ENDANGERED STATUS AND STRATEGIES FOR CONSERVATION OF THE LEAST BELL'S VIREO (*VIREO BELLII PUSILLUS*) IN CALIFORNIA

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The Least Bell's Vireo (*Vireo bellii pusillus*) is a small, gray, migratory passerine that feeds mainly on insects. The normal clutch of four eggs is incubated about 14 days. The young remain in the nest approximately 10-12 days. The Least Bell's Vireo arrives in its breeding habitat from mid-March to early April, and departs in late August or September for its wintering range in Baja California, Mexico.

The Least Bell's Vireo usually constructs its nest low to the ground, primarily in willow-dominated riparian habitats, but also uses a variety of shrubs, trees, and vines. Nesting is now largely restricted to small, remnant segments of willow-dominated habitats. Its precarious status prompted the U.S. Fish and Wildlife Service (FWS) (1986a) to designate it officially as an endangered species on May 2, 1986. The state of California classified the vireo as an endangered species in 1980.

HISTORICAL AND PRESENT DISTRIBUTION, POPULATION SIZE, AND DENSITY

Once widespread and abundant throughout the Central Valley and other low-elevation riverine valleys, the Least Bell's Vireo maintained an historical breeding range that extended from interior northern California (near Red Bluff, Tehama County) to northwestern Baja California, Mexico. In the last several decades, the subspecies apparently has been extirpated from the Sacramento and San Joaquin valleys, which once were the center of its breeding range. Several intensive surveys of virtually all potential breeding habitat in California have been conducted (Gaines 1977, Goldwasser 1978, Goldwasser et al. 1980, unpublished FWS data). In total, Least Bell's Vireos have been reported from only 47 of over 150 former localities (some locatities cover several miles of a water course) surveyed in the U.S. from 1977 through 1985 (Table 1). The data indicate the presence of approximately 300 territorial males. This is considered a maximum estimate because roughly 20% of territorial male vireos are believed to be unpaired.

Results from a comprehensive survey in 1986 indicate there are approximately 395 territorial males (319 pairs) in the United States (RECON 1986). Preliminary field examinations in Baja California, Mexico, resulted in the locating of a number of small populations, but suitable habitat is declining and limited (Wilbur 1980a, P. Fromer, pers. comm. 1986, Franzreb, pers. obs.). There are probably several hundred pairs in Baja California (Wilbur 1980b).

Relative density data (Table 2) indicate that from 1 to a maximum of 20 males per kilometer of habitat were located during recent surveys. This compares to the historical figure of 11-29 males/km estimated by Grinnell and Storer (1924).

Table 1 Location and Number of Territorial Male Least Bell's Vireos in 1985

County	Sites[a]	Males[b]
San Benito	1	1
Monterey[c]	0	0
Inyo[c]	0	0
San Bernardino[c]	0	0
Santa Barbara	3	26
Ventura	1	5
Los Angeles	3	7
Orange	1	1
Riverside	8	29
San Diego	30	223
Total	47	292

[a]Number of different known breeding localities.
[b]Number of known territorial males.
[c]No known breeding in 1985.

The average number of fledglings produced per nesting pair has varied from a low of 0.17 in 1984 along the San Diego River (Jones 1985) to a high of 2.85 in 1983 along the Santa Margarita River (Salata 1983b). Fledging rates have been substantially higher in the least degraded habitats such as the Santa Margarita River on Camp Pendleton (40-59%) and Gilbraltar Reservoir (35-36%) (Table 3).

Table 2 Population Densities of the Least Bell's Vireo

Region	Estimated males/km	Source
Historical		
Sierra Nevada foothills	11-29[a]	Grinnell and Storer (1924)
Current		
Santa Margarita River (Camp Pendleton)	3-7	Salata (1981)
	1-8	Salata (1983a)
	1-13	Salata (1983b)
	1-19	Salata (1984)
8 sites in southern California	3-5	Goldwasser et al. (1980)
Northwestern Baja California	8-20	Wilbur (1980a)

[a]Historical density data are based on extrapolation and are not direct counts.

Table 3 Fledging Rate and Reproductive Success of the Least Bell's Vireo

Location	Fledging rate[a] (%)	Avg. no. fledglings per nesting pair[b] and per successful pair[b]	Year	Source
Santa Margarita River (Camp Pendleton)	40	2.08/2.78	1982	Salata (1983a)
Santa Margarita River (Camp Pendleton)	57	2.85/3.21	1983	Salata (1983b)
Santa Margarita River (Camp Pendleton)	59	1.60/2.24	1984	Salata (1984)
Gibraltar Reservoir	36	1.98/3.27	1980	Gray and Greaves (1984)
Gibraltar Reservoir	35	1.90/2.84	1981	Gray and Greaves (1984)
San Luis Rey River	6	0.25/1.0	1984	Jones (1985)
San Diego River	5	0.17/3.0	1984	Jones (1985)
Sweetwater River	16	0.50/2.25	1984	Jones (1985)

[a]Number of eggs that produced fledglings.
[b]Number of fledglings per nesting pair; number of fledglings per successful nesting pair.

REASONS FOR DECLINE

Habitat Loss or Modification

Over 95% of historical riparian habitat has been lost throughout the vireo's former breeding range in the Central Valley of California, which may have accounted for 60-80% of the original population (U.S. Fish and Wildlife Service 1986a). Similar habitat losses have also occurred throughout its remaining stronghold in southern California, and habitats are currently declining in Baja California as well (Wilbur 1980a, Fromer pers. comm. 1986, Franzreb pers. obs. 1986). These widespread losses are attributable mainly to flood control and water development projects, agricultural development, livestock grazing, invasive exotic plants, off-road vehicles, and urban development resulting from rapidly expanding human populations. Despite growing concern for declining riparian vegetation, substantial amounts of such habitat continue to be lost each year.

