

Gray Vireo (*Vireo vicinior*) Recovery Plan

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Photograph by Greg Lasley

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1.0 Introduction

This is a Recovery Plan for the Gray Vireo (*Vireo vicinior*), developed under the authority of the New Mexico Wildlife Conservation Act (WCA). The New Mexico Department of Game and Fish (NMDGF) is directed under the Act to develop recovery plans for species listed as threatened or endangered by the State [17-2-40.1 NMSA 1978]. Each recovery plan is to have the following components:

- a strategy to restore and maintain viable populations of the listed species and its habitat, to the extent that the species may be downlisted
- a strategy that mitigates adverse social or economic impacts resulting from recovery actions
- a strategy to identify social or economic benefits and opportunities
- a strategy to use existing resources and funding to implement the overall Recovery Plan.

As directed by the WCA, public information meetings were held on August 28, 2006, at the Bosque del Apache National Wildlife Refuge near San Antonio, New Mexico; September 5, 2006, in Santa Fe, New Mexico; September 7, 2006, in Carlsbad, New Mexico; and September 11, 2006, in Farmington, New Mexico. An Advisory Committee was formed to develop the Recovery Plan. Members of the Advisory Committee met on February 13, 2007 in Farmington, NM; February 27, 2007 in Carlsbad, NM; February 28, 2007 in Las Cruces, NM; and March 2, 2007 in Albuquerque, NM, to formulate the management section of the Recovery Plan. Agencies represented are Bureau of Land Management (Santa Fe and Farmington offices), Private Industry, Natural Heritage New Mexico, New Mexico State University, Audubon Society, as well as members of the New Mexico Department of Game and Fish. See Appendix 8.1 for a list of committee members.

The organization of this Recovery Plan follows Graves (2002). To aid in readability, limits have been placed upon the number of studies cited used to support a particular statement; additional references may be found in Section 5.0, Additional Citations, indicated in the text by a superscripted number. The range of the species is broken into four Management Units (MU; Figure 1); successful recovery of the species will depend upon meeting objectives within those MU's and statewide.



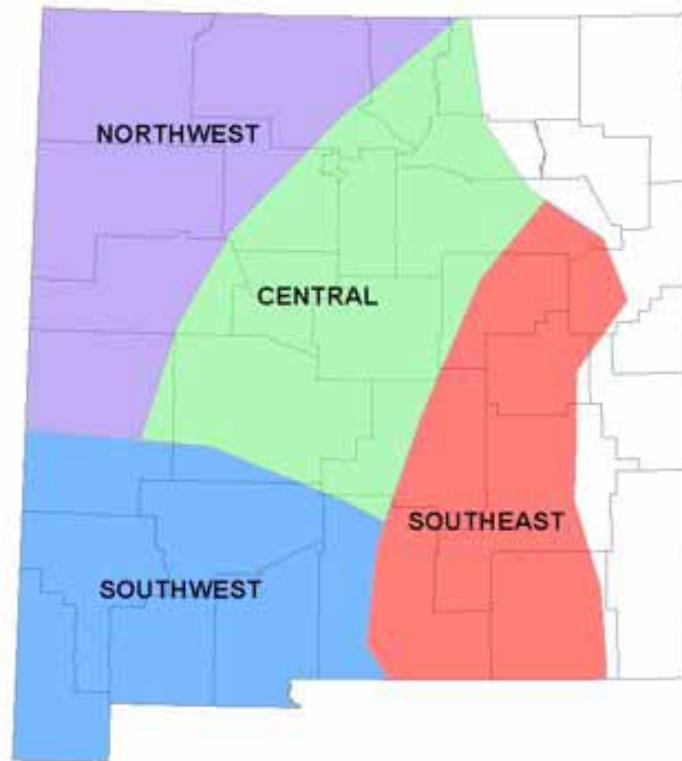


Figure 1. Gray Vireo Recovery Plan Management Units.

Section 2 includes background information on the natural history, historical perspective, habitat assessment, and potential economic and social impacts of this Plan. Section 3 contains the goal for the recovery of the Gray Vireo, accompanying objective, the issues affecting the recovery of the species, and the strategies for addressing those issues.

1.1 EXECUTIVE SUMMARY

This is a Recovery Plan for the Gray Vireo (*Vireo vicinior*), developed under the authority of the New Mexico Wildlife Conservation Act (WCA). The Gray Vireo is a small, gray songbird, found in the dry foothills and bajadas west of the Great Plains in New Mexico, and is associated with juniper, piñon pine, and oak. The distribution of the species is extremely patchy, and eighty percent of known sites are found in twelve main areas in the state. The species arrives in New Mexico in April for breeding, and breeds through August, before migrating to its wintering grounds in September. Chief threats are centered around vulnerability due to its small population sizes and its habitat, specifically the use or alteration of nesting trees, and brood parasitism by cowbirds attracted to disturbed habitat. Key recommendations for the recovery of the species are



to manage the species both on a statewide basis and in four management units within that overall range; improve the knowledge of the biology and status of the bird; improve communication between management agencies, such as providing guidelines for and sharing information on the management of the species; and improve the knowledge of the impact of habitat use or alteration on the biology of the Gray Vireo.

1.2 RECOMMENDED CITATION

New Mexico Department of Game and Fish. 2007. Gray Vireo (*Vireo vicinior*) recovery plan. New Mexico Department of Game and Fish, Conservation Services Division, Santa Fe, New Mexico. 30 p.

1.3 ADDITIONAL COPIES

Additional copies of the Recovery Plan may be obtained from:

New Mexico Department of Game and Fish
P. O. Box 25112
Santa Fe, NM 87504
(505) 476-8101
<http://wildlife.state.nm.us/conservation/index.htm>

2.0 Background

Section 2.0 consists of background information on the distribution, status, habitat requirements, biology, and ecology of the Gray Vireo. The section also includes economic and social profiles of the species and its habitat. This information provides the basis for assessing current status, threats to persistence, and the most effective strategies for the recovery of the species.

