

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

**5-Year Review
Summary and Evaluation**



Photo by B. Moose Peterson

**U. S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
Carlsbad, California**

September 2006

5-YEAR REVIEW
Species reviewed: Least Bell's vireo (*Vireo bellii pusillus*)

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5-YEAR REVIEW
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I. GENERAL INFORMATION

I.A. Methodology used to complete the review:

Dr. Donald McGraw was contracted by the U. S. Fish and Wildlife Service (Service) to gather and synthesize information regarding the status of the least Bell's vireo (*Vireo bellii pusillus*, "vireo"). This review was subsequently compiled by Peter Beck of the Carlsbad Fish and Wildlife Office (CFWO) and considered Dr. McGraw's final report (McGraw 2006), office files, available literature, new survey information, and interviews of individuals involved with surveying, research and management of this species. Vireo survey reports submitted to the Ventura Fish and Wildlife Office (VFWO) were supplied to CFWO by Chris Dellith of the VFWO.

I.B. Reviewers

Lead Region: Diane Elam and Mary Grim, California-Nevada Operations Office, 916-414-6453.

Lead Field Office: Karen Goebel, Gjon Hazard, and Peter Beck, Carlsbad Fish and Wildlife Office, 760-431-9440.

I.C. Background

I.C.1. FR Notice citation announcing initiation of this review:

The notice announcing the initiation of this 5-year review and opening of the first comment period for 60 days was published on July 7, 2005 (70 FR 39327). A notice reopening the comment period for 60 days was published on November 3, 2005 (70 FR 66842). No comments were received during the comment period.

I.C.3. Listing history:

Original Listing:

FR notice: Federal Register 51(85):16474-16481.

Date listed: May 2, 1986.

Entity listed: Least Bell's vireo (*Vireo bellii pusillus*); subspecies.

Classification: Endangered.

I.C.5. Associated rulemakings:

Critical Habitat: Federal Register 59(22):4845-4867.

I.C.6. Review History:

No formal status review (per the criteria set in the March 27, 2006, draft 5-Year Review Guidelines) has been conducted since the original listing of the species. Informal status reviews have been conducted on a regular basis and incorporated into multiple biological opinions, habitat conservation plans, and the 1998 draft recovery plan developed for this subspecies.

I.C.7. Species' Recovery Priority Number at start of review:

3C. This priority number, as identified in the 2005 Recovery Data Call, indicates a high degree of threat but a high potential for recovery for a listed subspecies.

I.C.8. Recovery Plan or Outline:

A draft recovery plan for the least Bell's vireo was printed and distributed within and outside of the Service in 1998 (Service 1998). This plan was never finalized and remains in draft form.

Name of plan: Draft Recovery Plan for the Least Bell's Vireo (*Vireo bellii pusillus*).
Date issued: 1998.

II. REVIEW ANALYSIS

II.A. Application of the 1996 Distinct Population Segment (DPS) policy

II.A.1. Is the species under review listed as a DPS?

 Yes, go to section II.A.2.
 X No, go to section II.A.4.

II.A.4. Is there relevant new information that would lead you to consider listing this species as a DPS in accordance with the 1996 policy?

 Yes.
 X No, go to Section II.B., Recovery Criteria.

II.B. Recovery Criteria

II.B.1. Does the species have a final, approved recovery plan containing objective, measurable criteria?

 Yes
 X No

Although a draft recovery plan was distributed to the public in 1998 (Service 1998), it was not finalized due to other higher priority listing and recovery actions. The draft recovery plan constituted a thorough summary of the status of the species at the time it was distributed and provided broadly measurable recovery goals aimed at reducing threats and increasing the number of breeding pairs within the species' present and historic range.

II.B.2. Adequacy of recovery criteria.

II.B.2.a. Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?

Yes; go to section II.B.2.b.
 No; Explain and continue to section II.B.2.b.

The draft recovery plan provides broadly measurable vireo population goals (occurrence for 5 consecutive years of "several hundred" breeding pairs of vireos at 14 distinct current or historical sites), but the draft recovery plan did not include a habitat-based assessment to evaluate whether the identified current and historical sites, even with restoration, could support these population goals. Due to new information regarding the species and an improved understanding of ongoing recovery actions to reduce threats, the recovery goals and strategies should be modified and refined.

II.B.2.b. Are all of the five listing factors* that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

Yes, go to section II.B.3.
 No, Explain and continue to section II.B.3.

Two of the five listing factors, habitat loss (listing factor 1) and brown-headed cowbird (*Molothrus ater*, "cowbird") nest parasitism (listing factor 5), are partially addressed in the recovery criteria. Listing factor 2 is not relevant for this subspecies. Listing factors 3 and 4 do not appear to be addressed explicitly. Although not discussed in detail in the original listing, one recovery criterion within the draft recovery plan recognizes and addresses habitat degradation and loss resulting from invasion of riparian habitat by introduced exotic plant species (primarily *Arundo donax*, "giant reed"; listing factor 1). The plan could be improved by more directly addressing a solution to the underlying threats that led to the initial decline and listing.

II.B.3. List the recovery criteria as they appear in the recovery plan and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors* are addressed by that criterion. If any of the five listing factors are not relevant to this species, please note that here.

Downlisting Criterion 1:

“For a period of 5 consecutive years...Stable or increasing least Bell’s vireo populations/metapopulations, each consisting of several hundred or more breeding pairs, are protected and managed at the following sites: Tijuana River, Dulzura Creek/Jamul Creek/Otay River, Sweetwater River, San Diego River, San Luis Rey River, Camp Pendleton/Santa Margarita River, Santa Ana River, an Orange County/Los Angeles County metapopulation, Santa Clara River, Santa Ynez River, and an Anza Borrego metapopulation.”

Although the draft recovery plan does not define when an area is “protected and managed,” the required population increase is most likely to occur when overall habitat loss and degradation is substantially reduced or reversed through enhancement and restoration actions at the 11 specific locations listed in Criterion 1; therefore, this criterion appears to primarily address listing factor 1. It is possible that this criterion was also intended to address cowbird control (listing factor 5), although this is not explicit.

