	Primary	Same as above	Kus et al. 2010

Foraging Requirements

As reported in Kus et al. (2010), studies that looked at foraging trends found that 69% of observations documented non-random use of vegetation for foraging, with vireos preferentially feeding at heights 3–6 m above the ground. Specifically, Least Bell's vireos appeared to prefer black willow (*Salix gooddingii*) relative to its cover within territories, but foraged on other plant species as available, favoring those plants that had the greatest prey abundance. Least Bell's vireos have also been observed to forage in upland vegetation adjacent to riparian corridors, particularly later in the season. Vireos rarely feed on the ground though may occur in wintering grounds when food is limited. Main foods taken include insects, such as bugs, beetles, grasshoppers, moths, and particularly caterpillars (Kus et al. 2010).

Reproduction

Females typically arrive on breeding grounds 1–2 weeks after males; courtship begins as soon as females settle on male territory. The length of the courtship period prior to initial nest construction is unknown, but is believed to be 1–2 days. Time for production of brood is about 34–37 days and consists of the following periods: 4–5 days nest building, 1–2 days rest between nest building and egg laying, 4 days egg laying, 14 days incubation, and 10–12 days hatching to fledging. Females typically lay one egg per day with the average clutch being 3-4 eggs. Eggs are usually laid in April although in California, nests have been seen in late July. Although pairs may attempt several nests in a year, they rarely fledge young from multiple broods (Kus et al. 2010).

Table 2. Key Seasonal Periods for Least Bell's Vireo

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

Source: Kus et al. 2010

Movement

In general there is minimal quantitative information about migration of vireos though some information is known through seasonal changes in regional occurrence and from recoveries and returns of banded birds. Least Bell's vireos leave the breeding range in late August or September (gone by October) and overwintering occurs primarily along the Pacific coast and interior of Middle America. Vireos return to breeding grounds most commonly in March (Kus et al. 2010).

Fledglings are known to disperse 10 m from the nest one day after fledging, 100 m after five days, 30–60 m after 14 days, and 1,600 m from natal site (in California) by the time a second brood has fledged. Dispersal between natal site and first breeding site, in California, generally to within natal drainage. Dispersal distance may vary depending on the habitat and the need for dispersal (may disperse farther to find better nest or food areas). Data collected between 1987 and 1995 in southern California suggest that approximately 20% of returning first-year breeders disperse to sites outside their natal drainages. This trend may differ depending on population density and available habitat at natal site (Kus et al. 2010).

Table 3. Movement Distances for Least Bell's Vireo

Type	Distance/Area	Location of Study	Citation
Home Range	No specific information. Likely depends on habitat conditions (may have larger ranges if foraging conditions are better further from the nest site).	–	–
Dispersal (from natal sites)	10–1,600 m	Southern California (specific locality unknown)	Kus et al. 2010
Migration	Winter in Pacific coast and interior of Middle America	Information from various bird banding efforts in Baja California, Rio San Jose near San Jose del Cabo, San Luis Rey River and Sweetwater River in San Diego County, and El Triunfo	Kus et al. 2010

Ecological Relationships

Key ecological relationships that are known to affect Least Bell's vireo survival include brood parasitism, nest predation, climate, and anthropogenic interactions. According to Kus et al. (2010), brown-headed cowbird (*Molothrus ater*) parasitism on vireo's (which is common) reduces vireo productivity through effects on several components of reproductive success. In California, parasitized clutches were smaller (generally by one egg) than unparasitized clutches in 6 of 9 years. Also, damage to vireo eggs by cowbirds reduced hatching rate in parasitized nests (from which cowbird eggs had been removed by investigators) to half that in unparasitized nests. The combined effects of reduced clutch size and hatch rate in manipulated (cowbird eggs removed) parasitized nests resulted in four times fewer young per nest being fledged from parasitized nests as compared to unparasitized nests. It has also been observed that vireo young that hatch in parasitized nests generally starve to death (Kus et al. 2010).

Nest predation is assumed to be the greatest source of nest failure for vireos (though rates of nest predation vary spatially and temporally) (Kus et al. 2010). Nest predators include native mammals and nonnative exotics such as feral cats and Argentine ants (U.S. Fish and Wildlife Service 2006). An average of 34 % of nests annually were lost to predators in California. Additionally, partial predation (disappearance of partial clutches or broods) is suspected to occur but has not been documented (Kus et al. 2010).