2.1 NATURAL HISTORY

2.1.1 Taxonomy

The Gray Vireo belongs to the Vireo Family (Vireonidae), in the Passerine bird order (Passeriformes). The first known specimen was taken in 1865 near Prescott, Arizona (Coues 1866, Barlow et al. 1999). The species name “vicinior” stems from the Latin term “vicinis”, which means neighboring or related, and refers to the resemblance of this bird to other gray birds found in similar habitat (Barlow et al. 1999). Of the thirty-two species within the genus *Vireo*, the Gray Vireo is most closely related to the Plumbeous Vireo (*V. plumbeus*), although the two species differ in jaw muscle configuration (Orenstein and Barlow 1981).

2.1.2 Description

A small, drab songbird, the Gray Vireo ranges from 13.0 cm – 14.8 cm (5.1 – 5.8 in) in total length and 11.5 – 13.5 g (0.4 – 0.5 oz) in mass. Upperparts and cheeks are medium gray, while chin, throat, and chest are pale gray. Abdomen is whitish, as are the undertail coverts. The wings and tail of the Gray Vireo are a darker gray than the rest of the body; the wings have one indistinct white wing-bar. The Gray Vireo’s bill, stoutest in the vireo family, is hooked, blackish, and short (Orenstein and Barlow 1981). White eye-ring is complete but inconspicuous. The Gray Vireo has proportionally the longest tail of any vireo (Barlow et al. 1999).



The Plumbeous Vireo is similar in appearance, but is one third larger, with two white wing-bars and an incomplete white eye-ring.

2.1.3 Distribution

Historic. Little information exists for the species in general (Barlow et al. 1999). Records for the Gray Vireo go back to the 1870's in New Mexico (DeLong and Williams 2006). The species has always been known to be patchily distributed in the state (Ligon 1961), and appears to have abandoned some historic sites in northeastern and southwestern New Mexico (DeLong and Williams 2006).

Current. The Gray Vireo breeds only in the southwestern United States, northern Mexico, and Baja California Norte, Mexico (Figure 2). Wintering range is Baja California Sur, Mexico, coastal and lowland areas of Sonora, Mexico, and north into southwestern Arizona. A separate population winters in the Big Bend region of Texas, and perhaps is present there year-round (Barlow et al. 1999). In Arizona and Utah the Gray Vireo was found at lower densities than other songbirds of the region (Schlossberg 2006). Within New Mexico, the species is found throughout the state west of the Great Plains, but with an extremely patchy distribution often composed of small sites each having less than 10 territories (Figure 3). However, over 80 percent of the Gray Vireo territories in New Mexico are found in 12 sites, the largest site found in the Guadalupe mountains west of Carlsbad, NM (DeLong and Williams 2006, Figure 4). Density from five sites in the state range from 0.2 to 0.9 birds/40.0 hectares (0.2 – 0.9/98.8 acres; DeLong and Williams 2006). Currently estimates are that 418 Gray Vireo territories have been documented in New Mexico; this is an upper estimate, but, with further systematic survey work, other populations are likely to be found in the state (DeLong and Williams 2006).



Figure 2. Overall distribution for the Gray Vireo (Barlow et al. 1999).



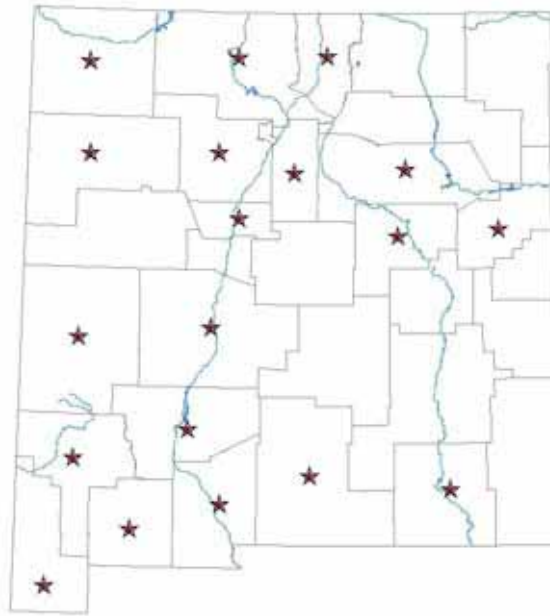


Figure 3. New Mexico counties with confirmed breeding records for the Gray Vireo (DeLong and Williams 2006).

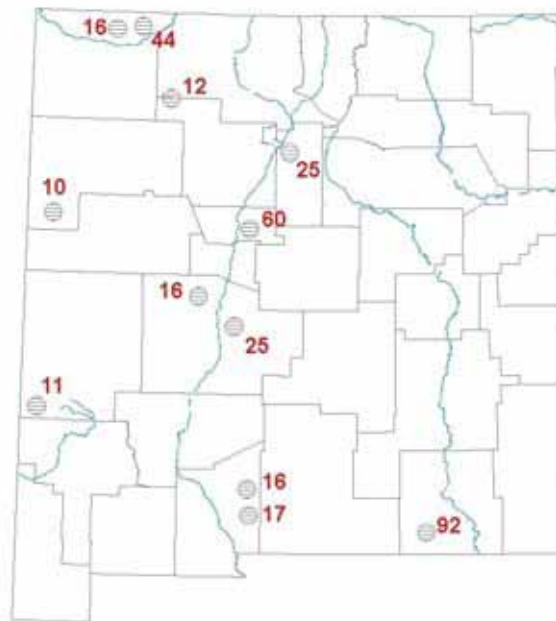


Figure 4. Breeding territory clusters for the Gray Vireo in New Mexico. Number given are documented territories for each cluster (DeLong and Williams 2006).

