Background

Multiple Scale Habitat Selection: In Brown Canyon, Buenos Aires National Wildlife Refuge, Bell's vireo had different degrees of selection at different spatial scales; this species was highly selective at the nest-patch scale and less selective at the canyon scale (Power and Steidl 2002). Implications of this scale of selection may result in difficulties modeling habitat at the landscape scale.

Proximity to Water: Often nests near water in arid regions (Brown 1993).

Vegetation Type:

NOT USEFUL INFORMATION:

THIS INFORMATION DOES NOT FIT WITHIN ANY ALLIANCE. In southeastern Arizona, this species occurs in dense shrubs and trees of lower canyons, generally below the oak zone, and along desert streams and washes (Edison et al. 1995). Near Tucson, this species’ densities were highest in urban areas characterized by native vegetation (0.18 individuals/ 4.0ha; recorded in 22% of sites surveyed), and second highest in native vegetation, which were control sites (0.58 individuals/ 4.0ha; recorded in 17% of sites surveyed; Mills et al. 1989). In New Mexico, it is “rare to uncommon” in riparian woodlands and valley mesquite (Hubbard 1971). Hubbard (1978) revised this initial statement and suggests BEVI is "rare to fairly common in lowland riparian shrubland, woodland and adjacent microphyll shrubland. This vireo usually occurs in dense, low, shrubby vegetation within early successional stage riparian, brushy fields, young second-growth forest or woodland, shrub oak and mesquite brushlands; it is largely absent from cultivated areas, forests, pure grasslands and open deserts (Brown 1993).

Brown (1987, 1989) observed this species nesting within vegetation characterized by honey mesquite, catclaw acacia (Acacia greggii), netleaf hackberry (Celtis reticulata), Apache plume (Fallugia paradoxa), redbud (Cercis canadensis) and scrub oak (Quercus turbinella) between Glen Canyon Dam and Diamond Creek, Grand Canyon. Regarding the vegetation inventory information
provided by Brown (1987, 1989), there was no ecological system, which fit the information provided.

USEFUL INFORMATION:
MESQUITE GRASSLAND: In the Santa Rita Experimental Station, Santa Rita Mountains, this species occurred in a grassland range vegetation, which included mesquite (Prosopis juliflora), cacti (Opuntia spp.), burrowweed (Haplopappus tenuisectus), acacias (Acacia spp.), ocotillo (Fouquieria splendens), mimosas (Mimosa spp.), and false mesquite (Calliandra eriophylla); grass species included Arizona cottontop (Trichacne californica), threeawns (Aristida spp.), bush muhly (Muhlenbergia porteri), several perennial grmmas (Bouteloua spp.), as well as the introduced Lehmanlovegrass (Eragrostis lehmanniana; Maurer 1985). During a two year study in the Santa Rita Mountains, Bell’s vireo were detected during this study within mesquite savannah at 7.3 singing males/ 1 km² in 1982 and 9.1 singing males/ 1 km² in 1983 (Maurer 1985).

APACHERIAN-CHIHUAHUAN PIEDMONT SEMI-DESERT GRASSLAND - This ecological system is a broadly defined desert grassland, mixed shrub-succulent or xeromorphic tree savanna that is typical of the Borderlands of Arizona, New Mexico and northern Mexico [Apacherian region], but extends to the Sonoran Desert and throughout much of the Chihuahuan Desert. It is found on gently sloping bajadas that supported frequent fire throughout the Sky Islands and on mesas and steeper piedmont and foothill slopes in the Chihuahuan Desert. Common grass species include Bouteloua eriopoda, Bouteloua hirsuta, Eragrostis intermedia, Muhlenbergia porteri, Muhlenbergia setifolia, Pleuraphis jamesii, Pleuraphis mutica, and Sporobolus airoides, succulent species of Agave, Dasylirion, and Yucca, and tall shrub/short tree species of Prosopis and various oaks (e.g., Quercus grisea, Quercus emoryi, Quercus arizonica). Many of the historical desert grassland and savanna areas have been converted, some to Chihuahuan Mesquite Upland Scrub (Prosopis spp.-dominated), through intensive grazing and other land uses. Two of seven shrub species identified by Maurer (1985) occurred within this ecological system. This includes Prosopis spp. Which was identified by Maurer (1985) and was listed in the system, and Fouquieria splendens, which is not listed in this narrative, but was listed as one of two dominant species in three alliances listed in the “alliance and association” section of the ecological system description. Also, Opuntia spp. And Acacia spp. Were not listed in the entire ecological system description, but certainly occurs within the system. Also, two of five grass species/ geneses listed by Maurer (1985) were identified as occurring within this ecological system. Admittedly, this is a weak fit when comparing the vegetation inventory to the ecological system narrative. However, this is the only Chihuahuan semi-desert grassland. Therefore, inclusion of this ecological system seems reasonable. This species is expected to breed within this ecological system.