Since listing of the species in 1986, there has been tremendous growth of the vireo populations in specific areas in San Diego and Riverside. However, only the Camp Pendleton/Santa Margarita River and the Santa Ana River populations have clearly met and exceeded the target of “several hundred or more breeding pairs” of vireos at the designated site (Table 1). Population increases at both of these locations have likely been driven by habitat protection, habitat quality improvement by the removal of invasive exotic plants, and thorough, consistent cowbird control (Griffith and Griffith 2000; Zembal *et al.* 2003) achieved as a result of ESA section 7 consultations.

While other vireo populations have not reached target levels set by Downlisting Criterion 1, the general population trend has been positive (Table 1). It should be noted that while these 11 populations only represent a portion of the known vireo populations, they contain approximately 90 percent of the known vireo territories (refer to Section II.2.C. Biology and Habitat for a full discussion of vireo abundance). New information about vireo population dynamics and the observed patterns in the vireo population growth since the listing suggests this downlisting criterion may need to be revised.

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- 1) Present or threatened destruction, modification or curtailment of its habitat or range;
 - 2) Overutilization for commercial, recreational, scientific, or educational purposes;
 - 3) Disease or predation;
 - 4) Inadequacy of existing regulatory mechanisms;
 - 5) Other natural or manmade factors affecting its continued existence.

Table 1: Most Recent Comprehensive Estimates of Vireos at 11 Population Units.¹

Location	County	Year ²	Vireo Territories ³	Population Trend ⁴
Tijuana River	San Diego	2004-2005	150	+ / -
Dulzura Creek/Jamul Creek/Otay River ⁵	San Diego	2001-2005	36	+ / I
Sweetwater River	San Diego	2001	103	+ / +
San Diego River	San Diego	1997	66	+ / I
San Luis Rey River ⁶	San Diego	2000	233	+ / I
Camp Pendleton/Santa Margarita River ⁷	San Diego	2005	827	+ / -
Santa Ana River ⁸	Orange Riverside, San Bernardino	2005	813	+ / +
Orange and Los Angeles Counties ⁹	Orange Los Angeles	2001-2005	180	+ / +
Santa Clara River	Los Angeles Ventura	2001	119	+ / +
Santa Ynez River	Santa Barbara	2001	11	- / -
Anza Borrego Desert State Park	San Diego	2002	117	+ / +

¹ As designated in the 1998 draft recovery plan.

² Year(s) of most recent extensive surveys. Composite of surveys across multiple years used where within-year surveys not considered adequately comprehensive.

³ Minimum estimate; generally a composite of multiple survey efforts covering different reaches; may exclude large stretches of non-surveyed habitat. All estimates based on survey reports submitted to the Carlsbad Field Office or values obtained from the U.S. Geological Survey (USGS) database (USGS 2006).

⁴ Overall trend since original listing / Trend comparing 1996-2000 to 2001-2005. "+"=Increasing, "-"=Declining, "I"=Inadequate data to evaluate.

⁵ Primarily derived from Otay River surveys. No comprehensive surveys of Dulzura and Jamul Creeks since 1996.

⁶ Mainstem only; excludes Pilgrim Creek.

⁷ Includes all willow riparian habitat on MCB Camp Pendleton; excludes portions of Santa Margarita River off of MCB Camp Pendleton.

⁸ Mainstem and Prado Basin study area only; excludes San Timoteo Creek, Temescal Wash, and other tributaries.

⁹ Excluding Santa Ana River and Santa Clara River mainstems.

Delisting Criterion 2:

"Stable or increasing least Bell's vireo populations/metapopulations, each consisting of several hundred or more breeding pairs, having become established and are protected and managed at the following sites: Salinas River, a San Joaquin metapopulation, and a Sacramento Valley metapopulation."

Like Downlisting Criterion 1, Delisting Criterion 2 appears to primarily address listing factor 1, and possibly listing factor 5 (cowbird parasitism). No breeding vireos have been recorded in Salinas Valley since 1986, and none have been recorded in the Sacramento Valley since prior to the listing of the vireo. In 2005, the first breeding pair of vireos detected in the San Joaquin Valley since the listing of the vireo successfully bred at the San Joaquin National Wildlife Refuge in Stanislaus County. Again in 2006, a single pair of

vireos (including the same male banded at the site in 2005) bred successfully at this site. This pair may represent the nascent re-colonization of the San Joaquin Valley.

A few incidental sightings of vireos after the breeding season have occurred within the last five years in the Salinas Valley, but territorial and reproductive status for these birds has not been established. It is possible that a few more vireo territories are dispersed across the San Joaquin and Salinas Valleys and have not been detected due to extremely low population densities and minimal or no formal vireo surveys. There have been no sightings of vireos in the Sacramento Valley since prior to the listing, and there are no known source populations nearby; therefore, it is unlikely that any breeding vireos have occurred within recent years in the Sacramento Valley. Although a few vireos and at least one breeding territory have been detected in the combined area of the Salinas, San Joaquin, and Sacramento Valleys within recent years, Delisting Criterion 2 has not been met. With the current knowledge of vireo population increases within its present range and in consideration of a population viability analysis (PVA), this Delisting Criterion may need to be revised.

Delisting Criterion 3:

“Threats are reduced or eliminated so that least Bell’s vireo populations/metapopulations listed above are capable of persisting without significant human intervention, or perpetual endowments are secured for cowbird trapping and exotic plant (Arundo) control in riparian habitat occupied by least Bell’s vireos.”

This criterion implicitly addresses all listing factors (“threats”), but most explicitly addresses listing factors 1 (habitat degradation caused by exotic plant invasion) and 5 (cowbird parasitism). Since the listing of the vireo there has been substantial progress made in controlling cowbird populations and giant reed invasion in specific areas in southern California, but these threats have not been adequately reduced even across most of the vireo’s current range. It is unlikely that these threats can be completely eliminated, but they may be controlled with coordinated, consistent, widespread management efforts. Thus, while substantial progress has been made, Delisting Criterion 3 has not been fully met (refer to section II.C.2 Five Factor Analysis for a full discussion of current threats).