2.1.4 Required Habitats



Gray Vireos are found in hot, arid regions, most often associated with juniper trees (*Juniperus* spp.), piñon pine (*Pinus edulis*), or oak (*Quercus* spp.). Piñon-juniper savannahs and woodlands often have high bird diversities, upwards of 150 species over a calendar year; these systems offer sufficient structural diversity to provide a large number of opportunities for perching, nesting, and singing for many bird species like the Gray Vireo (Belsky 1996, Buckman and Wolters 1987, Gashwiler 1977, Paulin et al. 1999)¹. The species is also found in oak scrub and chaparral regions. Within its habitat, density of the species was higher at lower elevations on the Colorado Plateau (Schlossberg 2006). Likewise, in southeastern New Mexico, the Gray Vireo was found in only a narrow elevation range, with trees above the range potentially too dense, and trees below potentially too sparse (Hawks Aloft 2006).

Wintering. In southwestern Arizona and northwestern Sonora, Mexico, the Gray Vireo is directly associated with the elephant tree (*Busera microphylla*), often in rocky canyons (Bates 1992a, Barlow et al. 1999). Associated vegetation includes various cacti (*Pachycereus* spp., *Lophocereus* spp.), ironwood (*Olneya tesota*), jojoba (*Simmondsia chiensis*), and cholla (*Opuntia* spp.; Bates 1992a). In a separate population in the Big Bend National Park in Texas, winter habitat is desert scrub, such as creosote (*Larrea* spp.), ocotillo (*Fouquieria* spp.), and yucca (*Yucca* spp.). The Gray Vireo appears not to winter in New Mexico.

Migration. Few documented instances of stopover sightings, and therefore poorly studied, as the Gray Vireo is considered a short-distance migrant (DeLong and Williams 2006, Barlow et al. 1999). Birds in Texas have been found to stop at habitat similar to winter and breeding regions (Griffin 1986).

Breeding. In California the Gray Vireo is found in coastal chaparral and piñon-juniper woodland, and the latter habitat in Colorado (Barlow et al. 1999). In Arizona the species is associated with chaparral-juniper and dwarf conifer forests, oak (*Quercus* spp.), piñon pine, juniper, and madrone (*Arbutus* spp; Phillips et al. 1964, Barlow et al. 1970). The bird was found to prefer piñon-juniper habitat dominated by juniper on the Colorado Plateau in Arizona and Utah (Schlossberg 2006). The vireo makes use of three habitat forms in New Mexico (DeLong and Williams 2006). In northern part of the state, the species uses stands of piñon pine and Utah juniper (*J. osteosperma*) at elevations of 1768 – 2195 m (5800 – 7200 ft); in central New Mexico, the Gray Vireo typically uses oneseed juniper (*J. monosperma*) savannahs at 1676 – 2134 m (5500 – 7000 ft), although in west-central New Mexico, the species may occasionally be found in juniper savannahs above 2195 m (7,200 ft); in southern parts of New Mexico, the bird uses juniper-oak woodlands and desert riparian communities at 1311 – 2012 m (4300 – 6600 ft). Habitat quality may be linked to juniper density, perhaps with quality thresholds for density of trees (DeLong and Williams 2006, Schlossberg 2006). While on the Colorado Plateau areas with some shrubs were preferred (Schlossberg 2006), no relationship was found between Gray Vireo presence and any shrub variable in northern and central New Mexico (DeLong and Williams 2006). Currently no information is available for habitat selection by the vireo in southern New Mexico.

2.1.5 Food Habits

During breeding season, the Gray Vireo is insectivorous, taking grasshoppers, stinkbugs, treehoppers, crickets, moths, damselflies, cicadas, and caterpillars (Barlow et al. 1999). Butterflies and wasps may also be taken. During winter, the species is frugivorous, taking fruits from the Elephant Tree (*B. microphylla*), in southwestern Arizona, Sonora and likely Baja, Mexico (Bates 1992b), whereas the population in Big Bend National Park, Texas, is insectivorous (Barlow et al. 1999).

Gray Vireos forage in thickets (Hamilton 1962), predominantly by gleaning foliage and branches for insects or fruits (Barlow et al. 1999). They will stalk prey, capture with a short flight, hover, take prey in flight like a flycatcher, or pounce upon insects. Most prey items are taken by gleaning, stalking, or capture after a short flight (Orenstein and Barlow 1981, Griffin 1986, Barlow et al. 1999). Prey is consumed in the branches of the thicket. Wintering birds that take fruit feed on capsule-free fruit and do not defecate seeds, in all likelihood regurgitating them instead (Bates 1992b).



Gray Vireos may not drink in arid parts of California but seem to build nests near water sources in Arizona and Texas (Wauer 1971, Barlow et al. 1999).

2.1.6 Behavior

Breeding. Unmated male Gray Vireos sing from exposed branches, often at the top of a tree and may use its pale gray breast as a form of signal for potential mates (Barlow et al. 1999). Nesting Gray Vireos are territorial, with males maintaining the territory through song and patrolling of the perimeter. Territory size varies in part with population density, ranging from 2.0 – 4.0 ha (4.9 – 9.9 ac) in Texas to 7.0 ha (17.3 ac) in Colorado (Barlow et al. 1999). Some fighting takes place between males, with most agonistic displays consisting of spreading and closing of the long tail, puffing the breast and back feathers, and the erecting of the crest (Barlow et al. 1999). Females will on occasion emit a scolding call toward an intruding conspecific. Males will chase intruders. Birds give scolding calls and will attack and chase potential nest predators. Both sexes sit tightly on nest (Barlow et al. 1999, see Figure 5).



Figure 5. Male Gray Vireo incubating nest. Photograph by John DeLong.

Winter. Gray Vireos are territorial in their wintering habitat, but the incidence of territorial disputes decrease over the course of winter (Bates 1992a, Barlow et al. 1999).