MESQUITE BOSQUE: In New Mexico, vegetation at Rattlesnake Spring, at Carlsbad Caverns NP, was characterized by mature fruit trees (apple and plum; Malus spp.), hackberry thickets and mesquite flats (Parody and Parker 2002). Throughout most of Arizona, this species was identified as a “common summer resident” in dense low brush, especially mesquite associations along streams, up to the top of the Lower Sonoran Zone, including the recent bottom of the Grand
Canyon (Monson and Phillips 1981). Along the Santa Cruz River, between Sahuarita and Tubac, Arizona this species nested within dense mesquite and along “fencerow thickets of elderberry” \( (n = 24 \text{ nests}; \text{Clark 1988}) \). Between Glen Canyon Dam and Diamond Creek, this species was observed nesting within the mesquite vegetation type, which was characterized by honey mesquite, catclaw acacia (Acacia greggii), netleaf hackberry (Celtis reticulata), Apache plume (Fallugia paradoxa), redbud (Cercis canadensis) and scrub oak (Quercus turbinella; Brown 1987, 1989). In the Chiricahua Mountains, east of Portal, Ligon and Balda (1968) considered this species “not common,” but occurring within thick mesquite bosques along dry creek beds.

APACHERIAN-CHIHUAHUAN MESQUITE UPLAND SCRUB - This ecological system occurs as upland shrublands concentrated in the extensive grassland shrubland transition in foothills and piedmont in the Chihuahuan Desert. It extends into the Sky Island region to the west, and the Edwards Plateau to the east. Substrates are typically derived from alluvium without a well-developed argillic or calcic soil horizon that would limit infiltration and storage of winter precipitation in deeper soil layers. Prosopis spp. And other deep-rooted shrubs exploit this deep soil moisture that is unavailable to grasses and cacti. Vegetation is typically dominated by Prosopis glandulosa or Prosopis velutina and succulents. Other desert scrub that may codominate or dominate includes Acacia neoovernicosa, Acacia constricta, Juniperus monosperma, or Juniperus coahuilensis. Grass cover is typically low. During the last century, the area occupied by this system has increased through conversion of desert grasslands as a result of drought, overgrazing by livestock, and/or decreases in fire frequency. It is similar to Chihuahuan Mixed Desert and Thorn Scrub, but is generally found at higher elevations where Larrea tridentata is not codominant. It is also similar to Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub, but does not occur on eolian-deposited substrates. This ecological system included the Prosopis velutina / Celtis laevigata var. reticulata Shrubland alliance. Parody and Parker (2002) identified this species as occurring within hackberry thickets and mesquite flats Rattlesnake Spring, at Carlsbad Caverns NP, New Mexico. There is 100% agreement between the dominant descriptive information identified by Parody and Parker (2002). Therefore, inclusion of this ecological system was reasonable. This species is expected to breed within this ecological system.