II.C. Updated Information and Current Species Status

II.C.1. Biology and Habitat:

Abundance

The vireo population in the U. S. has increased 10-fold since its listing in 1986, from 291 to 2,968 known territories (Table 2). The population has grown during each five-year period since the original listing, although the rate of increase has slowed over the last 10 years. Population growth has been greatest in San Diego County (621 percent increase) and Riverside County (2,997 percent increase), with lesser but significant increases in Orange County, Ventura County, San Bernardino County, and Los Angeles County. The population in Santa Barbara County has declined by 54 percent since the original listing

and 79 percent since its post-listing peak in 1986, although it is uncertain whether this population was historically significant. Kern, Monterey, San Benito, and Stanislaus Counties have had a few isolated individuals and/or breeding pairs since the original listing, but these counties have not supported any sustained populations. Although the number of individuals in Inyo County has increased to up to 11 territorial locations, these birds occur over widely dispersed locations, and there is some uncertainty whether these individuals are *V. b. pusillus* or *V. b. arizonae* (Arizona Bell's vireo; Patten *et al.* 2003).

Table 2: Estimate of Least Bell's Vireo Territories by County

County	Estimate of Vireo Territories (and Percentage of the Total Population) for a given Range of Years ¹				
	1977-1985 ²	1986-1990	1991-1995	1996-2000	2001-2005
San Diego ³	223 (77%)	401 (76%)	1118 (78%)	1899 (76%)	1609 (54%)
Riverside ⁴	29 (10%)	50 (9%)	223 (16%)	395 (16%)	898 (30%)
Orange	1 (<1%)	3 (1%)	16 (1%)	68 (3%)	177 (6%)
San Bernardino	0 (0%)	2 (<1%)	5 (<1%)	20 (1%)	87 (3%)
Los Angeles	6 (2%)	1 (<1%)	4 (<1%)	13 (1%)	56 (2%)
Ventura ⁵	5 (2%)	8 (2%)	35 (2%)	86 (3%)	117 (4%)
Santa Barbara ⁶	26 (9%)	57 (11%)	32 (2%)	12 (<1%)	12 (<1%)
Inyo	0 (0%)	4 (1%)	5 (<1%)	0 (0%)	11 (<1%)
Kern	0 (0%)	0 (0%)	1 (<1%)	0 (0%)	0 (0%)
Monterey	0 (0%)	3 (1%)	0 (0%)	0 (0%)	0 (0%)
San Benito	1 (<1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Stanislaus	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (<1%)
Total	291	529	1439	2493	2968
Percent Increase from Previous Period	-	82%	172%	73%	20%
Percent Increase since Listing	-	82%	394%	753%	920%

¹ Estimates based on a composite of surveys across the specified range of years.

² From the original listing (51 FR 16474).

³ Approximately 50% or greater from Camp Pendleton.

⁴ Approximately 90% or greater from the Santa Ana River and its tributaries.

⁵ Approximately 90% or greater from the Santa Clara River.

⁶ Approximately 90% or greater from the Santa Ynez River.

Preliminary reports from vireo surveys conducted in 2006 indicate that the vireo population at two key locations, Camp Pendleton and the Prado Basin on the Santa Ana River, may have declined by up to 15 percent. Possible causes for these reported declines are uncertain. Although single year declines should be viewed with caution when evaluating population trends, they indicate population volatility associated with a higher risk of extinction (Fagan *et al.* 1999).

As discussed in section II.B.3., vireos have recently been discovered in the San Joaquin Valley. Although incidental vireo sightings have been reported for the Salinas Valley, no territories have been recently identified for the Salinas or Sacramento Valleys.

No systematic surveys of the vireo population in Mexico have been conducted since the listing of this species. Vireos appear to be dispersed from the international border down through at least Cataviña (approximate latitude North 29° 45') in Baja California Norte, but these populations are subject to ongoing habitat loss and uncontrolled cowbird parasitism (Service 1998). It is uncertain whether the vireo populations in Mexico are self-sustaining or are being augmented by dispersal of vireos from populations in the U. S.

The draft recovery plan includes a PVA for 8 vireo populations, including 7 of the 11 target recovery populations (*i.e.*, the Tijuana River, Sweetwater River, San Diego River, San Luis Rey River, Santa Margarita River, the Santa Ana River, and the Santa Ynez River; Service 1998). Based on historical data collected from the selected sites and reasoned assumptions about other demographic parameters for the vireo, the PVA concluded that vireo populations at seven of these eight sites had a zero probability of going extinct within the next 100 years. Only the Santa Ynez River population was determined to be at risk of extinction.

A fundamental assumption of this PVA was that intensive cowbird control (*i.e.*, cowbird trapping) would be continued at each of these locations into the future. The PVA was based on an average annual reproductive rate of 2.6 offspring produced per pair. Although this annual reproductive rate was based on empirical data, these rates are from populations that had high levels of cowbird control and low to moderate parasitism rates. Without cowbird control, the average annual reproductive rate is likely to decline substantially (Kus and Whitfield 2005). The draft recovery plan indicates that without intensive cowbird control, or some other solution to the continuing threat that cowbird parasitism poses to vireos (*i.e.*, development of sufficient anti-parasitism defenses by the vireo), that vireo populations at each of these sites are likely to return to the low levels that occurred at the time of the listing.

In summary, the U. S. population from Ventura County southward has increased significantly, while the population from Santa Barbara County northward has actually declined. At the time the draft recovery plan was distributed in 1998, there were no demographic features or trends identified that would indicate limitations on recovery. No limiting demographic features or trends have been identified since the development of the draft recovery plan.