2.1.7 Reproductive Biology

Male Gray Vireos arrive on the breeding grounds a few days before females and begin calling (see Section 2.1.6, Behavior, and Section 2.1.8, Movement). Pairs are formed within the first day



the female arrives and birds normally remain monogamous during the breeding season. In New Mexico breeding commences in late April, and may continue into July if nest failure has occurred (DeLong and Williams 2006, see Section 2.1.9, Predators and Brood Parasitism). Once a mate has been acquired, the male follows the female as she searches for a suitable nesting site, the male singing constantly, with copulation taking place as the nest nears completion (Barlow et al. 1999). Nests are often on west or north-facing trees (Barlow et al. 1999). Nesting trees in Colorado ranged from 1.8 – 4.8 m (5.9 – 15.6 ft) in height, with the nests ranging from 1.3 – 3.4 m (4.3 – 11.2 ft) above ground (Barlow et al. 1999). Nests often screened by other foliage. Tree species used for nesting include oneseed juniper (*J. monosperma*), Utah juniper (*J. utahensis*), alligator juniper (*J. deppeana*), piñon pine (*P. edulis*), mesquite (*Prosopis* spp.), and oak (*Quercus* spp.). In New Mexico nests are placed primarily in juniper trees (*Juniperus* spp.; DeLong and Williams 2006).

Nest typical of vireo family in that it is a cup hanging from forks in tree (See Figure 6). Construction of nest takes approximately five days, beginning with equal efforts by both parents before the female takes over the majority of construction (Barlow et al. 1999). Nests are constructed of woven grasses, bark, plant fiber, spider webs, and cocoons, and lined with fine grass, hair, and thistle down (Barlow et al. 1999, Bent 1950). Dimensions of nests measured in Colorado ranged from 45 – 70 mm (1.8 – 2.8 in) in height, 50 – 85 mm (2.0 – 3.4 in) outside diameter, 35 – 71 mm (1.4 – 2.8 in) inside diameter, and 28 – 48 mm (1.1 – 1.9 in) cup depth.



Figure 6. Gray Vireo nest in juniper (*Juniperus* spp.), Bernalillo County, New Mexico.

Gray Vireos lay an average of 3 eggs, generally one egg per day until the clutch is complete, with incubation beginning after the second egg is laid. For 38 nests in New Mexico, 2.8 eggs (± 1.1 SD) were produced (DeLong and Williams 2006). Eggs are smooth, oval in shape, rose-colored when freshly-laid and dull white when dry, with some spots present throughout. Size ranges from 16.7 – 19.7 mm (0.7 – 0.8 in), and mass ranges from 1.8 – 2.1 g (0.06 – 0.07 oz; Barlow et al. 1999). Both sexes will sit on eggs during the day, but only the female incubates at night (Barlow et al. 1999). Both sexes will sing occasionally while on the nest. The incubation patch on the female is gone by August in birds nesting in Colorado but still present at that time in Arizona and Texas (Barlow et al. 1999).

Incubation lasts 12 – 14 days. Nestlings are altricial (naked with eyes closed at hatching), with eyes beginning to open after five to six days (Barlow et al. 1999). Gape and feet are yellow in color. Both parents brood, with brooding diminishing somewhat after six days. Parents will stand on the rim of the nest and shade the nestlings, and will also remove shell fragments and other debris (Barlow et al. 1999). All fledglings tend to leave the nest on the same day, often flying to nearby low branches and to the ground. In New Mexico, of 44 nests examined, young fledged per territory ranged from 0.7 to 3.0 fledglings (DeLong and Williams 2006). In southeastern New



Mexico 6 of 19 (32%) nests fledged at least one vireo (Hawks Aloft 2006). Parents will continue to feed the young birds for five to ten more days, the young staying within 15.0 – 20.0 m (49.2 – 65.6 ft) of nest (Barlow et al. 1999). Subsequent dispersal by immatures is poorly studied. Gray Vireos will abandon nests. Of 87 nests examined in New Mexico, 38 were abandoned (DeLong and Williams 2006). In the case of nest failure, for such reasons as disease, desiccation, predation, or brood-parasitism, Gray Vireos will re-nest. Males will build practice (bachelor) nests (Barlow et al. 1999).

2.1.8 Movement

Basic flight of Gray Vireos is rapid and direct between shrubs, with the Gray Vireo more active than most vireos (NMDGF files). They will sally from perches like flycatchers and will also hover at leaves to pick off insects (Barlow et al. 1999). Flight undulating when approaching nest. Birds hop while foraging in shrubs for food or on the ground for nesting material (Barlow et al. 1999). The Gray Vireo is a short-distance migrant (See Figure 2). Populations in Utah south to Arizona migrate to southwestern Arizona and coastal Sonora, Mexico, while Californian populations move down to Baja California, Mexico (Barlow et al. 1999). Birds arrive in New Mexico in April, and leave by early September, with few reports of migration stopovers in the State (DeLong and Williams 2006). The wintering grounds of Gray Vireos that breed in New Mexico are unknown.

2.1.9 Predators and Brood Parasitism

Predation on Gray Vireos has not been observed, but Loggerhead Shrikes (*Lanius ludovicianus*) have been suggested as one potential predator (Barlow et al. 1999, Barlow and Flood 1990, Bates 1987). Species that may prey upon eggs or nestlings include snakes, Western Scrub-jays (*Aphelocoma californica*), Mexican Jays (*A. ultramarina*), Northern Mockingbirds (*Mimus polyglottos*), Scott's Oriole (*Icterus parisorum*), Hooded Orioles (*I. cucullatus*), rats (*Rattus* spp.), chipmunks, and Coyotes (*Canis latrans*; Barlow et al. 1999).

Brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) is a threat for Gray Vireo nests, and may well be a major limiting factor of the vireo in New Mexico (Barlow et al. 1999, DeLong and Williams 2006, Hanna 1944, Friedmann 1963)². Cowbirds will lay eggs in vireo nests, usually before the vireos have finished laying their own eggs, leaving the feeding and care of the hatchlings to the vireos. Both sexes of the Gray Vireo will chase off a cowbird, but if the nest is parasitized the parents will normally abandon the nest and try again elsewhere. In four studies in New Mexico cowbird brood-parasitism of Gray Vireos ranged from 24 – 71% of nests, of which three quarters of the nests were abandoned (DeLong and Williams 2006). In a recent study in southeastern New Mexico, 12 of 17 nests (71%) were parasitized by Brown-headed Cowbirds, with 1 cowbird fledged (Hawks Aloft 2006). Occasionally Gray Vireos will re-nest in the same structure of the parasitized nest (Ehrlich et al. 1988). Habitat quality and connectivity heavily influence the rates of both nest predation and brood parasitism, particularly the latter; cowbirds are often associated with disturbed landscapes and/or the presence of cattle (Tewksbury et al. 2006, Lowther 1993, NMDGF files).





Figure 7. Juniper (*Juniperus* spp.) used for nesting by Gray Vireo, Bernalillo County, New Mexico.

2.1.10 Threats

The primary threat to the Gray Vireo is habitat alteration, through such activities as juniper control, firewood collection, use of trees for energy production, and removal of trees to facilitate oil and gas production, as the species will not use areas lacking trees (Schlossberg 2006, see Sections 2.2.1, Habitat Trends, and 2.4.1, Economic Use of Habitat). A secondary threat is brood parasites, such as cowbirds (Genus *Molothrus*; see Section 2.1.9, Predators and Brood Parasitism). Lastly, juniper has been implicated in soil erosion in some parts of its distribution through exclusion of native grasses that help retain the soil (Davenport et al. 1998, Miller et al. 2000); although in the majority of the Gray Vireo's range in New Mexico juniper is the species of tree in which the bird nests, such soil erosion or desertification might negatively impact other aspects of the Gray Vireo's natural history, such as through loss of prey base.

2.1.11 Associated Species

Other bird species found in similar habitat that would benefit from habitat protection and improvement on behalf of the Gray Vireo include but are not restricted to: Black-chinned Hummingbird (*Archilochus alexandri*), Gray Flycatcher (*Empidonax wrightii*), Ash-throated Flycatcher (*Myiarchus cinerascens*), Juniper Titmouse (*Baeolophus ridgwayi*), Bushtit (*Psaltiparus minimus*), Bewick's Wren (*Thryomanes bewickii*), Blue-gray Gnatcatcher (*Polioptila caerulea*), Townsend's Solitaire (*Myadestes townsendi*), Black-chinned Sparrow (*Spizella atrogularis*), and Scott's Oriole (*Icterus parisorum*; Gillihan 2006, Latta 1999).

2.2 HISTORICAL PERSPECTIVE



2.2.1 Habitat Trends

The Gray Vireo is associated mostly with juniper, piñon-juniper, and, in southeastern New Mexico, oak, along foothills and bajadas (see Section 2.1.4, Required Habitats). Based upon old photographs, age-structure analyses, and observations, the distribution of piñon pine and particularly juniper have expanded across the southwest with potentially an increase in tree density as well (Barbour and Billings 1988, Springfield 1976, Tausch et al. 1981)³. Piñon-juniper was mostly absent from the Great Basin and southwestern United States up until 10,000 years before present (BP; Tausch 1999). Since 150 years BP, current theory holds that overly-intensive grazing removed native herbaceous vegetation that crowded out woody seedlings and thus fine fuels for fire ignition and transmission, allowing piñon-juniper to invade; further, reductions in fire frequency and intensity that tended to control the woodland may have led to piñon-juniper expanding from poor soil types or rocky areas where herbaceous vegetation was sparse, to upslope and into savannahs (Belsky 1996, Ellison 1960, Burkhardt and Tisdale 1976, but see Romme et al. 2003)⁴. Invasive juniper has also been implicated in soil erosion or desertification in certain areas (Davenport et al. 1998, Miller et al. 2000). However, piñon-juniper has been a long-standing component in many areas, perhaps including regions favored by the Gray Vireo, such as foothills and bajadas (Belsky 1996, Betancourt 1987, Davis 1987, West and Van Pelt 1987)⁵.

An associated trend for Gray Vireo habitat are efforts to remove or thin juniper, through chaining, fire, chipping, and other such activities (Belsky 1996, Monsen and Stevens 1999). In the southwest hundreds of thousands of acres of piñon-juniper were treated from the 1940's-1960's, mostly to improve forage for livestock, but such efforts were eventually all but abandoned due to expense (Belsky 1996). Interest in such treatments have rekindled in recent decades (Monsen and Stevens 1999). In some cases, removal of piñon-juniper has led to increases in quality forage (Belsky 1996, Monsen and Stevens 1999, Bedell 1987, Brown 1987)⁶. In other cases no improvement in forage was found; in certain instances, noxious weeds like cheatgrass (*Bromus tectorum* L.) invaded after treatment, including some treatments employing high-intensity fires (Evans 1988, Evans and Young 1985 and 1988, Bunting 1987).

Climate change could also potentially impact the habitat of the Gray Vireo. The trend for the average temperature in July in New Mexico, when the Gray Vireo is in the state, has been an increase of 0.83° C (1.5°F) per decade over the last twenty years (National Climatic Data Center, National Environmental Satellite, Data, and Information Service, <http://www.ncdc.noaa.gov/oa/ncdc.html>). This trend is expected to continue (Floyd 2006). Drier conditions from increased temperatures and evapotranspiration could reduce the distribution and health of piñon-juniper and increase its susceptibility to fire (Floyd 2006). Further, climate changes, such as increased drought, may exacerbate the threat of insect outbreaks, as was the case for piñon pine forests in northern New Mexico in recent decades (Allen and Breshears 1998, Ayres and Lombardero 2000).





Figure 8. Gray Vireo habitat, Santa Fe County, New Mexico. Photography by John DeLong.

