

Habitat Preference and Status of Gray Vireos on Kirtland Air Force Base in Albuquerque, New Mexico

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INTRODUCTION

The Gray Vireo (*Vireo vicinior*) is listed as threatened by the State of New Mexico (NMDGF 2008). Reasons for its possible decline in parts of New Mexico are not well understood. It is absent from some historical locations (e.g., Montoya and Hachita-Big Hatchet mountains), but recent surveys have found this species in “new” areas, including the foothills east of Albuquerque, Bernalillo County, New Mexico (BISON-M 2008).

The Gray Vireo is an inhabitant of dry woodlands, usually in association with steep, rocky, or rolling terrain. It seems to avoid the denser and higher elevations of the piñon (*Pinus* spp.)-juniper (*Juniperus* spp.) woodland community, which is often occupied by the Plumbeous Vireo (*V. plumbeus*) (Andrews and Righter 1992).

On Kirtland Air Force Base (AFB) in Bernalillo County, New Mexico, Gray Vireos are found in rolling terrain, valleys, and at the base of steeper slopes. Open juniper woodlands are preferred, consisting of oneseed juniper (*J. monosperma*), apache plume (*Fallugia paradoxa*), tree cholla (*Opuntia imbricata*), prickly pear cactus (*Opuntia phaeacantha*), grama grasses (*Bouteloua* spp.), and an occasional piñon (Kirtland AFB 2005).

In 2003, a Kirtland AFB-wide survey for the Gray Vireo revealed 53 territories. These surveys provided Kirtland AFB with baseline data, but did not address habitat characteristics/needs, nest predation, nest abandonment, nestling mortality, nest parasitism, or nesting success determined by number of fledged young. In 2005, a subset of the population was chosen for a comprehensive monitoring program to address these data needs.

Prior to the present study, long-term monitoring of Gray Vireos on base had not been conducted. Therefore, impacts to this species from military operations, construction, land management, nest parasitism from Brown-headed Cowbirds (*Molothrus ater*), and other factors were largely

unknown. In 2007, Kirtland AFB developed a Gray Vireo Management Plan that addresses the ecological needs of the Gray Vireo on the base.

METHODS

STUDY AREA

Kirtland AFB is located just southeast of Albuquerque at the foot of the Manzanita Mountains, with elevations ranging from 5200 to nearly 8000 ft above mean sea level. Land use adjacent to the base includes Cibola National Forest to the northeast and east, the Pueblo of Isleta Indian Reservation to the south, and residential and business areas of the City of Albuquerque to the west and north.

Because of limited resources, only the juniper woodland habitat, located along the boundary of the base along Coyote Springs Road, was surveyed. Only those lands owned by Kirtland AFB were included in the study. This sub-set represents 25–33% of the Gray Vireo population on base.

BIRD SURVEYS

The methods employed during this study came from the *Work Plan for Surveying Mountain Plover and Gray Vireo Populations at Kirtland Air Force Base* (Kirtland AFB 2002):

- The general survey window for the Gray Vireo at Kirtland AFB occurs between the last week in April and 15 July. Actual survey dates started as early as 12 May and extended until 14 July from 2005 through 2007 depending on field conditions.
- Surveys were conducted one-half hour before sunrise and ended at 1100 MDT.
- Field biologists walked transects through all appropriate habitat searching for Gray Vireos.
- Transects were approximately 200 m apart, although the original methods suggested 100 m between transects. This distance was changed because Gray Vireo territories are larger than

previously believed. The greater distance between transects helped prevent repeated counting of Gray Vireos. Transect length varied depending on availability of suitable habitat.

- A recorded Gray Vireo song was played using a portable CD player to call in Gray Vireos in the immediate area. Birds lured to the call were typically observed at close range (i.e., 3–10 m).

- Recorded songs were played every 200–250 m along transects.

- Recorded songs were generally played over a five min period with a one min break in the middle.

- Areas that were initially surveyed during bad weather conditions (i.e., rain or strong winds) were resurveyed when conditions were more favorable.

