

Habitat Use at Multiple Scales by Nesting Gray Vireos in New Mexico

Lynn E. Wickersham

Animas Biological Studies, Durango, Colorado

Kristine Johnson

University of New Mexico, Natural Heritage New Mexico, Biology Department, Albuquerque, New Mexico

Giancarlo Sadoti

Department of Geography, University of Nevada, Reno, Nevada

Teri Neville

University of New Mexico, Natural Heritage New Mexico, Biology Department, Albuquerque, New Mexico

John Wickersham

Animas Biological Studies, Durango, Colorado

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Piñon-juniper (*Pinus edulis*–*Juniperus* spp.) woodlands cover approximately 40 million hectares of the western United States (Romme et al. 2009) and provide habitat for a diverse suite of avian species. Several U.S. Fish and Wildlife Service (FWS) Birds of Conservation Concern (BCC) depend on piñon-juniper habitats for breeding, including the Gray Vireo (*Vireo vicinior*). Gray Vireos breed within a limited range only in the hot, arid southwestern USA (Barlow et al. 1999). In New Mexico, they occupy the piñon-juniper habitats of foothills, canyons, mesas, and rolling hills. Their populations are disjunct, however, with most occupied sites containing few, often less than 10, territories (DeLong and Williams 2006). The New Mexico Department of Game and Fish (NMDGF) currently lists the Gray Vireo as a threatened species (NMDGF 2016).

We evaluated habitat use by Gray Vireos at landscape, territory, and nest scales on U.S. Department of Defense (DOD) and Bureau of Land Management (BLM) lands in New Mexico. We collected data

between 2009 and 2012 on three DOD sites: White Sands Missile Range (WSMR; Sierra County), Kirtland Air Force Base (KAFB; Bernalillo County), and Camel Tracks Training Area (CTTA; training grounds on BLM land in Santa Fe County). We expanded the study to BLM lands in the Farmington Field Office from 2013 to 2016, including Crow Mesa (Sandoval County), Pump Canyon and Pump Mesa (San Juan County), and several canyons and rolling hills north and west of the City of Aztec (San Juan County). To date, we have completed landscape- and territory-scale analyses only at DOD sites and nest-scale analyses at both DOD and BLM sites.

At the landscape scale, the vast majority (≥ 75 percent) of Gray Vireo detections and nests at DOD sites occurred in juniper-dominated woodlands or savanna habitat types containing less than 25 percent piñon trees. At KAFB and WSMR, 10 percent or fewer detections/nests also occurred in piñon-juniper woodlands (25–50 percent piñons). Additionally at WSMR, 10 percent or fewer detections/nests occurred

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in shrubland and ≤ 4 percent in arroyo riparian habitat types dominated by shrub species such as wavyleaf oak (*Quercus x pauciloba*), mountain mahogany (*Cercocarpus montanus*), acacia (*Acacia* spp.), catclaw mimosa (*Mimosa aculeaticarpa* var. *biuncifera*), featherplume (*Dalea Formosa*), common sotol (*Dasyllirion wheeleri*), Apache plume (*Fallugia paradoxa*), resinbush (*Viguiera stenoloba*), and desert willow (*Chilopsis linearis*; see Johnson et al. 2014).

Mean territory size at DOD sites was 0.9 ha at WSMR ($n=44$), 2.8 ha at CTTA ($n=24$), and 3.1 ha at KAFB ($n=49$); overall mean territory size was 2.3 ha. Important predictor variables for the territory-scale analysis included slope, aspect, elevation, curvature, solar radiation, and greenness; however, the importance and/or relationship of these predictors varied across sites. At CTTA, territories occurred on terrain with more north-facing aspects, higher elevations, intermediate slopes, and lower overall solar radiation compared with non-territories. At KAFB, territories occurred at more intermediate aspects (e.g., east- or west-facing), lower elevations, and in areas with more intermediate evergreen greenness than non-territories. Finally, at WSMR, territories were situated in areas with more southerly aspects, negative (bowl-shaped) curvature, intermediate elevations, lower slopes, and lower solar radiation than non-territories. Differences in the relationship of some territory predictor variables occupancy—specifically slope, aspect, and elevation—probably reflect inherent differences in topography and elevation across the three study sites rather than specific preferences by vireos (see Johnson et al. 2014).