NORTH AMERICAN WARM DESERT RIPARIAN MESQUITE BOSQUE - This ecological system consists of low-elevation (<1100 m) riparian corridors along intermittent streams in valleys of southern Arizona and New Mexico, and adjacent Mexico. Dominant trees include Prosopis glandulosa and Prosopis velutina. Shrub dominants include Baccharis salicifolia, Pluchea sericea, and Salix exigua. Vegetation, especially the mesquites, tap groundwater below the streambed when surface flows stop. Vegetation is dependent upon annual rise in the water table for growth and reproduction. This ecological system lists, Prosopis velutina / Celtis laevigata var. reticulata Shrubland as one of the alliances in the “Alliances and Associations” section. Parody and Parker (2002) identified this species as occurring within hackberry thickets and mesquite flats Rattlesnake Spring, at Carlsbad Caverns NP, New Mexico. There is 100% agreement between the dominant descriptive information identified by Parody
and Parker (2002). Therefore, inclusion of this ecological system was reasonable. This species is expected to breed within this ecological system.

WILLOW RIPARIAN: Along the Gila River, near Lordsburg, New Mexico, vegetation was dominated by dense stands of willow (Salix spp.) and seepwillow (Baccharis salicifolia) with upland areas characterized by mesquite (Prosopis sp.) and hackberry ( Celtis sp.) stands (Parody and Parker 2002). Historically, this species was most common in willow habitats, where it occupied understory shrubs including “guatemote,” along the Lower Colorado River valley (LCRV; Rosenberg et al. 1991). Because this alliance is dominated by willows and vegetation where this species is known to occur is characterized by dense stands of Salix spp. By Parody and Parker (2002) and “willow habitats” are identified by Rosenberg et al. (1991), inclusion of this vegetation alliance seemed justified. This species is expected to breed within this ecological system.

ROCKY MOUNTAIN LOWER MONTANE RIPARIAN WOODLAND AND SHRUBLAND - This system is found throughout the Rocky Mountain and Colorado Plateau regions within a broad elevation range from approximately 900 to 2800 m. This system often occurs as a mosaic of multiple communities tree-dominated with a diverse shrub component. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. They can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. Dominant trees may include Acer negundo, Populus angustifolia, Populus balsamifera, Populus deltoides, Populus fremontii, Pseudotsuga menziesii, Picea pungens, Salix amygdaloides, or Juniperus scopulorum. Dominant shrubs include Acer glabrum, Alnus incana, Betula occidentalis, Cornus sericea, Crataegus rivularis, Forestiera pubescens, Prunus virginiana, Rhus trilobata, Salix monticola, Salix drummondiana, Salix exigua, Salix irrorata, Salix lucida, Shepherdia argentea, or Symphoricarpos spp. Exotic trees of Elaeagnus angustifolia and Tamarix spp. Are common in some stands. Generally, the upland vegetation surrounding this riparian system is different and ranges from grasslands to forests.

OAK WOODLANDS: This alliance occurs in the mountains of Arizona and New Mexico (NatureServe 2002). In the Chiricahua Mountains, southeastern Arizona, Balda (1967, 1970) found this species in low breeding densities; it was estimated at 3 breeding pair per 100 acres within oak woodlands. Oak woodland is characterized by Quercus emoryi (95.0% relative density), Q. arizonica (2.9% relative density), Juniperus deppeana (1.4% relative density), and J. monosperma (0.7% relative density) with 14 shrub species (Fallugia paradoxa, Brickellia sp., Rhus microphylla, R. trilobata, Calliandra eriophylla, Nolina microcarpa, Arctostaphylos pungens, Opuntia spinosior, Mimosa grahami, Aplopappus sp., Opuntia sp., Yucca elata, Y. schottii, Mimosa sp.; Balda 1967).