Distribution

Greater than 99 percent of the remaining vireos were concentrated in southern California (Santa Barbara County and southward) at the time of the listing in 1986 (51 FR 16474), with San Diego County containing 77 percent of the population. Although the population has grown 10-fold since the listing, greater than 99 percent still remain in southern California (Table 2). The populations are now more evenly distributed in southern California with 54 percent of the total population occurring in San Diego County and 30 percent of the population occurring in Riverside County; however, there has been only a slight shift northward in the species' overall distribution. Historically, the San Joaquin and Sacramento Valleys were considered to be the center of the vireo's breeding range

(60 to 80 percent of the historic population; 51 FR 16474), but the vireo has not yet meaningfully re-colonized those areas. Thus, despite the significant increase in overall population numbers, the population remains constricted to the southern portion of its historic range.

Habitat Conditions

Riparian habitat suitable for vireos had declined by an estimated 95 percent at the time of the listing, primarily driven by anthropogenic modification (*e.g.*, flood control, water impoundment and diversion, urban development, agricultural conversion, and livestock grazing; Service 1998). An objective, systematic estimate of the amount of available riparian habitat in California does not currently exist, although estimates for smaller regions indicate stable to increasing riparian habitat (Faber 2003). The Riparian Habitat Joint Venture ("RHJV"; a cooperative association of Federal, State and private organizations) plans to systematically map existing riparian habitat in California starting in 2007 (RHJV 2006).

Though some unauthorized and not quantified loss of riparian habitat continues to occur (Hays 2006), and no systematic estimate of the State's available riparian habitat exists, riparian habitat in San Diego County appears to have stabilized since the listing of the vireo and has improved locally where afforded protection by the ESA and other Federal and State legislation (*i.e.*, Clean Water Act; California Fish and Game Code Sections 1600-1616 addressing lake or streambed alterations). It appears that riparian habitat connectivity may also be improving along the mainstems of some major rivers in southern California (*e.g.*, on the Santa Margarita, Santa Ana Rivers, and to a lesser extent the San Luis Rey River) due to giant reed removal, restoration, and the reduction of high impact activities like sand mining operations (Service 1998), but fragmentation may still be occurring on lower order tributary streams due to increasing urban development and associated flood control (Kus 2006).

In many situations where riparian habitat is impacted by authorized Federal and State actions, an equal or greater amount of riparian habitat is restored (*i.e.*, through active planting and maintenance of riparian habitat) or enhanced (*i.e.*, through giant reed and other exotic plant removal) to offset the impacts. Restoring or enhancing riparian habitat through giant reed removal has met with some success on the Santa Ana River in southern California (Hays 2006) and the Russian River (outside of the vireo's range) in northern California (Gaffney and Gledhill 2003).

Despite the localized and likely improved condition overall of Southern California's riparian habitats, associated native upland plant communities (*i.e.*, coastal sage scrub, chaparral, oak woodlands) adjacent to riparian habitat are not afforded the regulatory protections of wetlands because they are often outside of the jurisdiction of the regulatory agencies and thus do not receive the same degree of consideration when impacted by State and Federal actions. Although no baseline assessment is available, it appears that riparian areas are increasingly bordered by urbanization where they would have historically been bordered by native upland plant communities (Kus 2002). Vireo territories bordering on agricultural and urban areas are less successful in producing

young than territories bordering on native upland plant communities (RECON 1989 *in* Kus 2002).

A thorough evaluation of the change in riparian habitat in the northern portion of the vireo's historic range (*i.e.*, the Salinas Valley, San Joaquin Valley, and Sacramento Valley) has not been conducted, but it appears that there has been substantially increased protection and restoration of riparian habitats in northern California (Faber 2003). Restoration of riparian habitat has occurred on the Cosumnes, Kern, Merced, Sacramento, and San Joaquin Rivers since the listing of the species (Faber 2003).

In summary, historic loss of riparian habitat contributed to the decline of the species and factored in the decision to list the vireo as endangered in 1986. Since then, the amount of riparian habitat loss has been reduced and to some extent restoration efforts have increased vireo habitat. Most of this improvement has occurred in southern California, although it appears that protection and restoration efforts in the northern portion of the vireo's historic range have been successful also.

Genetics and taxonomy

No in-depth studies of genetic variation in the least Bell's vireo have been published since the listing of the species. One study (Spiegelberg 1997) used genetic analyses to evaluate the incidence of extra-pair paternity in this species within a limited sample of vireo families ($n = 12$ families; "families" consist of both adults in a pair and at least one offspring) in San Diego County, but this study did not evaluate broader genetic variation within the subspecies or across subspecies. Spiegelberg (1997) found no evidence of extra-pair paternity among sampled vireos and considered this to be atypical among bird species.

No changes to the vireo taxonomic classification or the accepted nomenclature have been published or otherwise proposed since the listing.

II.C.2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms):

II.C.2.a. Present or threatened destruction, modification or curtailment of its habitat or range:

At the time of listing, loss of habitat due to agricultural practices, urbanization, and exotic plant invasion was identified as a major threat to vireo populations. Since the listing of the vireo, destruction and modification of riparian habitat within its current range has been curtailed significantly, primarily as a consequence of protections provided by the original listing in 1986 (51 FR 16474), the subsequent designation of critical habitat in 1994 (59 FR 4845), and other Federal and State regulatory processes.

Urbanization

Urbanization appears to have displaced former agriculture and grazing operations in

many areas within southern California, thereby indirectly reducing riparian habitat degradation caused by these activities. Agriculture and grazing continue to threaten riparian habitat within the larger historic range, particularly the Salinas, San Joaquin, and Sacramento valleys (Service 1998). Where the impacts of grazing and agriculture are reduced as a consequence of being displaced by urbanization, improved habitat quality may come at the cost of increased habitat fragmentation and decreased riparian/urban buffering.

Invasive Plants

Within the past decade, control of giant reed and other exotic plants has been and continues to be systematically conducted on both the Santa Ana River and at Camp Pendleton. This effort has been effective at removing giant reed over large portions of these specific population areas. Recovery of riparian habitat after giant reed removal has been limited at some locations, but recovery has been more noticeable on the Santa Ana River near Prado Basin (Hays 2006). In general, giant reed removal has been effective but will require continued annual efforts to achieve local eradications and address new invasions.