2.2.2 Population Trends

Analysis of Breeding Bird Survey Data (BBS) suggests that during 1996-2005, the Gray Vireo increased in population numbers in Arizona, southern Utah, southern New Mexico, and west Texas (Sauer et al. 2005). In northern New Mexico declines in populations were detected. However, these trends must be viewed with extreme caution, as only 12 of over 80 BBS routes in New Mexico detect the species (DeLong and Williams 2006). Likewise, national BBS routes are considered too imprecise to draw proper trend inferences for the Gray Vireo (Rich et al. 2004). The species is known to have abandoned some historic sites for unknown reasons (DeLong and Williams 2006, see Section 2.1.3, Distribution).

2.2.3 Use and Demand Trends

At present there appears to be no use of or demand for the Gray Vireo, as there is no evidence that the species has been subject to either commercial or recreational collection. Given the scattered distribution of the bird, the unique opportunity to observe the Gray Vireo in its native habitat might be of interest to birders.

2.2.4 Past Management

The Gray Vireo was listed as endangered, group 2, by the NMDGF in 1983, and as a species of greatest conservation need under the Comprehensive Wildlife Conservation Strategy-New Mexico (NMDGF 1990, 2005). Surveys were not conducted specifically for the species in the 1980's, but agencies began to monitor for the vireo beginning in the 1990's (DeLong and Williams 2006). While not listed under the federal Endangered Species Act, the bird has been listed by Partners in Flight as a priority species in North America and by the U.S. Fish and Wildlife Service as a national species of conservation concern (Rich et al. 2004, USFWS 2002a). The Gray Vireo, like all wild birds in the United States except for game species, the House Sparrow (*Passer domesticus*), Eurasian Starling (*Sturnus vulgaris*), and Rock Pigeon (*Columba livia*), is protected



from take, killing, or possession under the 1918 Migratory Bird Treaty Act (<http://laws.fws.gov/lawsdigest/migtrea.html>).

2.3 HABITAT ASSESSMENT

The Gray Vireo is associated with juniper, piñon-juniper, and oak habitat along foothills and bajadas in New Mexico (see Sections 2.1.4, Required Habitats, and 2.2.1, Habitat Trends).

2.3.1 Status

The Gray Vireo breeds in 19 of the 33 counties of New Mexico, generally west of the Great Plains. These regions likely receive recreational use for such activities as hunting, hiking, and off-road vehicle driving. Other uses of the habitat include wood-collection, and control of piñon-juniper (see sections 2.1.3, Distribution, and 2.2.1, Habitat Trends).

2.4 ECONOMIC AND SOCIAL IMPACTS

2.4.1 Economic Use of Habitat

The chief economic use of the habitat favored by the Gray Vireo involves removal of piñon pine and juniper for range improvement for livestock and game animals, wood collection, and use of wood for energy production. Nuts from piñon are also collected for a variety of personal and economic uses in New Mexico. Control of juniper and to a lesser degree piñon pine, has been suggested to be economically sustainable if control takes place at the seeding stage (Ueckert 1997, Reinecke et al. 1997, but see Rowan and Conner 1994). Benefits from projects that mix wood waste with natural gas to produce energy, “biomass” projects, are purported to include creation and retention of local jobs in a rural economy, reduction of waste, reduced use of landfills, reduction of dependence on fossil fuels, and protection of wildlife through reduced wildfires (NM Energy, Minerals, and Natural Resources Department, <http://www.emnrd.state.nm.us/ECMD/IndustryBiomass/index.html>). In some areas favored by the Gray Vireo, oil and gas industries are important to local economies, such as up in San Juan County, where in 2005 over 636 million Mcfs of natural gas and over 35 million Bbls of oil were produced alone (NM Energy, Minerals, and Natural Resources Department, <http://www.emnrd.state.nm.us/ocd/Statistics.htm>).

Given the high degree of bird diversity found in such habitats as piñon-juniper woodlands (Buckman and Wolters 1987, Gashwiler 1977, See Section 2.1.11, Associated Species) the habitat favored by the Gray Vireo would also have use for the birding industry, estimated to have generated over 32 billion dollars of revenue in 2001 (USFWS 2002b).

2.4.2 Sociological Factors

Piñon pine and to a lesser extent juniper are used for firewood and, in the case of the former, harvesting of nuts. Biomass projects are given to create local jobs, and improved rangeland habitat benefits both local livestock ranchers and sportsmen favoring such species as Bighorn Sheep (*Ovis Canadensis*), Elk (*Cervus canadensis*), Mule Deer (*Odocoileus hemionus*), Pronghorn Antelope (*Antilocapra americana*), and quail species. A chief social misgiving would be for private property to be negatively impacted by the discovery of the Gray Vireo on that land. However, the New Mexico Wildlife Conservation Act has no provision for restricting private property use to protect any species. What is more, through a cooperative process such as this Recovery Plan, private landowners and the State can work to further the survival of any vireos



found on the landowner's property in a positive fashion for both the Gray Vireo and the landowner.

3.0 Management Strategy

3.1 MANAGEMENT GOAL AND OBJECTIVE

Goal: Ensure the long-term persistence of the Gray Vireo within New Mexico, thereby contributing to the maintenance of the biological diversity in the State.

Objective: That by 2022, the populations and distribution of the Gray Vireo are sufficient to ensure its persistence within New Mexico.

Objective Parameters:

All existing populations and potential habitat have been identified.

Biological and ecological needs of the Gray Vireo identified.

Threats are identified and managed such that any significant and imminent threat to its habitat, health, and environmental conditions are minimized.

Viable populations of the Gray Vireo maintained within each management unit in New Mexico.

3.2 MANAGEMENT ISSUES AND STRATEGIES

3.2.1 Issue 1-Need for Information on Biology and Natural History of the Gray Vireo

Much of the biology and natural history of the Gray Vireo is not well understood. It is important to gather such information to improve the success of recovery efforts.

Strategy 1. Support research into the biology and natural history of the Gray Vireo, to determine the population dynamics necessary to sustain the species in New Mexico, to include the following:

- Population viability
- Reproductive biology, including nest success
- Fitness
- Site fidelity
- Habitat structure
- Cowbird parasitism
- Territory components
- Predation
- Diet
- Migration

Strategy 2. Using historic information and current knowledge of distribution, develop population trend analyses, including potential threats to the species and causes of any declines in populations.