MADREAN ENCINAL - Madrean Encinal occurs on foothills, canyons, bajadas and
plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, extending north into Trans-Pecos Texas, southern New Mexico and sub-Mogollon Arizona. These woodlands are dominated by Madrean evergreen oaks along a low-slope transition below Madrean Pine-Oak Forest and Woodland (CES305.796) and Madrean Pinyon-Juniper Woodland. Lower elevation stands are typically open woodlands or savannas where they transition into desert grasslands, chaparral or is some case desert scrub. Common evergreen oak species include Quercus arizonica, Quercus emoryi, Quercus intricata, Quercus grisea, Quercus oblongifolia, Quercus toumeyi and in Mexico, Quercus chihuahuensis and Quercus albocincta. Madrean pine, Arizona cypress, pinyon and juniper trees may be present, but do not codominate. Chaparral species such as Arctostaphylos pungens, Cercocarpus montanus, Purshia spp. Garrya wrightii, Quercus turbinella, Frangula betulifolia (=Syn Rhamnus betulifolia), or Rhus spp. May be present, but do not dominate. The graminoid layer is usually prominent between trees is grassland or steppe that is dominated by warm-season grasses such as Aristida spp., Bouteloua gracilis, Bouteloua curtipendula, Bouteloua rothrockii, Digitaria californica, Eragrostis intermedia, Hilaria belangeri, Leptochloa dubia, Muhlenbergia spp., Pleuraphis jamesii, or Schizachyrium cirratum; species typical of Chihuahuan Piedmont Semi-Desert Grassland. This system includes seral stands dominated by shrubby Madrean oaks typically with strong graminoid layer. In transition areas with dryer chaparral systems, stands of chaparral are not dominated by Madrean oaks, however Madrean encinal may extend down along drainages. This ecological system contains all overstory tree species identified by Balda (1967). Also, Balda (1967) indicates Quercus emoryi occurred at a relative density of 95.0%. In this system, oak dominates as well. As for the understory information, only one of 14 species listed by Balda (1967) were listed in the ecological system. However, it is likely all will occur within this system. Therefore, inclusion of this ecological system is reasonable. This species is expected to breed within this ecological system.

MADREAN PINE-OAK FOREST AND WOODLAND - system occurs on mountains and plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, Trans-Pecos Texas, southern New Mexico and southern and central Arizona, from the the Mogollon Rim southeastward to the Sky Islands. These forests and woodlands are composed of Madrean pines (Pinus arizonica, Pinus engelmannii, Pinus leiophylla or Pinus strobiformis) and evergreen oaks (Quercus arizonica, Quercus emoryi, or Quercus grisea) intermingled with patchy shrublands on most mid-elevation slopes (1500-2300 m elevation). Other tree species include Cupressus arizonica, Juniperus deppeana, Pinus cembriodes, Pinus discolor, Pinus ponderosa (with Madrean pines or oaks), and Pseudotsuga menziesii. Subcanopy and shrub layers may include typical encinal and chaparral species such as Agave spp., Arbutus arizonica, Arctostaphylos pungens, Arctostaphylos pringlei, Arctostaphylos pungens, Garrya wrightii, Nolina spp., Quercus hypoleucoides, Quercus rugosa, and Quercus turbinella. Some stands have moderate cover of perennial graminoids such as Muhlenbergia emersleyi, Muhlenbergia longiligula, Muhlenbergia virens, and Schizachyrium cirratum. Fires are frequent with perhaps more crown fires than ponderosa pine woodlands, which tend to have more frequent ground fires on gentle slopes. This ecological system contains three of four overstory tree species identified by
Balda (1967). It is highly probable J. monosperma occurs within this system. Balda (1967) did indicate Quercus emoryi occurred at a relative density of 95.0%. Because this ecological system doesn't provide relative density and/or species dominance information, we can only use the information provided by Balda (1967) as a vegetation inventory irrespective of the relative density information. As for the understory information, only two of 14 species listed by Balda (1967) were listed in the ecological system. However, it is likely all will occur within this system. Therefore, inclusion of this ecological system is reasonable. This species is expected to breed within this ecological system.