Giant reed removal on Camp Pendleton is currently a funding priority due to, in part, the endangered status of the vireo. Control of giant reed within the Santa Ana River Watershed is organized through a multi-agency partnership (Santa Ana Watershed Association, "SAWA") and is funded by the proceeds from an endowment and through competitive grants (Zemba *et al.* 2003). Giant reed removal has also been initiated within several other watersheds within southern California and has been organized through cooperative partnerships with funds provided from competitive grants (Natural Resources Conservation Service 2006). Giant reed is also found and has been recognized as a problem within northern California watersheds, and associated eradication efforts have been initiated at several locations (Sacramento and Russian Rivers; Faber 2003).

Although control of giant reed has made great progress since the original listing of the vireo, invasions by other exotic plants (*e.g.*, *Tamarix* species, perennial pepperweed [*Lepidium latifolium*]) continue to degrade existing riparian habitat and impede recovery efforts (Kus and Beck 1998; Hoffman and Zemba 2006).

Protection and Restoration

A primary factor to consider in addressing the current threat of vireo habitat destruction and modification is today's greater public awareness of the value of riparian habitat to conserving California's overall biodiversity. The importance of conserving California's riparian habitats is widely recognized by Federal, State, and private partnerships such as the California Riparian Habitat Conservation Program formed by State law in 1991, the California Chapter of Partners in Flight (CalPIF) established in 1992, and the California Riparian Habitat Joint Venture initiated (RHJV) by CalPIF in 1994. These programs share the common mission of coordinating and implementing conservation efforts aimed at protecting and restoring California's riparian ecosystems.

Rehabilitation of riparian habitats and processes has been identified as a major conservation priority in California (RHJV 2006), leading to many riparian restoration and conservation actions that are not driven by Federal or State regulatory processes (Faber 2003). Compliance driven and voluntary riparian restoration activities throughout the historic range may have contributed to an increase in riparian habitat since the listing of the vireo, although this cannot be established without a thorough evaluation of riparian habitat within California.

In summary, the trend of riparian habitat loss and degradation appears to have been substantially abated, and possibly reversed on a local level. While there are currently no quantified, range-wide estimates of the change in riparian habitat since the listing (see section II.C.1.e), there is recognition that the degree of threat to the vireo caused by habitat loss has been significantly reduced, albeit not entirely eliminated.

II.C.2.b. Overutilization for commercial, recreational, scientific, or educational purposes:

Overutilization has not been identified as a threat to the vireo.

II.C.2.c. Disease or predation:

Nest predation (*i.e.*, by native and introduced nest predators; see Service 1998) rates between 25 to 40 percent were reported in the listing rule, which was considered abnormally high by the Service at the time of the listing in 1986. Although nest predation rates on vireos can exceed 60 percent of the vireo nests in a given area within a year (Kus 1999), typical nest predation rates average around 30 percent (Franzreb 1989). Although nest predation rates for this species appear to be high, they are comparable to nest predation rates for other North American passerines (Martin and Clobert 1996).

In highly urbanized areas, where habitat is fragmented and upland plant community buffers are minimal or non-existent, there is a potential for an increase in nest and adult predation due to mesopredator release and/or the addition of non-native predators (*i.e.*, domestic cats, *Felis catus*) (Crooks and Soule 1999). This process may lead to local extirpation of small, isolated bird populations. The only empirical study (Peterson 2002; Peterson *et al.* 2004) that has directly investigated vireo nest predation relative to habitat fragmentation found that most local landscape features (including urbanization) did not appear to elevate vireo nest predation rates; from a larger spatial perspective, nest predation appeared to be a somewhat random process. There have been no studies published that directly investigate the impact of domestic cats on adult or nestling vireos, although Peterson *et al.* (2004) did not observe vireo depredation by domestic cats or detect them in the vicinity of vireo nests.

Argentine ants (*Linepithema humile*), a non-native ant species whose spread is generally believed to be augmented by urbanization (Suarez *et al.* 1998), has been observed to be a predator of vireo nests where they co-occur (Peterson *et al.* 2004). Although not identified as a threat at the time of the listing, Argentine ants may pose a problem to

vireos if the riparian-urban interface of occupied vireo habitat increases without adequate buffers.

Although background nest predation rates on vireos reported at the time of listing appeared high, they are comparable to that of other species (Martin and Clobert 1996) and do not appear to have impeded vireo population expansion where cowbird control and riparian habitat conservation has been effective (e.g., at Camp Pendleton and at the Prado Basin on the Santa Ana River; Griffith and Griffith 2000; Zembal *et al.* 2003). With a continued increase in riparian habitat conservation and restoration (as described in sections II.C.1.e and II.C.2.a), the potential risk of increased predation due to habitat fragmentation (as listed in 51 FR 16474) has and should continue to decline. Predation does not currently appear to constitute an imminent threat to the survival of the vireo. Expansion of the Argentine ant population in association with ongoing urban development may constitute a previously unrecognized predation threat to the vireo, but this threat needs further study.

West Nile virus is a potential disease threat not known at the time of the listing. The vireo has likely been exposed to West Nile virus, as displayed by *Corvus sp.* mortalities in Los Angeles and Orange Counties (Turell *et al.* 2002, 2005; Reisen *et al.* 2006); however, direct mortalities of vireos from this disease have not been reported.

II.C.2.d. Inadequacy of existing regulatory mechanisms:

State Protections

Least Bell's vireo is listed as an endangered species under the California Endangered Species Act of 1984 (CESA). This legislation requires State agencies to consult with the California Department of Fish and Game (CDFG) on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat.

The California Environmental Quality Act (CEQA) requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA Sec. 21002). In the latter case, projects may be approved that cause significant environmental damage, such as destruction of listed endangered species or their habitat. Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved.

The Natural Communities Conservation Planning Act (NCCP) program purpose is to conserve natural communities at the ecosystem scale while accommodating compatible land use, including urban development. NCCPs identify and provide for the regional or area-wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity.

