

A PETITION TO THE STATE OF CALIFORNIA FISH AND GAME COMMISSION

for action pursuant to section 670.1, Title 14, California Administrative Code, and sections 2072 and 2072.3 of the Fish and Game Code, relating to listing and delisting endangered and threatened species of plants and animals.

I. SPECIES BEING PETITIONED:

Common Name: Arizona Bell's Vireo

Scientific Name: *Vireo bellii arizonae*

II. RECOMMENDED ACTION:

(Check the appropriate categories.)

Endangered:  List:   
Threatened:  Delist:

III. SUMMARY OF REASONS FOR RECOMMENDED ACTION:

(Provide a brief statement on why the action is being recommended. This should include an account of the status of the species involved and any factors listed in Section 670.1, Title 14, California Administrative Code, that threaten its survival. If the species is being recommended for delisting, tell why any one or a combination of the aforementioned factors no longer threaten its existence.)

In California, the Arizona Bell's Vireo (*Vireo bellii arizonae*) is a summer resident of willow and mesquite riparian habitat of the Sonoran desert area (the low desert area of southeastern California). The lower Colorado River historically has provided the vast majority of this habitat type in California. Here, the Arizona Bell's Vireo was regarded as common to abundant up until the middle of this century. Since then the species has undergone a drastic population decline due to the massive loss of riparian habitat in the Colorado River valley, compounded by the nest parasitism of Brown-headed Cowbirds (*Molothrus ater*). Due to this decline, the Arizona Bell's Vireo was included on the California Department of Fish and Game's Bird Species of Special Concern List (Remsen 1978). In recent surveys of bird populations in riparian habitat along the entire length of the California side of the Colorado River, Serena (1986) found 35 singing males in 1981 and last year Laymon and Halterman (1986) found only four singing males. The continued existence of this species in California is seriously threatened by further reduction of riparian habitat along the lower Colorado River due to water development projects, agricultural conversion, and recent severe and prolonged flooding, coupled with continued nest parasitism by Brown-headed Cowbirds.

The Arizona Bell's Vireo is a native species in serious danger of becoming extinct throughout all, or a significant portion, of its range in California due to a combination of loss of habitat and parasitism and should be classified as endangered pursuant to Section 2062 of the California Fish and Game Code.

## SUPPORTING INFORMATION

### IV. NATURE AND DEGREE OF THREAT:

(Discuss types of direct or indirect threat to each population, significant portion of range or habitat. Indicate immediacy of threat and magnitude of loss or rate of decline expected without protective measures.)

In California, Arizona Bell's Vireos are summer residents that occur only along the lower Colorado River where they occupy remnants of cottonwood-willow and mesquite riparian habitat. In these areas these vireos face two primary problems (Serena 1986): the loss of habitat and parasitism of nests by Brown-headed Cowbirds.

Hunter (1984) reported that in almost all historical accounts the lower Colorado River was described as being bordered by large forests of cottonwood (*Populus fremontii*) and willow (*Salix goodingii*) with intermittent riparian forests of honey mesquite (*Prosopis glandulosa*). The flow of the river was calm in the winter but during late spring and early summer snow melt from the Rocky Mountains caused dramatically increased flows for a short duration (two weeks to a month). Although these flows often scoured areas and destroyed large tracts of forest, they also prepared seedbeds for future willow and cottonwood regeneration.

The quantity of cottonwood-dominated riparian forest along the Colorado River decreased from at least 5,000 acres in the 1600's to 500 acres by 1977 (Ohmart, Deason and Burke 1977), and to less than 200 acres in 1982 (Hunter 1984). Damage to riparian habitat continues to occur. Reductions in the quantity and quality of native riparian habitat were due to logging for fuel in the 1800's, clearing for agriculture in the early 1900's, and recently, water development and flood control projects. During the last three years there has been extensive, prolonged flooding along the lower Colorado River, causing further reduction in the remaining riparian habitat.

The remaining habitat is vastly different from the original cottonwood-willow and mesquite habitats. The change in water flow patterns due to the construction of dams has favored the establishment of the exotic salt cedar (*Tamarix* sp.). This species is much better adapted to the new water flow regime than are cottonwoods and willows and it now dominates most riparian areas. However, salt cedar does not support many species of native fauna and is not used by Arizona Bell's Vireos. Alteration of river flow patterns also resulted in permanent flooding of former cottonwood and willow seedbeds. Flow pattern changes, combined with salt cedar intrusion have prevented regeneration of naturally occurring riparian habitat.