MADREAN PINYON-JUNIPER WOODLAND - This system occurs on foothills, mountains and plateaus in the Sierra Madre Occidentale and Sierra Madre Oriental in Mexico, Trans-Pecos Texas, southern New Mexico and in southern and central Arizona, from the Mogollon Rim south to the Sky Islands. Substrates are variable, but soils are generally dry and rocky. The presence of Pinus cembroides, Pinus discolor, or other Madrean trees and shrubs is diagnostic of this woodland system. Juniperus coahuilensis, Juniperus deppeana, Juniperus pinchotii, Juniperus monosperma, and/or Pinus edulis may be present to dominant. Madrean oaks such as Quercus arizonica, Quercus emoryi, and Quercus grisea may be codominant. Pinus ponderosa is absent or sparse. If present, understory layers are variable and may be dominated by shrubs or graminoids. This ecological system contains all overstory tree species identified by Balda (1967). Also, Balda (1967) indicates Quercus emoryi occurred at a relative density of 95.0%. In this system, oak dominates as well. No understory species were listed for this ecological system. However, it is likely most, if not all, will occur within this system. Therefore, inclusion of this ecological system is reasonable. This species is expected to breed within this ecological system.

TAMARIX: Between Glen Canyon Dam and Diamond Creek, this species was also observed nesting within the tamarisk vegetation type, other associated species included coyote willow (Salix exigua), Goodding willow (S. gooddingii), arrowweed (Tessaria sericea), seepwillow (Baccharis spp.) and reed (Phragmites australis; Brown 1987, 1989).

INVASIVE SOUTHWEST RIPARIAN WOODLAND AND SHRUBLAND - Tamarix spp. Semi-Natural Temporarily Flooded Shrubland Alliance, or Elaegnus angustifolus Semi-Natural Woodland Alliance. Although either Tamarix spp. And Russian olive may occur as dominant within this woodland/shrubland, this was the only ecological system, which listed Tamarix spp. As a dominant. Therefore, inclusion of this ecological system is reasonable. This species is expected to breed within this ecological system.

Treatment of Vegetation Information: Vegetation information was derived from the BNA species’ account (Brown 1993), six peer-reviewed journal articles (Balda 1970; Hutto 1985; Maurer 1985; Clark 1988; Mills et al. 1989; Parody and Parker 2002), two Ph.D. dissertations (Balda 1967; Brown 1987), one government document (Brown 1989), four natural history accounts (Tanner and Hardy 1958; Ligon and Balda 1968; Rosenberg et al. 1991; Edison et al. 1995), and two bird checklists (Hubbard 1971, 1978). Of these, seven citations
(Tanner and Hardy 1958; Ligon and Balda 1968; Hubbard 1971, 1978; Mills et al. 1989; Brown 1993; Edison et al. 1995) rendered information, which was too vague to be useful, four citations (Balda 1970; Monson and Phillips 1981; Clark 1988; Rosenberg et al. 1991) were non-descriptive yet useful in identifying vegetation alliances, and four citation (Balda 1967; Maurer 1985; Brown 1987, 1989; Parody and Parker 2002) provided a vegetation information in the form of a vegetation inventory of species within the study area.

Vegetation Structure: Nesting ecology – “Essential breeding habitat” consists of dense and extensive riparian forests containing Tamarix spp., Tessaria sericea, Salix exigua, S. gooddingii, Baccharis spp., and Prosopis velutina (Brown et al. 1983). Parody and Parker (2002) suggest “narrow-leaf riparian plants” are selected. This species nests consistently in dense, patchy riparian vegetation throughout its range, but plant species used is highly variable (Brown and Trosset 1989). In Grand Canyon, Brown and Trosset (1989) suggest this species is a habitat generalist with respect to nest habitat selection (n = 47). Of nests identified in Grand Canyon, placement was 64% in shrub tamarisk and 24% in honey mesquite (P. glandulosa; N =121; Brown 1993). It occasionally breeds in dense vegetation in nonriparian lowland areas in the southwest (Brown and Trosset 1989). Consequently, nest placement is explained proximally by the presence of specific structural characteristics, such as vegetation cover and volume.