Another state regulatory program promoting the recovery of the vireo is the California Lake and Streambed Alteration Program (California Fish and Game Code Sections 1600-

1616). This program provides a permitting process to reduce impacts to fish and wildlife from projects affecting important water resources of the State, including lakes, streams, and rivers. Because riparian habitats are closely associated with lakes, streams, and rivers, this program provides recognition of the importance of riparian habitats to sustaining California's fish and wildlife species and helps prevent the loss and degradation of riparian habitats important to the vireo.

Federal Protections

The National Environmental Policy Act (NEPA) provides some protection for least Bell's vireo. For activities undertaken, authorized, or funded by Federal agencies, NEPA requires the project be analyzed for potential impacts to the human environment prior to implementation (42 U.S.C. 4371 et seq.). For instances where that analysis reveals significant environmental effects, the Federal agency must propose mitigations that could offset those effects (40 CFR 1502.16). These mitigations are usually developed in coordination with the Service during section 7 consultation and should provide some protection for listed species. However, NEPA does not require that adverse impacts be fully mitigated, and so some impacts could still occur. Additionally, NEPA is only required for projects with a Federal nexus, and therefore, actions taken by private landowners are not required to comply with this law.

Under section 404 of the Clean Water Act, the USACE regulates the discharge of fill material into waters of the United States, which include navigable and isolated waters, headwaters, and adjacent wetlands (33 U.S.C. 1344). In general, the term "wetland" refers to areas meeting the USACE criteria of having hydric soils, hydrology (either sufficient flooding or water on the soil surface), and hydrophytic vegetation (plants specifically adapted for growing in wetlands). Any actions within the vireo's habitat that has the potential to impact waters of the United States would be reviewed under the Clean Water Act as well as NEPA and the Endangered Species Act. These reviews would require consideration of impacts to the vireo and its habitat, and when significant impacts could occur, mitigations would be recommended.

The Endangered Species Act (Act) is the primary Federal law providing protection for the vireo. Since its listing, the Service has analyzed the potential effects of many projects under section 7(a)(2) of the Act, which requires Federal agencies to consult with the Service prior to authorizing, funding, or carrying out activities that may affect listed species. A jeopardy determination is made for a project that is reasonably expected, either directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild or reducing its reproduction, numbers or distribution (50 CFR § 402.02). A non-jeopardy opinion may include reasonable and prudent measures that minimize the amount or extent of incidental take of vireo from a project. Incidental take refers to taking that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by a Federal agency or applicant (50 CFR § 402.02). While projects that are likely to result in adverse effects often include minimization measures, the Service is limited to requesting minor modifications in the project description. In instances where some incidental take is unavoidable, the Service

requires that additional measures be performed by the project proponents to compensate for negative impacts.

A prime example of the protection provided by the Act is the conservation benefit that resulted at two main population centers at Camp Pendleton and within the Prado Basin of the Santa Ana River. Interagency section 7 consultations made necessary by the listing of the vireo were the basis of existing Federal partnerships between the Service and the U. S. Marine Corps and the USACE aimed at promoting the recovery of the vireo. Coordination of Federal agency actions at these two essential locations has resulted in significant habitat management, habitat restoration, and research activities. Today, these two populations support the largest concentrations of vireo and likely represent the major source populations providing for expansion of the vireo in southern California (Griffith and Griffith 2000; Zembal *et al.* 2003).

Incidental take permits, pursuant to Section 10(a)(1)(B) of the Act, may be issued for projects without a Federal nexus. This section provides protection for vireo through the approval of habitat conservation plans (HCPs) that detail measures to minimize and mitigate the potential impacts of the project to the maximum extent practicable. Regional HCPs in San Diego, Orange, and Riverside counties now provide an additional layer of regulatory protection for the vireo over much of its current range, and these HCPs are coordinated with the related NCCP-State program identified above. This regulatory protection was not wholly realized prior to the listing of the vireo. The vireo is now a "covered species" under most existing and planned regional NCCP/HCPs in southern California. Under any permitted NCCP/HCP, covered species conservation is provided regardless of the Federal or State-listed status of a species. Thus, even if the status of the vireo was changed under the Act, the requirements for vireo conservation under the existing regional NCCP/HCPs would remain in effect for the life of the permit (generally 50 to 75 years), and most of the habitat protection and management benefits would continue in perpetuity.

Protection on Department of Defense Lands

The Sikes Act (16 U.S.C. 670) authorizes the Secretary of Defense to develop cooperative plans for conservation and rehabilitation programs on military reservations and to establish outdoor recreation facilities. The Sikes Act also provides for the Secretaries of Agriculture and the Interior to develop cooperative plans for conservation and rehabilitation programs on public lands under their jurisdiction. While the Sikes Act of 1960 was in effect at the time of the vireo's listing, it was not until the amendment of 1997 (Sikes Act Improvement Act) that Department of Defense (DOD) installations were required to prepare Integrated Natural Resource Management Plans (INRMP). Consistent with the use of military installations to ensure the readiness of the Armed Forces, INRMPs provide for the conservation and rehabilitation of natural resources on military lands. They incorporate, to the maximum extent practicable, ecosystem management principles and provide the landscape necessary to sustain military land uses. While INRMPs are not technically a regulatory mechanism because their implementation is subject to funding availability, they address the conservation of natural resources on

military lands and can be an added conservation tool in promoting the recovery of endangered and threatened species.

In 2001, the Marine Corps adopted an INRMP for Camp Pendleton (U.S. Marine Corps 2001). Like other INRMPs, it is largely ecosystem-based except where biological opinions direct species-specific actions. Camp Pendleton's INRMP incorporated the Service's 1995 *Biological Opinion on Programmatic Activities and Conservation Plans in Riparian and Estuarine/Beach Ecosystems on Marine Corps Base, Camp Pendleton* (1-6-95-F-02) (the "Riparian BO"), which addresses the majority of vireo breeding habitat at Camp Pendleton. Because it incorporates the provisions of this consultation, Camp Pendleton's INRMP provides specific direction regarding vireo management and conservation. It is possible, therefore, that management actions specific to maintaining vireo populations at Camp Pendleton (such as cowbird trapping) may receive lower priority under the current INRMP if the vireo was no longer listed under the ESA. The INRMP would likely continue to provide benefit to the vireo through the protection and management of its habitat; however, these benefits would be subject to military funding allocations that generally give higher priority to endangered species management issues.