Early in the 1900's the Arizona Bell's Vireo was characterized as a common summer resident of the Colorado River valley with density estimates of one singing male for every 200 yards of willow habitat along the river's edge (Grinnell 1914). Toward the middle of this century they were still characterized as a common summer residents (Grinnell and Miller 1944). However, the species began to decline dramatically in the mid-1950's and was reported to be scarce in the valley by 1960 (Monson 1960, Serena 1986).

Serena (1986) feels that a major cause of the decline of Arizona Bell's Vireos along the Colorado River is the loss of suitable willow habitat. However, since they are also absent from some seemingly suitable areas, other factors are undoubtedly involved including poor conditions in wintering areas, high mortality during migration, and especially cowbird parasitism.

With such an extreme reduction of riparian habitat, nest parasitism by Brown-headed Cowbirds became a major factor in reducing Arizona Bell's Vireo numbers and their ability to take advantage of what little is left of the existing habitat (Remsen 1978, Serena 1986). Female Brown-headed Cowbirds parasitize the open nests of small songbirds by laying an egg in an unguarded nest and then flying away and leaving their offspring to be raised by the host parents. Since the parasite egg and nestling are much larger, the host's nestlings are usually either outcompeted or destroyed. The result is reduced vireo productivity with fewer young surviving the year to produce young in successive years. The lack of native habitat coupled with reduced productivity due to Brown-headed Cowbird parasitism will limit any recovery in the Arizona Bell's Vireo population for the foreseeable future. Remsen (1978) feels that destruction of riparian habitat has caused the population to decline to such a low level that it is incapable of withstanding cowbird parasitism, especially since cowbirds have continued to increase dramatically.

The situation of declining habitat for Arizona Bell's Vireos is critical since prolonged flooding in the early 1980's likely has degraded most of the remaining cottonwood-willow riparian habitat. Prompt action is needed to reestablish these habitats before Arizona Bell's Vireos disappear completely from the lower Colorado River valley and no longer occur in California.

#### V. HISTORIC AND CURRENT DISTRIBUTION:

( Historic- Indicate historical range by county and physiographic description and number of historical sites of species occurrence. Attach California range map. )

( Current- Describe number and quality of known extant populations and assess potential for introduction to historical sites. Attach detailed maps (15' scale topographic) of extant occurrences. )

The Arizona Bell's Vireo historically has been described as occurring in California along the Colorado River valley from the Nevada line south to the Mexican boundary (Figure 1) (Grinnell and Miller 1944). This area includes the southeastern edge of San Bernardino County, and the extreme eastern edges of Riverside and Imperial counties.

Currently Arizona Bell's Vireos only occur sporadically on the California side of the Colorado River. Only a few sightings have been made in the most recent surveys in this region. Hunter (1984) observed a few singing males near Needles and near Laguna Dam, and Laymon and Halterman (1986) found four singing males in the same areas (Figure 2). More precise locations of the individuals observed in these two surveys are shown on Attachments "A" through "C" (USGS 15' and 7.5' quadrangle maps - **NOT ATTACHED IN PDF FORMAT**).