The widespread habitat losses described above have fragmented remaining breeding populations into small, disjunct, widely dispersed subpopulations. Of the 47 localities known to have supported breeding populations from 1977 to 1985, 35 localities support 4 or fewer territorial males and only seven sites support more than 10 territorial males.

Predation

As with other passerines, the Least Bell's Vireo has always been subject to nest predation. Unlike many other passerines, however, Least Bell's Vireos typically build nests within about 1 m of the ground, where they are accessible to a variety of terrestrial predators that prey on eggs or young (Wilbur 1980b; Salata 1981, 1983a). Male vireos often sing while on the nest, thereby potentially increasing predation rates by attracting predators. Recent studies have quantified predation rates of 25-40% of all nesting attempts (J. Greaves and M. Gray, unpubl. data; Salata 1981, 1983a; Jones 1985).

Nest Parasitism

The effect of nest parasitism by the Brown-headed Cowbird (*Molothrus ater*) has been greatly enhanced by anthropogenic factors, resulting in increased cowbird habitat and range and decreased vireo habitat. The Brown-headed Cowbird was rare in California prior to 1900, but expanded tremendously in both range and numbers (Garrett and Dunn 1981) as irrigated agriculture and animal husbandry increased (Wilbur 1980b). The first record of nest parasitism on the Least Bell's Vireo was in 1907, after which reported incidences increased rapidly (Linton 1908, Wilbur 1980b).

Recent studies have documented parasitism rates of between 20 and 47% from 1980 to 1982 (Greaves and Gray, unpubl. data; Salata 1981, 1983a) and 80% in 1984 (Jones 1985). S.A. Laymon (unpubl.) suggests rates above 20% are probably detrimental to the vireo population's recruitment; at levels above 40% the local population may be expected to decline. Although the results of these studies do not indicate inordinately high parasitism rates compared to those of other common host species of Brown-headed Cowbirds, they do support the hypothesis that cowbird parasitism is significantly reduc-

ing Least Bell's Vireo reproductive success. Considering the present widespread abundance of cowbirds throughout the historic range of the vireo, it appears that cowbird parasitism may greatly increase the probabilities of localized extinction to many of the small, vulnerable breeding subpopulations of Least Bell's Vireos.

ONGOING AND PLANNED CONSERVATION EFFORTS

Section 7(a) of the Endangered Species Act, as amended, requires federal agencies to consult with the FWS to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. Through this consultation process, the FWS may require compensation for any possible adverse impacts or recommend against the action if no appropriate compensation is possible.

A recovery plan specific for the Least Bell's Vireo has been prepared (FWS 1986b) that draws together the state, federal, and local agencies having responsibility for conservation of the vireo and provides a framework for agencies to use to coordinate conservation efforts. The plan describes recovery tasks, sets priorities, estimates the cost of each task, and assigns an agency lead responsibility for implementing each task.

A limited amount of cowbird control and monitoring of vireo breeding success has been funded by the FWS, California Department of Fish and Game, California Department of Transportation, San Diego Association of Governments (SANDAG), and the U.S. Marine Corps Base, Camp Pendleton. Cowbird trapping in a portion of Anza-Borrego Desert State Park is also underway.

Section 9 of the Endangered Species Act prohibits the "taking" of endangered and threatened species. Within the broad legal definition of "take" is to ". . . harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

Section 10(a) of the Endangered Species Act covers the development of a habitat conservation plan (HCP) and issuance of a permit to take an endangered species incidentally. To obtain such a permit, an applicant must submit a conservation plan that specifies the possible impacts of such taking and the actions the applicant will undertake to minimize and mitigate such impact. The FWS may issue a Section 10(a) incidental-take permit provided that, among other things, the permit application is supported by an HCP whose implementation will ensure the long-term conservation of the species and the taking of the species will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. Issuance of such a permit is subject to the requirements of Section 7(a)(2) of the Act as well as Section 102(2)(C) of the National Environmental Policy Act (NEPA) [42 U.S.C. 4332(2)(C)].

SANDAG is spearheading the effort by local governments, state and federal agencies, private entities, and conservation organizations to prepare a comprehensive species management plan (CSMP) that will consist of one or more separate habitat conservation plans (each HCP will cover one or more proposed critical habitat areas, of which there are 10). Funding for this effort originated with the state legislature, which appropriated $150,000 for this pro-

ject with both private and public entities providing matching funds for a total of $300,000. With these initial funds, SANDAG issued a contract to Regional Environmental Consultants (RECON) to prepare the CSMP. RECON's program includes collection of biological and land-use data, censusing vireos, monitoring nest parasitism in selected areas, and conducting hydrological analyses. In addition, the effects of aggregate mining and of both existing and proposed land uses will be assessed. With this information, RECON will develop HCP's for the San Luis Rey River and San Diego River and a prototype HCP to serve as a model for other organizations to follow in development of additional HCP's. A HCP for the Sweetwater River is being prepared by a private landowner.

Membership in the CSMP Task Force encompasses agencies, county and city government, project proponents, conservation organizations, and various other local entities. Initiated in November 1985, the task force has met regularly since then. Other government and local entities are being encouraged to develop HCP's for additional areas.

Preservation of the Least Bell's Vireo will rely on a long-range, well-funded conservation program as outlined in the recovery plan, compensation packages, and HCP's. Success is contingent on a successful monitoring program to assess progress, strict enforcement of laws and regulations designed to protect endangered species and ecosystems, and a dedicated effort on the part of all concerned parties.

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