Prior to its listing in 1986, the vireo was also afforded the regulatory protections of the Migratory Bird Treaty Act, which prohibits generally the take, capture, killing, or possession of migratory birds, their eggs, parts, and nests but does not protect habitat except where habitat alterations would directly kill or injure birds (e.g., felling a tree with an active nest). On January 10, 2001, Executive Order 13186 was issued to address the responsibilities of Federal Agencies to Protect Migratory Birds. The Executive Order directed Federal agencies whose actions have a measurable negative impact on migratory bird populations to develop Memoranda of Understanding (MOU) with the Service to promote the conservation of migratory birds. Under a July 31, 2006, Memorandum of Understanding (MOU) between the Service and the Department of Defense (DoD), the vireo, as a migratory bird species, will receive certain benefits on DoD lands.

The MOU addresses certain DoD activities including natural resources management, installation support functions, industrial activities, routine construction or demolition activities, and hazardous waste cleanup. Through the MOU, the parties will strive to protect migratory birds, work to protect habitat adjacent to DoD lands, and promote collaborative projects. Additionally, the DoD will follow migratory bird permitting requirements, incorporate or encourage incorporation of migratory bird conservation into INRMPs and other environmental documents, manage military lands and non-military readiness activities in a manner that supports migratory bird conservation, and develop and/or implement monitoring programs. The MOU provides that the management of DoD installations should be done in consideration to habitat protection (with specific attention to riparian habitats), fire and fuels management, and invasive species management.

Like INRMPs, this MOU is subject to budgetary limits; however, it provides an added level of recognition to the importance of conserving migratory birds and their habitats that was not in existence at the time the vireo was listed. We anticipate that this MOU

will further emphasize the importance of riparian vegetation communities (vireo habitat) to decision makers on DoD installations, such as Camp Pendleton, and otherwise promote migratory bird conservation, which could directly or indirectly benefit vireo recovery.

Summary of Factor D

In summary, at the time of the vireo listing in 1986, Federal and State laws, while in place, were not effective in reducing impacts to riparian habitats suitable for vireo, which had declined by an estimated 95 percent (51 FR 16474). Listing of the vireo provided greater incentives for Federal agencies to conserve and manage vireo habitat. At the same time, planning and development of regional NCCP/HCPs in Southern California provided additional conservation benefits to the vireo on private lands. In recent years, greater emphasis has been placed on conserving natural resources and, in particular, migratory birds, on military lands. With these overall improvements, it is unlikely that the increasing trend for riparian habitat conservation would be negatively affected by a change in the legal status of the vireo under the ESA. Thus, the inadequacy of existing regulatory mechanisms is no longer a primary threat to the recovery of the vireo.

II.C.2.e. Other natural or manmade factors affecting its continued existence:

The 1986 listing rule identifies brood parasitism by cowbirds as a substantial threat to the vireo. As noted in the rule, cowbirds were historically rare within the range of the vireo. Laymon (1987) detailed the rapid spread of cowbirds across California: the invasion started in the southeast in about 1900, expanded throughout southern California by 1920, and spread through the northern portion of the vireo's historical range by the 1940s. Cowbirds are now common throughout most of the current range of the vireo (Garrett and Dunn 1981). It is thought that the meteoric rise and expansion of cowbirds is largely due to anthropogenic changes in the landscape (Rothstein 1994).

Brood parasitism represents a novel threat to the vireo, in evolutionary terms. The first documentation of brood parasitism in this subspecies was in 1907 (Linton 1908; Franzreb 1987). Grinnell and Miller (1944) noted that cowbirds heavily parasitize the vireo. They also indicated a "noticeable decline" in the vireo, "apparently coincident with [the] increase of cowbirds." Brown (1993) summarized nest parasitism rates for the vireo to be between 30 and 50 percent. Nest parasitism rates in some populations of vireos have been as high as 80 percent (Jones 1985 *in* Franzreb 1987). As modeled by Laymon (1987), nest parasitism rates of 30 to 48 percent would allow vireo populations to be unstable, potentially suffering extinction from stochastic events, while rates higher than 48 percent would lead to extinction in a short time. More recently, Kus and Whitfield (2005) found that annual productivity of vireos increased by one young for each drop of 30 percent in parasitism frequency.

To promote recovery of the vireo, cowbird management has been implemented in many areas. This management has primarily been implemented through cowbird trapping programs initiated as a result of the ESA section 7 interagency consultation process. Cowbird trapping has been especially effective at the local level. For example, on Camp Pendleton (Griffith and Griffith 2000; Griffith Wildlife Biology 2001) and at the

Sweetwater Reservoir (Famolaro 2006) active cowbird control has, at least over the short term, reduced the rate of cowbird nest parasitism in least Bell's vireos to nearly 0 percent. Cowbird trapping, in general, has been attributed in promoting an increase in the overall vireo population rangewide (Kus 1999; Kus and Whitfield 2005). Despite the intensive trapping that has occurred at some locations over a number of years, it does not appear that cowbird numbers have been affected (Griffith Wildlife Biology 2004).

Although cowbird trapping has been lauded as a short-term management technique, it has been criticized for not promoting the long-term recovery of the vireo. Both Kus and Whitfield (2005) and Peer *et al.* (2005) have suggested that removing cowbirds from the vireo's environment limits or prevents selective pressures that may allow the vireo to evolve nest parasitism defenses. If the vireo had natural defenses to brood parasitism, they argue, cowbird trapping would not be necessary (Kus and Whitfield 2005; Peer *et al.* 2005). Such defenses have been observed in the nominate subspecies of the Bell's vireo (*V. b. bellii*), which has been in contact with cowbirds over a longer period of evolutionary time (Parker 1999).