Nest site selection was highly selective for this species, Brown Canyon, Buenos Aires National Wildlife Refuge; Bell’s vireo’s used 11 plant species as nesting substrates, but selected netleaf hackberry the most (n = 44 nest; X2 = 15.1; P < 0.001; Powell and Steidl 2002). It also selected sites near the creek with higher nest concealment (Powell and Steidl 2002). The odds of BEVI nesting in an area increased as the amount of netleaf hackberry and vegetation volume in the understory increased (Powell and Steidl 2002). This species nested in areas with less vegetation volume in the understory and midstory, and higher vegetation volume in the overstory (Powell and Steidl 2002). Also, this species nested in areas with greater vegetation volume in the understory and midstory (Powell and Steidl 2002).

In New Mexico, Principal Components Analysis of nest site data suggest BEVI nesting along the Gila River were influenced most by vegetation density; the first component was characterized by high loadings of variables related to vegetation density within five meters of the nest, while the second component was comprised mainly to variables related to overhead canopy density (39 % of the variation was explained by the first two components; Parody and Parker 2003). At Carlsbad Caverns NP, the first component was related to vegetation density within a five meter radius of the nest, while the second component was loaded heavily by measures of patch size (distance to nearest edge); these two components captured 40 % of the variation (Parody and Parker 2002). Within southern New Mexico, geographic variation in microhabitat selection has been documented by this study. However, in general, dense vegetation seems to be a fundamental requisite for nest site selection, and should be considered a “strong predictor of Bell’s vireo habitat in the Southwest” (Parody and Parker 2002).
Additionally, regional variation in nest site selection is further demonstrated between Arizona and New Mexico. In Arizona, this species nests within tamarisk thickets (Brown et al. 1983; Brown 1993; Brown 1989), while tamarisk is rarely used in New Mexico (Parody and Parker 2002).

Elevational Range: This vireo is largely absent above 1300 meters elevation (Brown 1993). The BNA species account provided a general elevational range for the species within its known range in the American southwest. Therefore, this elevational range was accepted. Elevational range is from 0 to 1300 meters elevation.

Disturbance by Humans- Threats: Rapid declines in this population are due to loss of willow habitats (Rosenberg et al. 1991) and increased brood parasitism by brown-headed cow birds (Beezley and Rieger 1987; Rosenberg et al. 1991). Monson and Phillips (1981) describe the birds “irregularity” in the state due largely to cowbird parasitism. The Bell’s vireo is one of the “most severely threatened breeding birds of the lower Colorado River valley (Rosenberg et al. 1991). Recent population estimates suggest there was a 57% population decline from 1976 to 1982 (from 203 to 88 individuals; Rosenberg et al. 1991).

Assessment: Proximity to water was derived from the BNA species’ account (Brown 1993). Vegetation information was derived from the BNA species’ account (Brown 1993), six peer-reviewed journal articles (Balda 1970; Hutto 1985; Maurer 1985; Clark 1988; Mills et al. 1989; Parody and Parker 2002), two Ph.D. dissertations (Balda 1967; Brown 1987), one government document (Brown 1989), four natural history accounts (Tanner and Hardy 1958; Ligon and Balda 1968; Rosenberg et al. 1991; Edison et al. 1995), and two bird checklists (Hubbard 1971, 1978). Vegetation structure related to nesting was derived from the BNA species’ account (Brown 1993), and four peer-reviewed journal articles (Brown et al. 1983; Brown and Trosset 1989; Parody and Parker 2002; Powell and Steidl 2002). Elevation was derived from the BNA species’ account (Brown 1993).

Narrative description of range: Range was derived largely from the BNA species account (Brown 1993), Nevada Bird Count Data (GBBO, unpublished data), and Nevada BBA (GBBO, unpublished data). Due to the use of HUCs, the distribution of range in eastern Colorado will be overestimated. Benesh and Rosenberg (1996) account of it occurring in Granite Creek near Prescott, as well as the few other Prescott records were not included. Prescott ranges from 5 to 15km from the nearest range of this species. Also, by incorporating the HUC that encompasses Prescott, it would add the entire area between Flagstaff and Prescott. Given the distance to nearest identified range and the overestimation potential, the HUC containing Prescott was not included.