Humans have been a major factor in the loss of habitat for vireos. Though vireos are known to utilize a variety of shrub/scrub habitats for nesting, dense shrub layer 0.6–3.0 m above ground has been found to be a critical habitat component for Least Bell's vireo (Kus et al. 2010). In the southwestern United States, riparian habitat modifications—including agriculture, urbanization, firewood cutting, grazing, flood control projects, and reservoir construction—have reduced habitat for this species.

In addition to nest loss from predation and parasitism, nests have also been reported to fail due to other causes, including precipitation (rain, hail), damage to nest or supporting plant by human or animal activity, collapse of supporting stem/branch in herbaceous species as they desiccate over the nesting cycle and/or as nestling weight exceeds the supporting ability of host plant, and infertile or otherwise non-viable eggs (Kus et al. 2010).

Population Status and Trends

Global: Declining (Kus et al. 2010)

State: Endangered (California Department of Fish and Game 2011). Subspecies is increasing (but numbers still low) (Kus et al. 2010)

Study Area: Unknown

Due to extensive alteration of riparian corridors and adjacent habitats throughout its range, Least Bell's vireo have increasingly limited breeding habitat (U.S. Fish and Wildlife Service 2006). Populations have declined nationwide since 1966; though since 1980, the population has mostly stabilized based on breeding bird survey data. In specific locales, such as in the Lower Colorado River Valley in California, vireos are nearly extirpated. In southern California, Least Bell's vireo numbers appear to be rebounding after a major decline during the second half of the 1900s, with numbers increasing tenfold from approximately 300 territorial males in 1986 to an estimated 3,000 territorial males in 2006 (Kus et al. 2010).

Population abundance appears to be a function primarily of availability of suitable nesting habitat and secondarily of rates of cowbird parasitism. Factors that limit populations on the wintering grounds are unknown, although based on the

relatively small size of the wintering range (compared to the breeding range) loss or degradation of habitat is likely a major factor (Kus et al. 2010).

Threats and Environmental Stressors

Within the range of Least Bell's vireo and within the study area, degradation of riparian habitat and nest disturbance are potential threats to Least Bell's vireos.

Degradation of Habitat

Land use patterns specifically along streams—including agriculture, urbanization, firewood cutting, grazing, flood control projects, and reservoir construction—have been shown to strongly influence abundance in the breeding range. Specifically, large water releases from dams and reservoirs during the breeding period can inundate low-lying vireo nests in downstream areas, resulting in high nest loss and egg/nestling mortality. Modifications that create habitat patchiness appear to increase rates of cowbird parasitism (a major threat to this subspecies) and act to segregate remaining breeding vireos into disjunct subpopulations that are more vulnerable to extinction (Kus et al. 2010).

In southern California wildfire poses a threat to vireo habitat because of the combination of a large urban population and Santa Ana wind conditions. For example, in 2003, approximately 10% of riparian habitat in San Diego County burned (Kus et al. 2010).

On the wintering grounds, agriculture, livestock grazing, and firewood cutting in and adjacent to floodplains are the primary land use threats to vireo habitat in rural areas. Resort and urban development, particularly in the coastal zones of southern Baja California and western mainland Mexico, appear to have been a greater threat to vireo habitat in the last 10–15 years (though more studies are needed) (Kus et al. 2010).

Human Disturbance

Although nesting adults are relatively tolerant of human interference at nests and minor habitat modifications near nests, human disturbance when young are present may cause premature fledging (Kus et al. 2010).

Conservation and Management Activities

The primary conservation and management activities are cowbird control, habitat protection, restoration and creation, and developing and implementing systematic survey programs for Salinas, Sacramento, and San Joaquin Valleys and watersheds in southern California that are no longer surveyed regularly (Kus et al. 2010; U.S. Fish and Wildlife Service 2006).

Data Characterization

The only data gap is the lack of widespread survey efforts for this subspecies. Expanded surveys may provide more information about the population levels and help researchers evaluate whether the subspecies has expanded its range throughout the Central Valley.

Management and Monitoring Considerations

The four major management and monitoring considerations for this species are identified in USFWS's (2006) Least Bell's Vireo 5-Year Review as follows.

1. Identify and test alternative options for cowbird control to reduce parasitism, including examination of potential natural defenses or ability of populations to withstand parasitism.
2. Determine the effect of land and water management practices such as controlled burning, grazing, agriculture, and similar measures on vireo abundance and reproductive success.
3. Evaluate response to habitat restoration to gauge effectiveness and improve protocols as appropriate.
4. Forecast vireo response to climate change scenarios at local, regional, and national scales to aid land and resource managers in conservation planning .