ARIZONA BELL'S VIREO  
 Historic Distribution  
 in California

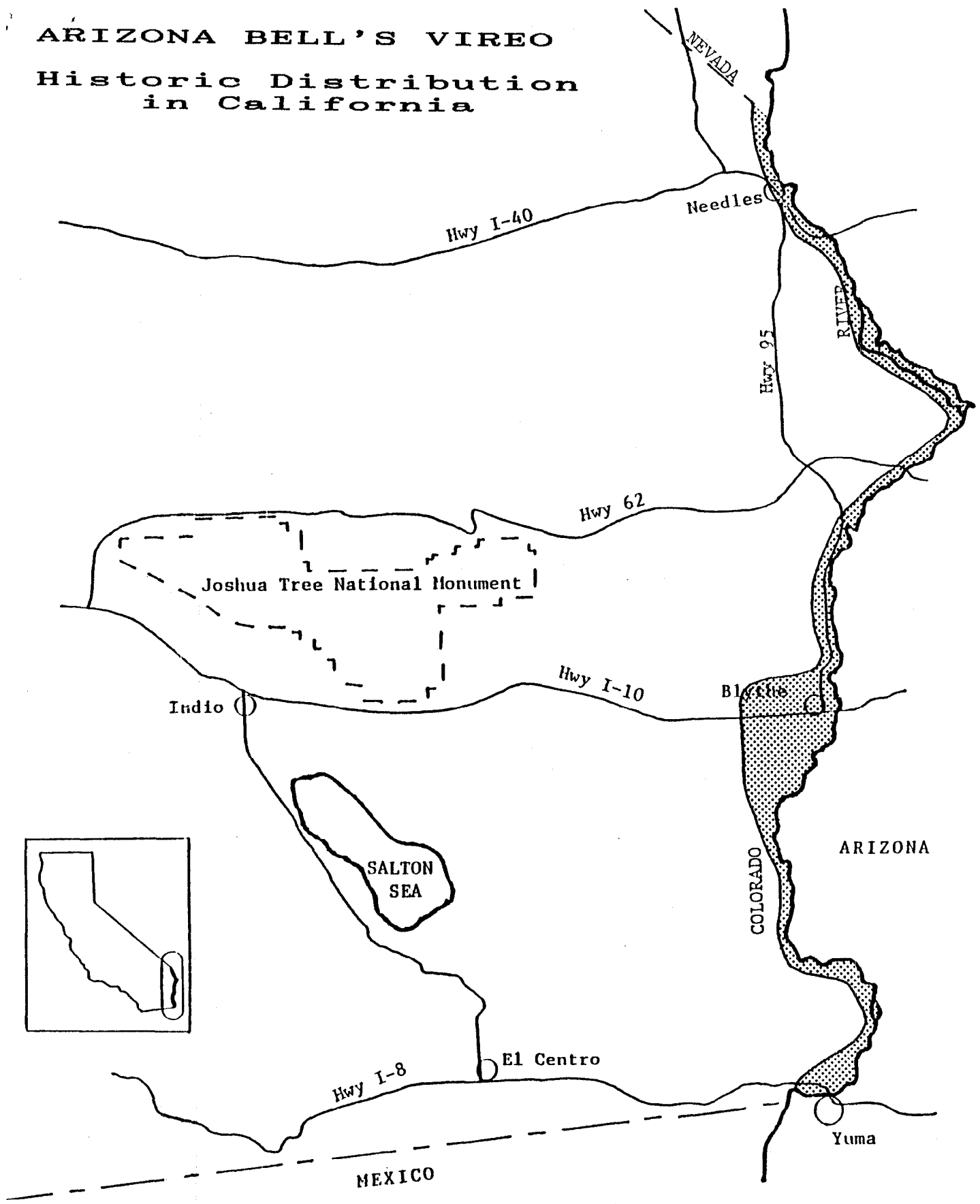


FIGURE 1. Historic Distribution of the Arizona Bell's Vireo (*Vireo bellii arizonae*) in California; as described by Grinnell 1914, Grinnell and Miller 1944, and AOU 1957 and 1983.