- Binoculars were used to identify Gray Vireos.

- Gray Vireos called in were allowed to return to their previous location before a location was mapped.

- When Gray Vireos were spotted, their location was mapped. Other related data, such as behavior and habitat, were also recorded.

Once territories were identified, biologists returned to each territory during the breeding season to look for nests. Gray Vireo nesting sites were found by following the birds, usually the males, to the nest tree. Singing males were followed until they entered a tree and stopped singing. The tree was intensively searched until the nest was located.

Once the nest was found, its location was recorded using a Global Positioning System (GPS) unit and, if possible, nest contents were viewed and recorded on datasheets. Because most nests were above eye level, viewing the nest contents usually required using a telescoping mirror. The mirror was

positioned above the nest allowing biologists to view the interior of the nest by looking at the reflected image. Investigating the nest in this manner was done when both the male and female Gray Vireo were off the nest. Initial information gathered included: numbers of eggs or young in the nest, height of the nest above ground level, and height and width of the tree. A photograph of each nest tree was taken. Nests were revisited to determine if a nest failed or was successful. Nests were observed at least twice a week until the young approached the fledgling stage, at which time nests were checked daily. During each visit, general notes were taken on brood parasitism by Brown-headed Cowbirds and occurrences of potential predation.

The heights of Gray Vireo nests, along with the height and width of nest trees, were measured from 2005–2007. Nest and tree height were measured with clinometers. A total of 27 trees, 16 from 2005 and 11 from 2007, were used in determining nest tree selection by Gray Vireos on Kirtland AFB. Nest tree data from 2006 were not used due to inconsistencies in data collection.

RESULTS AND DISCUSSION

The number of nesting pairs of Gray Vireos within the study area varied from year to year (Table 1). A high of 14 breeding territories was recorded in 2005 and a low of 8 were observed in 2006. Breeding territories were identified by the presence of a constructed or partially constructed nest. Occasionally, a single pair would construct two nests within a breeding season. This occurred twice in 2005.

Nesting success was defined by at least one fledged young per nest. Nesting success ranged from 15–66% over the three-year period (Table 1). Reasons for failed nesting attempts include brood parasitism by Brown-headed Cowbirds, predation,

TABLE 1. Summary of Gray Vireo (*Vireo vicinior*) nest monitoring results on Kirtland Air Force Base, New Mexico from 2005–2007.

| Monitoring year | Number of nests | Number of territories with nests | Number of nests used ^a | Number of nests parasitized by cowbirds | Number of failed nesting attempts ^b | Number of nests fledging young |
|-----------------|-----------------|----------------------------------|-----------------------------------|---|--|--------------------------------|
| 2005 | 16 | 14 | 13 | 8 (62%) | 8–11 (62–85%) | 2–5 (15–38%) |
| 2006 | 8 | 8 | 6 | 1 (17%) | 2–3 (33–50%) | 3–4 (50–66%) |
| 2007 | 11 | 11 | 10 | 2 (20%) | 5 (50%) | 5 (50%) |
| Average | 11.7 | 11.0 | 9.6 | 3.6 (38%) | N/A | N/A |

^a Defined as nests that contained Gray Vireo eggs or Gray Vireo young

^b Includes all causes of nest failure, such as parasitism by Brown-headed Cowbirds (*Molothrus ater*), suspected predation, weather, and unknown

and weather events (e.g., strong winds destroying nests). Brood parasitism accounted for 17–62% of failed nesting attempts. Most nests that were brood parasitized were abandoned. However, in 2005, one pair of Gray Vireos raised a cowbird chick to the fledgling stage, but failed to hatch any of its own eggs. Similar to nest parasitism, predation was a major factor that affected nest success; these two factors combined reduced the Gray Vireos nesting success typically to less than 50%. Although predation on nests was never directly observed, it was assumed to have occurred when young or eggs disappeared from the nest between observations for no other apparent reason (i.e., nestlings were too young to have fledged). Potential predators included jays (such as Western Scrub-Jay [*Aphelocoma californica*] and Steller’s Jay [*Cyanocitta stelleri*]), Scott’s Oriole (*Icterus parisorum*), coyote (*Canis latrans*), rock squirrel (*Spermophilus variegates*), chipmunks (*Neotamias* spp.), bullsnake (*Pituophis melanoleucus*), and other avian and mammalian predators. Although to a lesser extent than nest parasitism and predation, weather events also reduced nesting success. In 2005, a nest was destroyed from high winds from a strong thunderstorm.