Historically, this species was a common summer visitant to southern and western Arizona (Swarth 1914). It was found along the Colorado River at least as far north as Fort Mohave (Swarth 1914). In eastern Arizona, it bred abundantly within the valleys of the Santa Cruz and San Pedro, and probably occurs along the Gila River (Swarth 1914). Northern-most observations in
central Arizona include the Gila River, Graham County, and it was documented breeding 50 miles south of Fort Whipple (Swarth 1914). Edison et al. (1995) suggest this species may be viewed in Sabino Canyon, Proctor Road and Catalina State Park. This species has become a “common summer resident” in dense low brush, especially mesquite associations along streams, up to the top of the Lower Sonoran Zone, including the recent bottom of the Grand Canyon (Monson and Phillips 1981). It was also banded at Tanque Verde Ranch, Tucson Arizona June 1990 and recaptured three kilometers south of the banding location in June 1997 (Dunning 1998). In the Lower Colorado River Valley, this species is a “rare” to “locally uncommon summer resident” (Rosenberg et al. 1991). It was studied along the Santa Cruz River, between Sahuarita and Tubac (n = 24 nests; Clark 1988). This species has recently expanded its range into the Grand Canyon largely due to the invasion of tamarisk; this habitat is not used within the lower reaches of the Colorado River (Rosenberg et al. 1991). A Bell’s vireo was observed along Granite Creek near Prescott, which represents one of the few Prescott records for this species (Benesh and Rosenberg 1996). It also occurs within the Grand Canyon from Lake Mead to Lake Powell (Brown et al. 1983). In New Mexico, this species summers locally in the southern portion of the state northward to the lower Gila and lower Pecos (Carlsbad area) valleys and occasionally north in the lower San Francisco valley (north to Pleasanton; Hubbard 1978). It is an “irregular to regular summer resident” in the Redrock areas, and occasional in the Cliff (north to Mogollon Creek) and Virden areas (Hubbard 1971), and Guadalupe Canyon, Animas and Alamo Hueco Mountains (Hubbard 1978). In Nevada, it is a “summer resident” in the southern portion of the state (Alcorn 1988). Since around 1940, this species is identified as occurring within extreme southwestern Utah (Monson and Phillips 1981).

**Description Changes**

### Relationships

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elevation</strong></td>
<td>0 - 1300;</td>
</tr>
<tr>
<td><strong>Slope Min</strong></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Precipitation</strong></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Soil Depth</strong></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Aspect</strong></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Landform</strong></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Distance to Water</strong></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Soil associations</strong></td>
<td>n/a</td>
</tr>
</tbody>
</table>

Tuesday, June 28, 2005
**Ecological System**
S035 Madrean Pine-Oak Forest and Woodland
S051 Madrean Encinal
S058 Apacherian-Chihuahuan Mesquite Upland Scrub
S077 Apacherian-Chihuahuan Piedmont Semi-Desert Grassland and Steppe
S093 Rocky Mountain Lower Montane Riparian Woodland and Shrubland
S098 North American Warm Desert Riparian Mesquite Bosque
S112 Madrean Pinyon-Juniper Woodland
D04 Invasive Southwest Riparian Woodland and Shrubland

**Citations**

Alcorn, J.R. 1988 The birds of Nevada Fairview West Publishing, Fallon, Nevada


Balda, R.P 1970 Foliage use by birds of the oak-juniper woodland and ponderosa pine forest in southeastern Arizona Condor 71:399-412

Balda, R.P. 1967 Ecological relationships of the breeding birds of the Chiricahua Mountains, Arizona Ph.D. dissertation, University of Illinois, Urban, IL


Hubbard, J.P 1978 Revised check-list of the birds of New Mexico New Mexico Ornithological Society Publication No. 6, Albuquerque, New Mexico


Maurer, B.A. 1985 Avian community dynamics in desert grasslands: observational scale and hierarchical structure Ecological Monographs 55: 295-312


Swarth, H.S 1914 A distribution list of the birds of Arizona Pacific Coast Avifauna 10: 1-133

Tanner, J.T. and J.W. Hardy 1958 Summer birds of the Chiricahua Mountains, Arizona American Museum Novitates 1866, 12pps