█ = historic distribution

ARIZONA BELL'S VIREO  
 Current Distribution  
 in California

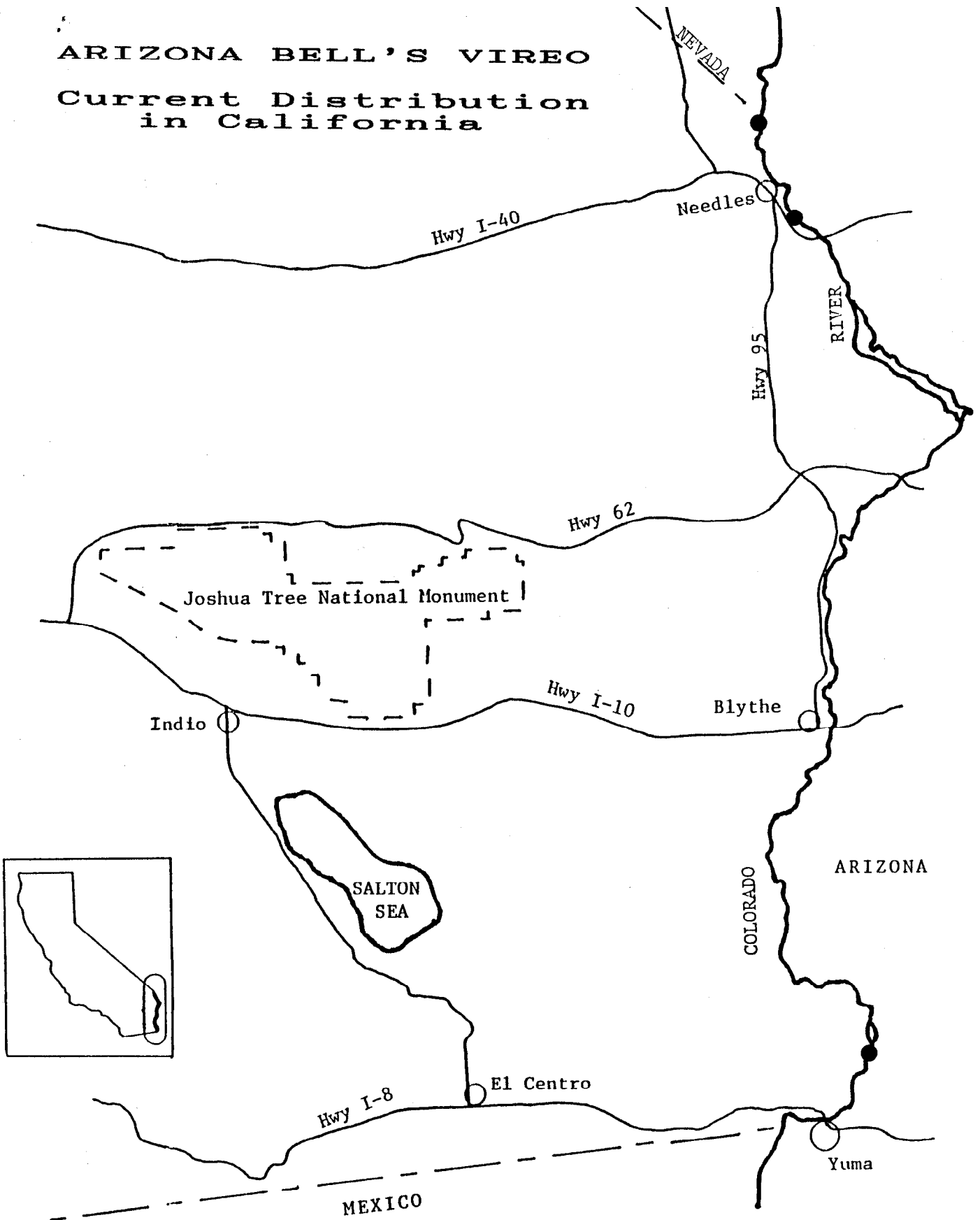


FIGURE 2. Current Distribution of the Arizona Bell's Vireo in California; after Hunter 1984, and laymon and Halterman 1986. (See Attachments "A" through "C" for exact locations.) ● = 1984-86 sitings

The small amount of existing available habitat that remains is not being fully utilized by vireos at this time. But, the near-term prognosis for introductions into these areas is dim. Even if the population increases, the small amount of habitat left may not be adequate to insure continued survival of the population, especially in the face of continued Brown-headed Cowbird parasitism. Before introductions into existing unoccupied habitats can be considered, it will be necessary to increase the productivity of the few remaining birds, until a healthy ongoing increase in the population level is established. If this is accomplished, in conjunction with a healthy increase in the amount of suitable habitat in California, a program of introductions may not be necessary, since natural expansion and dispersal may occur and all areas eventually may be occupied. Additionally, if a large amount of suitable habitat is made available by large-scale revegetation projects, Arizona Bell's Vireos conceivably may be able to overcome Brown-headed Cowbird parasitism.

#### VI. HISTORIC AND CURRENT ABUNDANCE:

(Provide historic and current population numbers, densities, vigor, sex and age structures and explanation of population fluctuations relative to natural events or threats.)

Arizona Bell's Vireos were described as locally abundant and common summer residents of the Colorado River valley around the beginning of this century (Grinnell 1914, Remsen 1978, Serena 1986). At that time Grinnell (1914) described them as one of the most characteristic species of the riparian strip, and estimated that there was one singing male for every 200 yards of willow breeding habitat. Toward the middle of the century Grinnell and Miller (1944) still classified this vireo as a common summer resident. After that date they began a steady decline and by the 1960's they were considered to be scarce everywhere (Monson 1960, Remsen 1978, Serena 1986).

More recently, Serena (1986) conducted an extensive survey of the Arizona Bell's Vireo population along the Colorado River. During April-July 1981, she found a total of 35 territorial males, most of which likely had mates, making the total population in California approximately 70 birds. They were mostly occupying two restricted areas along the Colorado River in California, one in the Mojave Valley from the Nevada border south to the beginning of Topock Gorge, and one near Parker, Arizona.