We found 89 Gray Vireo nests across DOD sites, all in juniper trees. Of 65 nests at BLM sites, 82 percent were in junipers, 15 percent in piñon trees, and 3 percent in big sagebrush (*Artemisia tridentata*). All but one of the piñon tree nests were from a single site, Crow Mesa, where the majority (75 percent) of vireo nests were in piñon trees. At that site, the ratio of piñon to juniper trees in the area immediate surrounding vireo nests was considerably higher (0.7) compared with the other BLM and DOD sites (≤ 0.2).

Nest-scale habitat use models at both DOD and BLM sites indicated that Gray Vireos selected nest sites in areas with more and taller trees relative to random points within their territories; however, actual tree density

and height varied across sites. Mean tree density on BLM sites was almost three times greater (316.1 trees/ha) than on DOD sites (113.0 trees/ha). Conversely, mean tree height surrounding nests on DOD lands averaged higher (3.3–4.0 m across sites) than BLM lands (2.5–3.4 m). At DOD sites, Gray Vireos also selected nest locations with more south-facing aspects and negative (bowl-shaped) curvature compared with randomly-selected locations within their territories. Our aspect data contradict an earlier study by DeLong and Cox (2005) in Socorro and Santa Fe, NM, who reported that Gray Vireos tend to nest on west-facing aspects. At BLM sites, vireos also exhibited a weak preference for nest trees with smaller, on average, tree foliage width than random trees within their territories.

Our data indicate that Gray Vireos mainly occupy juniper-dominated woodlands and savannas but can be flexible in choosing nest substrates. Likely, preferences for territory characteristics differ across landscapes based on varying topographic features and variation in woodland species composition. While vireos may occupy woodlands of varying density, height, and composition, they prefer nesting around taller and denser trees within their territories. Thus, piñon-juniper management activities should strive to retain older, more mature stands with similar tree densities as documented in our study.

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REFERENCES

- Barlow, J.C., S.N. Leckie, and C.T. Baril. 1999. Gray Vireo (*Vireo vicinior*), The Birds of North America Online (A. Poole, Ed.). Ithaca, NY: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online. doi:10.2173/bna.447. <http://bna.birds.cornell.edu/bna/species/447>
- Delong, J.P.; Cox, N.S. 2005. Nesting ecology of gray vireos in central New Mexico: 2005 results. Unpublished report prepared for the Bureau of Land Management and the New Mexico Department of Game and Fish by SORA and Eagle Environmental, Inc. 15 pp.
- Delong, J.P., and S.O. Williams. 2006. Status report and biological review of the Gray Vireo in New Mexico. Unpublished report prepared for the New Mexico Department of Game and Fish, Santa Fe, NM.
- Johnson, K.; Wickersham, L.; Smith, J; [et al.]. 2014. Habitat use at multiple scales by pinyon-juniper birds on Department of Defense lands III: Landscape, territory/colony, and nest scale. Natural Heritage New Mexico Publication 14-GTR-381. Albuquerque, NM: Natural Heritage New Mexico, University of New Mexico. 128 pp.
- New Mexico Department of Game and Fish (NMDGF). 2016. Threatened and endangered species of New Mexico, 2014 biennial review. Santa Fe, NM: Wildlife Management and Fisheries Management Divisions.
- Romme, W.H.; Allen, C.D.; Bailey, J.D.; [et al.]. 2009. Historical and modern disturbance regimes, stand structures, and landscape dynamics in piñon-juniper vegetation of the western United States. Rangeland Ecology and Management 62:203–222.