Breeding activity varied widely across years. During the first year of the study, a total of 14 breeding territories was identified. The number of breeding territories dropped to 8 in the following year and then rebounded to 11 breeding territories in 2007. Two factors likely contributed to these swings in breeding activity. The first was weather. Years 2005 and 2007 were fairly typical weather years. However, in 2006, the spring and early summer were incredibly dry and might have influenced the breeding biology of the local Gray Vireo population. The dry period extended through the nest building portion of the season, but it was quickly followed by one of the wettest summers on record for the Albuquerque area. This shift in

precipitation likely attributed to the decrease in the number of nesting attempts. Secondly, field personnel in 2006 differed from those in 2005 and 2007. Thus, there might have been some bias based on the biologists’ ability to locate active nests.

Reasons for the apparent decrease in cowbird nest parasitism from 2005 to 2007 are unknown. Two possible explanations might include that the Gray Vireo learned how to better avoid or conceal their nests from cowbirds based on previous experiences with past nest parasitism episodes, or there might have been factors that suppressed the cowbird population during the last two years of the study.

Currently, the sample size for nest tree characteristics is too small to analyze rigorously. Excluding data collected in 2006 due to inconsistent data collection, mean nest tree height and width both appeared similar among years (Table 2). Mean nest tree height was 10'7" and 10'6" in 2005 and 2007, respectively. Mean nest tree width was 15'2" and 15'1" in 2005 and 2007, respectively. Mean nest height varied among years, ranging from 6'10"–8'2" (Table 2). Over the three years of the study, mean nest height was lower in 2007 (6'10") than in both 2005 (8'2") and 2006 (7'6"). As more vegetation data are added in future years, we will focus not only on identifying habitat characteristics important to nest selection, but also on those that might influence nest success.

In 2007, Kirtland AFB completed a Gray Vireo Management Plan that identified goals and objectives for managing the species on base. Some of these goals and objectives include identifying and defining habitats preferred by the Gray Vireo, leg-banding adults and juveniles to determine site fidelity and survivorship, and identifying areas on base that could be modified or restored to provide additional Gray Vireo habitat. Additionally, one of the goals of the plan is to make available gathered information to individuals and agencies interested in

TABLE 2. Gray Vireo (*Vireo vicinior*) nest tree characteristics on Kirtland Air Force Base, New Mexico from 2005–2007.

| Monitoring year | Number of nests | Mean nest tree height | Mean nest tree width | Mean nest height in tree |
|-------------------|-----------------|-----------------------|----------------------|--------------------------|
| 2005 | 16 | 10'7" | 15'2" | 8'2" |
| 2006 ^a | 7 | – | – | 7'3" |
| 2007 | 11 | 10'5" | 15'0" | 6'10" |
| Average | NA | 10'6" | 15'1" | 7'6" |

^a Nest height was recorded for only 7 of the 8 nests constructed in 2006

Gray Vireo conservation.

In 2008, a study was completed that used nest tree data from Kirtland AFB (Table 2) and aerial photographs of Gray Vireo territories to define habitat based on tree density and nest tree characteristics. The results of the study showed that Gray Vireos most commonly used oneseed juniper savannas that had tree densities ranging from 31–90

trees per hectare (56 trees/hectare average) that provided an estimated canopy cover of 5–15% (average 8.5%) (Frei 2008). Juniper stands used were estimated to be 60–180 years old, with average nest tree approximated at 120 years of age. Management decisions were then outlined for Kirtland AFB based on this new information.