Laymon and Halterman (1986), after surveying the entire length of the Colorado River, found only four singing males, or a total population estimated at eight birds, on the California side of the river. They concluded that there is no question that the Arizona Bell's Vireo is on the verge of extirpation in California.

#### VII. SPECIES DESCRIPTION AND BIOLOGY:

(Include applicable information on species identification, seasonal activity or phenology, reproductive biology, mortality/natality, longevity, growth rate, food habits and use of habitat.)

The Arizona Bell's Vireo is a summer resident, common in streamside thickets along the river valleys of the southwestern Lower Sonoran desert region

including the Colorado River (Bent 1950). The Arizona Bell's Vireo generally can be described as a small pale grayish vireo about 5 inches long that is active and nervous. General field identification characteristics include being generally drab gray above and whitish below, with sides and flanks faintly washed with grayish-olive-yellow, indistinct white spectacles, and faint white wing bars with the lower bar being more prominent (Bent 1950, National Geographic Society 1983). Males, females, and juveniles are similar in coloration.

Bent (1950) described the Arizona Bell's Vireo as almost entirely insectivorous, and food items predominantly include various bugs, caterpillars, beetles, and grasshoppers. In one food habit study conducted during summer, Arizona Bell's Vireos' overall diet consisted of 34.4% Hemiptera (true bugs) and 18.5% Orthoptera (grasshoppers). However, during July, Orthopterans increased to 34.9% of the diet. Other items in the summer diet included adult moths and butterflies and their eggs, lady-bird beetles, weevils, leafbeetles, bees and wasps, spiders, a very few snails, and a little wild fruit. Grinnell (1914) reported that along the Colorado River Arizona Bell's Vireos foraged in all vegetation associations but were most represented in the willow association, especially where there was an undergrowth of seep-willow (*Baccharis glutinosa*). They worked in a rather low foliage zone, from the ground to a height of 6-8 feet.

Arizona Bell's Vireos generally arrive in the breeding habitat along the Colorado River valley in early March (Grinnell and Miller 1944). Bent (1950) described their breeding range as extending from southeastern California to southwestern New Mexico, and south to Sonora and Chihuahua, Mexico. Their winter range extends from Mexico southward into Central America. Migration southward from the nesting areas occurs during fall, with most birds gone by mid-October (Bent 1950). During migration and in winter they occupy open woodland and open brush, occurring regularly in northern Mexico (American Ornithologists Union 1983).

According to Bent (1950), the Arizona Bell's Vireo is a typical breeder of the streamside fringes of willows and mesquite along the lower Colorado River. Grinnell (1914) found this vireo at every station all along the Colorado River and described them as one of the most characteristic birds of the riparian strip. They were closely confined to the willow association and singing males occupied 200 yard segments of habitat. Each pair was closely delimited in foraging area by neighboring pairs, and they actively resented encroachment by others of their own species. Serena (1986) found that birds tended to clump their territories. Two to four males typically occupy territories in a 400-800 meter stretch, with large stretches of identical unoccupied habitat between groups of territories. She felt that there were two possible explanations for this. First, young males may preferentially establish territories in the vicinity of where they were born. Second, an important criteria of desirable habitat may be the presence of nearby singing males or nesting pairs.

Bent (1950) reported that birds apparently are mated on arrival and nest construction begins almost immediately. Construction usually lasts four to five days and is done by the female. The nest is usually placed less than 5 feet above the ground, with 3 feet being the average height. He found nests in several locations: 3½ feet above the ground on a horizontal willow branch beneath a clump of small willows; attached to a forking stalk of a

seep-willow about 5 feet above the ground; hanging between forks of a mesquite branch about 5 feet above the ground; and suspended between two twigs and close to the stem of a slender willow about 8 feet above the ground. He described a nest as a typical vireo basket not too firmly attached to twigs and made of various vegetable fibers, such as split large grasses, and mixed with strips of soft inner bark, fine grasses, willow cotton, plant down, pappus, spider nests, and considerable cattle hair, all firmly bound together. The lining typically is constructed of the very finest grass tops and a little cattle hair. The nest is about 3 X 2½ inches in outside diameter and 2 inches in outside depth, and internally it is about 2¼ X 1¾ inches in diameter and 1½ inches deep.