3.2.2 Issue 2- Need for information on Habitat Requirements of the Gray Vireo

The habitat requirements of the Gray Vireo are largely unknown, beyond a preference for juniper or oak trees around foothills and canyons between 1,311 – 2,195 m (4,300 – 7,200 ft).



Such information is vital for successful management of the species in light of other projects calling for habitat alteration.

Strategy 1. Describe habitat and its use by Gray Vireo prior to and after habitat treatment.

Strategy 2. Encourage and support research into relationship of dynamics of important vegetation communities and the Gray Vireo.

Strategy 3. Encourage and support research into relationship of land use and management activities and the vegetation communities important to the Gray Vireo.

Strategy 4. Encourage and support research into habitat modeling for potential habitat, to include field-verification.

Strategy 5. Encourage and support research into relationship of climate and the Gray Vireo.

Strategy 6. Assess potential Gray Vireo wintering habitat in New Mexico, particularly in the southeastern portions of the state.

3.2.3 Issue 3- Knowledge of the Status and Situation of Gray Vireo Varies Across State

The Gray Vireo is found throughout the State of New Mexico west of the Great Plains, but knowledge of its status and distribution varies across its range. The potential threats the species faces may vary across the state, and the species appears to use differing habitats across the state (particularly in the southeastern part). As such management requirements also vary across the state.

Strategy 1. Conduct surveys for the Gray Vireo to determine status, within management units and across the state.

Strategy 2. Develop guidelines for data collection (including GIS formats) for surveying, monitoring, studying, data management, trend analysis, and reporting of the status and situation of the Gray Vireo, within management units and across state.

Strategy 3. Support and contribute to a central data repository to share information on current knowledge of the Gray Vireo, including strategies for communicating information and updating guidelines on status and situation of the Gray Vireo.

Strategy 4. Support research into potential threats to the species and causes of any declines in populations, within management units and across the state.

3.2.4 Issue 4-Management issues

The Gray Vireo can be found on Federal, State, Tribal, and private lands. Coordination of efforts will allow such entities to pursue their own goals while maintaining efforts to recover the Gray Vireo.

Strategy 1. Create a statewide and/or localized recovery-working group of stakeholders and managers to coordinate efforts, develop partnerships, guide the direction of conservation efforts, guide in sharing information and data, and develop agreements as necessary among interested parties.

Strategy 2. Identify and secure funding to promote the goals of this recovery plan.



Strategy 3. Develop initial guidelines for land managers and landowners to refer to for improving Gray Vireo habitat, to be refined as more knowledge on the species becomes available.

Strategy 4. Refine management unit boundaries across the state, based upon the biology of the species.

Strategy 5. Develop long-term strategy for monitoring populations, taking into consideration original habitat conditions and landscape-scale recommendations such as the Comprehensive Wildlife Conservation Strategy-New Mexico, for the Gray Vireo in the State.

Strategy 6. Coordinate management of Gray Vireo with other wildlife management activities.

Strategy 7. Prioritize areas to survey for new populations, within management units and statewide.

Strategy 8. Encourage surveys for the Gray Vireo before and monitoring after habitat treatments.

Strategy 9. Develop strategies for responding to population trends from ongoing monitoring efforts.

Strategy 10. Develop public information and outreach program to inform the public about the Gray Vireo, up to and including publication of scientific data gathered during the management of the species and regional symposia over current research and management.



4.0 Implementation Schedule

Section 4.0 contains the Implementation Schedule for the Recovery Plan. Section 4.1 identifies specific tasks to be carried out to meet the strategies identified in Section 3.2 (Management Issues and Strategies). Section 4.2 presents a suggested time-line for the Implementation Schedule. Anticipated costs, including staffing, for these tasks will be addressed in an Operational Plan, to be developed following final approval of the Recovery Plan by the New Mexico State Game Commission

4.1 IMPLEMENTATION SCHEDULE TASKS

4.1.1 Support research into the biology and natural history of the Gray Vireo

1. Support research into the natural history of the Gray Vireo
2. Identify parties interested in conducting research on the biology of the Gray Vireo
3. Identify priorities for research on the biology of the Gray Vireo
4. Develop guidelines for population trend analyses
5. Identify parties interested research into the vegetation communities important to the Gray Vireo
6. Develop agreements for sharing data and information to facilitate trend analyses
7. Identify parties interested in population trend analyses of the Gray Vireo

4.1.2 Improve and maintain knowledge of status of the Gray Vireo

1. Develop survey guidelines
2. Develop relationships and any necessary agreements with stakeholders to allow surveys of potential habitats
3. Develop guidelines for monitoring populations of the Gray Vireo
4. Develop strategies for responding to trends found in monitoring populations
5. Develop guidelines for data management
6. Develop agreements for data sharing concerning surveys of the Gray Vireo

4.1.3 Improve and maintain knowledge of potential threats to the Gray Vireo

1. Support research into potential threats to populations of the Gray Vireo
2. Identify parties interested in research on potential threats to the Gray Vireo
3. Support research into the impact of climatic change at various scales on populations of the Gray Vireo

4.1.3 Develop and maintain high levels of cooperation and coordination between stakeholders and interested parties.

1. Formulate a Gray Vireo Recovery Team
2. Formulate Working Groups within Management Units as necessary
3. Identify measures of success for the Recovery Plan
4. Identify all stakeholders and interested parties
5. Identify any agreements necessary to aid in the recovery of the Gray Vireo
6. Develop guidelines to aid stakeholders in managing populations of the Gray Vireo
7. Identify interested parties in working to improve management unit boundaries as more information on the Gray Vireo becomes available
8. Identify potential funding sources
9. Acquire funding for the Recovery plan