Further, Sharp and Kus (2006) found that high microhabitat cover around vireo nests reduces the rate of cowbird parasitism. They suggest that the effect of cowbirds on vireos can be managed through management of vireo habitat. Also, Rothstein (2004 *in* Peer *et al.* 2005) suggests that small host populations may be parasitized more heavily than larger host populations.

In summary, cowbird nest parasitism continues to be a significant threat to the vireo. Cowbird trapping has proven a successful tool to halt vireo population declines over the short term, but trapping may not be the best method for long-term recovery of the vireo. It remains unclear as to the best way to manage this threat and additional research is needed to resolve this issue.

II.D. Synthesis:

The vireo population has grown robustly since the listing in 1986, primarily in response to improvements in habitat abundance and quality and effective cowbird control. The rapid loss and degradation of riparian habitat occurring across the vireo's range prior to the listing appears to have been halted and possibly reversed to some degree. Listing of the vireo under the ESA helped bring about a greater awareness of the importance of conserving riparian habitats for the benefit of many wildlife species.

Several regional NCCP/HCPs have been developed that include long-term conservation goals for vireo. Additional protections have been added for migratory bird conservation on military lands through the Sikes Act Improvement Act and the 2006 MOU between the Service and DoD. More effective implementation of Federal and State regulatory programs addressing water resource issues directly and indirectly provide conservation benefits to riparian habitats and the vireo, and public/private partnerships are now in existence with the specific mission of conserving riparian habitats and migratory birds, including the vireo.

Although nest parasitism by cowbirds has been reduced on a local level in southern California, it remains the primary threat limiting the vireo's overall recovery. A PVA conducted in 1998 determined that vireo populations at seven significant sites would not likely go extinct within the next 100 years, as long as habitat size and quality remains the same or increases and cowbird control continues. Thus, to sustain the vireo, continued cowbird control and exotic plant removal in riparian areas are likely to be necessary for the foreseeable future. Confounding the issue of nest parasitism by cowbirds, new studies have questioned the use of cowbird trapping as the only management tool in recovering the vireo over the long-term, and additional research is needed to resolve this issue.

Although the vireo has not met the downlisting goals of the draft recovery plan for several hundred or more breeding pairs of vireo at all 11 identified sites, these goals were not habitat-based, and the overall population trend since the time of the listing for 10 of the 11 sites has been positive. Despite the ongoing threat of nest parasitism by cowbirds, the vireo population has increased by 10-fold since the time of its listing to an estimated 2,968 territories. Cowbird trapping is well established at Camp Pendleton and within the Prado Basin of the Santa Ana River, which support the two largest concentrations of vireo. Wholesale loss and degradation of riparian habitats has halted, and riparian habitat restoration efforts are ongoing. This suggests that the species is no longer in danger of extinction throughout all or a significant portion of its range and warrants reclassification to threatened status.

We are not recommending delisting of the vireo at this time because: 1) further research is needed to address the primary threat of cowbird parasitism on the long-term recovery of the vireo; 2) without intensive cowbird control at the main population sites, which is linked to section 7 consultations under the Act, or new evidence to suggest that vireo can persist without management intervention, vireo populations are likely to return to the low levels that necessitated its listing; 3) the PVA determined that there was no imminent threat of extinction to the vireo, but this was based on maintaining reproductive rates correlated with cowbird control; and 4) draft recovery goals established for delisting need further assessment based on current knowledge of population trends and species distribution throughout the State.

III. RESULTS

III.A. Recommended Classification: Downlist to threatened status.

III.B. New Recovery Priority Number:

9. Per our listing and recovery priority guidance for threatened or endangered species (48 FR 43098), the least Bell's vireo, as a subspecies with moderate degree of threat and a high recovery potential, has a recovery priority number of 9. Much of the past economic conflict has been alleviated within the vireo's current range through ESA section 7 consultations and regional HCPs.

III.C. If a reclassification is recommended, indicate the Listing and Reclassification

Priority Number (FWS only):

This species should be given a reclassification priority of "4," which indicates an unpetitioned action with a moderate management impact.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Complete a functional recovery plan for the vireo with realistic, objectively based recovery goals.
2. Provide funding and technical support for further studies investigating continuing threats to the vireo from cowbird parasitism, exotic plant invasion of riparian habitats, and potentially elevated predation pressures due to habitat fragmentation or presence of exotic predators (*i.e.*, domestic cats and Argentine ants).
3. Complete an assessment or support other efforts (such as the RHJV effort) to assess the amount and distribution of riparian habitat in California including:
 - a. Establishment of baseline values for comparison to past and future estimates, including an assessment of various riparian habitat subtypes.
 - b. An evaluation of changes in distribution and connectivity of riparian habitat at different stream-order levels (*i.e.*, primary, secondary, tertiary, *etc.*).
 - c. An evaluation of the amount of riparian habitat restoration attempted and successfully completed since the listing, including restoration not driven by regulatory compliance.
4. Develop and implement:
 - a. A systematic survey program to locate vireo re-colonizations of the Salinas, San Joaquin, and Sacramento Valleys so that appropriate management can be developed and implemented.
 - b. Systematic survey programs for watersheds in southern California that are no longer regularly surveyed within a given 5-year period (*e.g.*, Dulzura Creek/Jamul Creek/Otay River, San Diego River, San Dieguito River/Santa Ysabel Creek, San Gabriel River, *etc.*). It is possible that these systematic surveys may need to rely on volunteer efforts organized and supported by the Service.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of Least Bell's Vireo (*Vireo bellii pusillus*)

Current Classification: endangered

Recommendation resulting from the 5-Year Review:

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

Appropriate Listing/Reclassification Priority Number, if applicable: 4

Review Conducted By: Karen Geobel, Gjon Hazard and Peter Beck

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____



Date 9-21-06

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve _____



Date 9/26/2006