Three or four eggs usually are laid and both parents share in incubation, which lasts about 14 days (Bent 1950). Egg laying occurs from the end of April to the end of May. Both parents participate in the care of the young, brooding them and feeding them mostly smooth caterpillars. Although normally timid, shy, and retiring, both parents are aggressive defenders of eggs and young. Two broods generally are raised each season. Juveniles undergo a partial postjuvenile molt in July and August. There is no prenuptial molt, but a complete postnuptial molt takes place in late summer.

Arizona Bell's Vireos are common victims of nest parasitism by Brown-headed Cowbirds (Bent 1950). A female cowbird lays an egg in the nest of an absent vireo, usually removing one of the owner's eggs if any are present, and then leaves, expecting the host to incubate and hatch the egg and raise the nesting. This results in a reduction of nest success and reduced productivity for the host bird. Usually the parasite nestling is much larger than the host's own nestlings, and the parasite nestling simply out-competes them. Serena (1986) found that five of nine Arizona Bell's Vireo's nests located along the California side of the Colorado River were parasitized by cowbirds in 1981.

Cowbirds are obligate nest parasites and their proliferation is correlated with the development of agriculture and ranches and the associated clearing of native riparian vegetation. Females prefer to lay eggs in a host nest with smaller eggs than their own, since a smaller bird is less likely to be strong enough to defend the nest or eliminate the egg, and the smaller nestlings will more likely be eliminated in competition for food and space. Female cowbirds are extraordinarily fecund, producing four or more eggs per week over the whole season, from late April to early July. Serena (1986) found that cowbird males often were more associated spatially with vireo territories than expected by chance alone. Because the rate of cowbird parasitism drops off in late June and July, Arizona Bell's Vireos are subjected to less parasitism of their second brood, usually raised toward the end of the cowbird breeding season. The rate of cowbird parasitism varies as a function of the local density of cowbirds in relation to the number of potential hosts. But, such high cowbird fecundity suggests that even a small number of cowbirds can have a drastic effect on the reproductive success of a vulnerable host species, such as the Arizona Bell's Vireo (Serena 1986).

There are several responses that a host species can have toward cowbird parasitism (Serena 1986): incubate the egg and raise the parasite nestling at the expense of the host's entire brood; abandon the nest; or remove the egg from the nest before it hatches. Bent (1950) reports a few cases where broken cowbird egg shells were found beneath Arizona Bell's Vireos' nests, indicating



that perhaps the host had managed to remove the egg. Although this is the most adaptive way to cope with parasitism, it is the rarest (Serena 1986). The more common method of coping is simply to abandon the nest and build another one. Bent (1950) reported an instance of up to four nests being abandoned within the territory of a single pair before they raised a successful brood. He also reported that only rarely will vireos add another layer of lining on top of the parasite egg. The most common responses are either to abandon the nest or raise to parasite nestling (Bent 1950).

There is much debate about the effect of cowbird parasitism on populations of small passerines such as the Arizona Bell's Vireo. Hunter (1984) stated that the Brown-headed Cowbird often has been blamed for the demise of local populations of small passerines, and although there is little question that they interfere with the nesting of these birds, evidence that they cause extirpation is circumstantial. Brown-headed Cowbirds have been considered abundant along the Colorado River at least since the late 1800's. Grinnell (1914) reported that Brown-headed Cowbirds were one of the five most abundant species in the region. Hunter (1984) felt that cowbird parasitism was a secondary factor, and that the loss of the cottonwood-willow riparian habitat along the Colorado River was the primary factor in the disappearance of small riparian passerines such as the Arizona Bell's Vireo. Remsen (1978), on the other hand, declares that destruction of riparian habitat is probably partly responsible for the decline, but that the present critical status of Arizona Bell's Vireos is almost certainly due to brood parasitism by Brown-headed Cowbirds. Remsen feels that the rate of decline of small riparian passerines, including the Arizona Bell's Vireo, coincides with the spectacular increase in numbers of Brown-headed Cowbirds. He adds that destruction of riparian habitat, however, may have been significant in reducing vireo populations below levels capable of withstanding increasing cowbird densities.

Serena (1986) feels that the destruction of habitat and the increase of cowbird parasitism have combined to worsen the situation. Riparian areas cleared for agricultural development are unsuitable for Arizona Bell's Vireos, and at the same time this practice encourages proliferation of Brown-headed Cowbirds. She points out that the rate of parasitism increases more rapidly than expected under these circumstances, since agricultural development causes a simultaneous increase in the number of cowbirds and a decrease in the number of riparian passerines that they parasitize.