4.2 IMPLEMENTATION SCHEDULE TIME-LINE

Time Frame	Population Surveys	Coordination	Research
1 st Half 2007	Survey known areas, determine new areas to survey	Commission approval; Formation of Recovery Team and Management Unit Working Groups	
2 nd Half 2007	Survey known and new areas; collect natural historical information	Develop guidelines, strategies, agreements, and information sharing; Develop operation plans and measures of success	Prioritize needs; identify interested parties
1 st Half 2008	Survey known and new areas; collect natural historical information		Identify funding sources
2 nd Half 2008	Survey known and new areas; collect natural historical information	Update Guidelines; Annual Report	Population trend analyses, management unit boundary delineation, others
1 st Half 2009	Survey known and new areas; collect natural historical information		Prioritized research where possible
2 nd Half 2009	Survey known and new areas; collect natural historical information	Update Guidelines; Annual Report	Update trends and management unit boundaries
1 st Half 2010	Survey for status		Prioritized research
2 nd Half 2010	Survey for status	Update Guidelines; Annual Report	Update trends and management unit boundaries
1 st Half 2011	Survey for status		Prioritized research
2 nd Half 2011	Survey for status	Update Guidelines; Annual Report	Update trends and management unit boundaries



5.0 Additional Citations

1-Webb 1999

2- Wauer 1996

3-Tausch 1999, West 1999, Belsky 1996

4-Neilson 1986 and 1987, Evans 1988, Miller and Wigand 1984, Dick-Peddie 1993, Young and Evans 1981

5-Miller and Wigand 1984

6-Clary 1987



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7.0 Approvals

This Recovery Plan is approved by:

 _____ Lisa Kirkpatrick, Conservation Services Division Chief New Mexico Department of Game and Fish	<u>5/4/07</u> Date
 _____ Bruce C. Thompson, Ph.D., Director and Secretary to the Commission New Mexico Department of Game and Fish	<u>5/4/07</u> Date
 _____ Alfredo Mollayo, Chairman New Mexico Department of Game and Fish	<u>5/10/07</u> Date



8.0 Appendices

8.1 LISTING OF MEMBERS OF ADVISORY COMMITTEE AND OTHER INTERESTED PARTIES

Active participants on the Gray Vireo Recovery Plan Advisory Committee in Bold

Audubon Society-**Deanna Einsphar, Mary Ristow, Sheila Gershen, Lois Herrmann**
Carlsbad Caverns National Park-**Renee West**
Ecosphere Environmental-**John Wickersham, Lynn Wickersham**
Forest Guardians-Sam Hitt
Kirtland Air Force Base-**Carol Finley**
Los Alamos National Laboratories-**Charles Hathcock**
N. M. Dept. of Game and Fish-**Dale Hall**
Natural Heritage New Mexico-**Kris Johnson, Ph.D**
Nature Conservancy (White Sands Missile Range)-**Carl Lundblad**
Nel-Con-**Jake Tanner**
New Mexico State University-**Martha Desmond, Ph.D**
Private-**David Griffin, Steve West**
SWCA Environmental Consulting-Matt McMillan
U. S. Bureau of Land Management-**Vicki Herren** (Santa Fe), **John Kendall, Jim Ramakka** (Farmington)
U.S. Forest Service-**Bill Falvey** (Carson District)

8.2 HISTORY OF PUBLIC PARTICIPATION

28 August 2006, Bosque del Apache National Wildlife Refuge, near San Antonio, NM: Public meeting to announce the initiation of a Recovery Plan for the Gray Vireo (*Vireo vicinior*). 6 attendees + 2 NMDGF employees.

5 September 2006, Santa Fe, NM: Public meeting to announce the initiation of a Recovery Plan for the Gray Vireo (*Vireo vicinior*). 7 attendees + 7 NMDGF employees.

7 September 2006, Carlsbad, NM: Public meeting to announce the initiation of a Recovery Plan for the Gray Vireo (*Vireo vicinior*), held in conjunction with announcement of the initiation of a Recovery Plan for the Texas Hornshell (*Popenaias popeii*). 3 attendees + 2 NMDGF employees.

11 September 2006, Farmington, NM: Public meeting to announce the initiation of a Recovery Plan for the Gray Vireo (*Vireo vicinior*). 7 attendees + 3 NMDGF employees.

13 February 2007, Farmington, NM: Meeting of members of northwest Management Unit Advisory Committee to develop management section of Recovery Plan for the Gray Vireo. 6 attendees + 1 NMDGF employee.





Figure 9. Members of northwest Management Unit Advisory Committee, left to right: Jake Tanner (Nel-Con), Jim Ramakka (BLM-Farmington), Vicki Herren (BLM-Santa Fe), John Kendall (BLM-Farmington), John Wickersham (Ecosphere Environmental), Lynn Wickersham (Ecosphere Environmental).

27 February 2007, Carlsbad, NM: Meeting of members of southeast Management Unit Advisory Committee to develop management section of Recovery Plan for the Gray Vireo. 1 attendee + 1 NMDGF employee.



Figure 10. Member of southeast Management Unit Advisory Committee: Renee West (Carlsbad Caverns National Park).

28 February 2007, Las Cruces, NM: Meeting of members of southwest Management Unit Advisory Committee to develop management section of Recovery Plan for the Gray Vireo. 3 attendees + 1 NMDGF employee.





Figure 11. Members of southwest Management Unit Advisory Committee, left to right: Martha Desmond (NMSU), Carl Lundblad (TNC-WSMR), David Griffin (Private)

2 March 2007, Albuquerque, NM: Meeting of members of central Management Unit Advisory Committee to develop management section of Recovery Plan for the Gray Vireo. 5 attendees + 2 NMDGF employees.



Figure 12. Members of central Management Unit Advisory Committee, left to right: Deanna Einspahr (Audubon), Chuck Hathcock (LANL), Mary Ristow (Audubon), Kris Johnson (NHNM), Dale Hall (NMDGF), Carol Finley (Kirtland AFB).