Predicted Species Distribution in the Study Area

Model Description

Primary Habitat—Breeding and Foraging

Breeding and foraging is limited to all riparian land cover types within the study area, including those in the Kern River watershed. Though the species is not known to nest in the study area, the suitable model habitat is represented by the dense riparian corridors that occur in the study area.

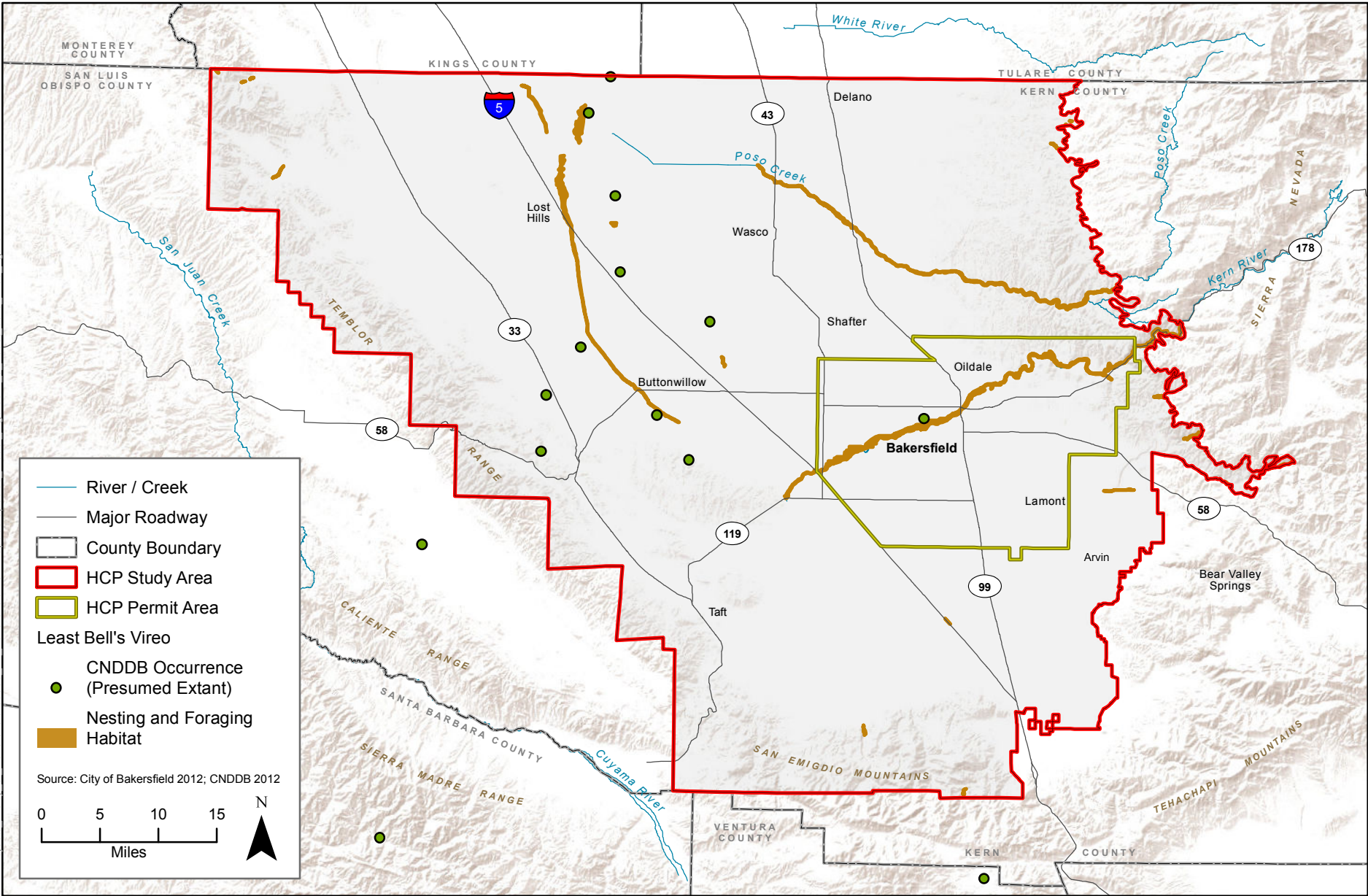
Model Results

Figure D-5 shows the modeled primary habitat for least Bell's vireo within the Plan Area and the Study Area.

Literature Cited

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Bakersfield Conservation Plan



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Figure D-5
Least Bell's Vireo Modeled Habitat