The lack of Arizona Bell's Vireos in some areas of suitable habitat suggests that other factors also may have been involved, including poor conditions in wintering areas and high mortality factors during migration (Remsen 1978, Hunter 1984, Serena 1986). Large-scale cowbird removal may not be the panacea for the Arizona Bell's Vireo's problems (Serena 1986, Hunter 1984), but it may be prudent to at least initiate a cowbird removal program at a local level on an experimental basis (Remsen 1978). Arizona Bell's Vireos have not developed any elaborate strategies to reduce the effect of cowbird parasitism. Their most common response is to accept the egg and nestling (Bent 1950, Serena 1986), so perhaps some help in coping with cowbird parasitism pressure is necessary since Arizona Bell's Vireo numbers are extremely low.

Besides cowbirds, Bent (1950) pointed out that the habit of nesting so close to the ground also makes nests vulnerable to other problems. House cats (as well as other small carnivores) can easily destroy nests. Browsing cattle also can destroy nests that are built in openings between thickets. As

browsing cattle crowd through they force the supporting branches aside and demolish nests.

#### VIII. HABITAT REQUIREMENTS:

(Describe physical habitat required for all life history stages of species including plant community, soils, microhabitat, slope, aspect, elevation, setting, climate and any other specific requirements.)

Grinnell (1914) described the Arizona Bell's Vireo as an inhabitant of the riparian strip along the edge of the Colorado River. In particular, they were closely confined to the willow association, especially where there was an undergrowth of seep-willow, and that singing males occupied 200 yard segments of that strip. Grinnell and Miller (1944) described the habitat, again, as chiefly the willow association with seep-willow undergrowth, and stated that the sphere of activity is within about 8 feet of the ground, and included open and sparsely foliated branchwork beneath or between the taller denser trees and bushes. Bent (1950) found Arizona Bell's Vireos in the narrow strips of willows, small cottonwoods and undergrowth along waterways and in extensive mesquite forests. He stated that generally they inhabit low dense thickets along river or stream banks with a preference for willows, especially those overgrown with a tangle of wild grapevines, as well as mesquite thickets. The American Ornithologists' Union (1983) described their habitat more broadly as including dense brush, mesquite, streamside thickets, and scrub oak, in arid regions usually near water. They added that during migration and in winter they also occupy other types of open woodland and open brush.

Serena (1986) conducted an extensive survey of habitat preferences of Arizona Bell's Vireos along the Colorado River during the 1981 breeding season. She found territorial males singing at sites dominated by stands of young willow or honey mesquite. Arizona Bell's Vireos' territories characteristically have a low (<3m) dense layer of vegetation that is used almost exclusively for both nesting and foraging. Along the Colorado River much of the brushy vegetation meets this criteria, consisting of dense stands of shrubs, shrubby trees and woody perennial herbs. Willow thickets are highly favored as nesting habitat, but in lieu of willows, Serena found that vireos preferentially occupy dense stands of honey mesquite or mixed stands of honey and screwbean mesquite. Over half of the territories were dominated by willows and 94% of the territories had at least some honey mesquite. Arizona Bell's Vireos did not nest in areas dominated by exotic salt cedar (*Tamarix chinensis*), but some salt cedar did occur on 60% of all vireo territories, reflecting how common it is in Colorado River riparian habitats.

Serena (1986) pointed out that stands of young willows are virtually absent along the Colorado River today, only occurring in a few areas. However, Arizona Bell's Vireos are not now saturating even this small amount of available willow or mesquite habitat, and in areas where suitable habitat has remained unchanged over the past several years their numbers continue to decline. The vireos have a habit of clumping their territories together when breeding, possibly because they return to the place where they were born, or because they have a desire to be in the vicinity of other singing males. Extreme loss of native habitat has reduced their productivity since they cannot utilize agricultural or urban areas, and they do not appear to breed in

riparian areas where non-native vegetation has replaced the original vegetation. Conversion of native riparian habitat areas to agricultural uses also has resulted in the proliferation of Brown-headed Cowbirds and increased the incidence of brood parasitism. Serena concludes that although preserving and enhancing native riparian habitat may not result in immediate expansion of Arizona Bell's Vireo populations, at least as long as their numbers remain below carrying capacity in the areas where they are breeding, it appears to be the only method available at this time to help the population recover.

#### IX. CURRENT AND RECOMMENDED MANAGEMENT:

(Explain existing state, federal, local or private management of known populations and available protection mechanisms. Indicate any methods or procedures useful for protecting the physical and biological features of the environment for conservation of the species. Describe activities necessary to insure the survival of the species.)

One of the primary reasons for the decline of the Arizona Bell's Vireo population in California has been the removal of essentially all of the native riparian habitat along the Colorado River. The river is near the western edge of the geographical range of this species, and the only place they occur in California at this time is along the Colorado River in the remnants of riparian vegetation. There are presently no existing state, federal, local or private management programs for Arizona Bell's Vireos aimed at insuring their continuing existence in the State. Acquiring, creating, maintaining and enhancing riparian habitat along the Colorado River is the only way to insure the continued survival of Arizona Bell's Vireo in California.

The only effective approach for long-term preservation of all lower Colorado River riparian forest species will be to restore the native habitat by careful revegetation of large tracts of cleared land or land vegetated by exotics along the banks of the river. Renovation and management of existing habitat can occur by selectively removing exotic salt cedar and replanting with native vegetation.

Experimental large-scale revegetation (>50 acres) conducted under contract with the Bureau of Reclamation along the Colorado River has been quite successful (Hunter 1984) and might provide the solution for expanding habitat and increasing numbers of Arizona Bell's Vireos and other riparian bird species in California. In this experimental program, it took five growing seasons to convert desolate dredge spoilings with little vegetation and wildlife to a young healthy cottonwood-willow woodland, with growth of up to 10 feet per year. Smaller revegetation efforts (<25 acres) could provide some habitat for Arizona Bell's Vireos since they may utilize brushy willow regrowth situations along the river for nesting (Serena 1986). Smaller scale revegetation projects also might be advantageous in areas adjacent to existing riparian woodlands, thus adding to the overall extent of suitable habitat. It will take much effort, however, over many years, to provide an adequate amount of habitat so that Brown-headed Cowbird parasitism will no longer be a serious burden.

Acquiring and preserving remaining tracts of native riparian habitat that are presently in private ownership along the Colorado River, especially any areas

that are fairly extensive, are necessary in a short-term approach to preserving the Arizona Bell's Vireo and the other species of Colorado River riparian birds. In lieu of, or prior to, actual habitat acquisition, it would be prudent to initiate land stewardship and educational programs that stress the importance of these existing remnants of riparian habitat to wildlife, as well as their recreational value. These programs should include farmers, ranchers, resort owners, native Americans, and governmental agencies.

Besides acquiring and safeguarding existing riparian habitat, additional management efforts should be made to make the habitat productive and attractive to Arizona Bell's Vireos and to ensure the riparian habitat's continued existence. Proper control of flooding with the purpose of enhancing existing riparian habitat is an extremely important management tool. River management activities and high water or prolonged flooding have the potential to either enhance or destroy existing woodlands. Prolonged abnormal flooding during late summer and fall or for several consecutive years can cause the death of most or all riparian trees resulting in total destruction of the habitat.

Another possible short-term solution for enhancing the breeding efforts of Arizona Bell's Vireos would be to control Brown-headed Cowbird nest parasitism. Cowbird nest parasitism is considered a major factor contributing to the current decline of this species. It would be prudent to at least attempt to control cowbirds on an experimental basis (Remsen 1978, Serena 1986). There are so few pairs of Arizona Bell's Vireos breeding in the state, that once these nests are located, it may be possible to monitor them and remove any cowbird eggs that are deposited.

Finally, it would be informative to establish cooperative research efforts with biologists in Central America and Mexico to attempt to determine the status of Arizona Bell's Vireos during migration and on their wintering grounds. It is important to know more about their overall biology and habitat requirements before more specific management plans can be formulated.

#### X. INFORMATION SOURCES:

(Cite literature, specimen collection records and other pertinent reference materials. Attach documents critical to recommended action. List names, addresses and telephone numbers of persons cited.)

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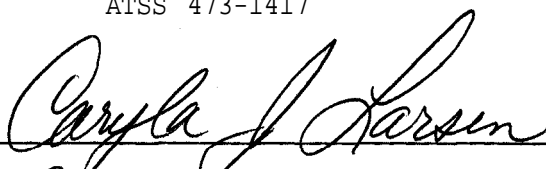
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