



Southern Colorado Plateau

INVENTORY & MONITORING NETWORK

Publication Brief - Birds

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Title: Pinyon-juniper specialist birds are resilient to local-scale reduction of canopy cover and pinyon pines, but amount of understory shrub cover determines the composition of the insectivore guild

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Black-headed Grosbeak
(Eleanor Briccetti/
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Vital Signs Monitoring Overview: Landbirds are a widespread and diverse group typically at or near the top of the food chain with relatively well understood ecology and population biology. They select habitat based on a combination of biotic and abiotic elements and serve as good indicators of ecosystem health and environmental change.

Key Findings

- Pinyon-juniper (PJ) specialist birds are relatively resilient to changes in canopy cover and height at the microhabitat (40-meter-radius) scale, perhaps due to the natural variability in the PJ ecosystem.
- Nine species showed very low or near-zero densities at Bandelier after a largescale (> 95%) die-off of pinyon pine, suggesting sensitivity at the landscape scale.
- Most species showed little preference for pinyon pines over junipers or vice versa, though cavity nesting birds were associated with greater pinyon pine basal area. Birds may select for both pinyons to forage in and junipers to nest in.
- Shrub foliage cover was an important structural habitat component, with the presence of 25-50% cover increasing densities of some foliage gleaning species by 150-200% compared to sites lacking shrubs. Aerial foragers and bark foragers were negatively associated with shrub foliage cover.
- The PJ bird community segregated along gradients of early-to-late woodland succession and vegetation complexity, with most species showing associations with simplified vertical vegetation structure.

Summary: [Pinyon-juniper \(PJ\) woodlands](#) are home to a number of habitat-specialist birds, and both the structure and plant species composition of this ecosystem are changing rapidly in the Southwest. The current megadrought has lead to outbreaks of bark beetles which can cause large-scale die-off of pinyon pines, leading to juniper-dominated woodlands. In other locations, PJ woodlands have experienced infill by young trees over the past several decades, and land managers are increasingly considering thinning treatments to reduce fuel loads and high-severity wildfire risk. Both thinning and drought change structural elements of the habitat by reducing canopy cover and increasing understory shrub cover. However, the extent to which bird species show associations with changing plant species composition and structural features is unknown.

In this study, the [Southern Colorado Plateau Network](#) (SCPN), in collaboration with partners at [The Institute for Bird Populations](#), analyzed local habitat associations for 25 species of birds regularly breeding in PJ. The study included monitoring data of both breeding-season bird densities and ten microhabitat variables collected at [Bandelier National Monument](#) (BAND), [Grand Canyon National Park](#) (GRCA), and [Mesa Verde National Park](#) (MEVE). These habitat-specific data spanned an eleven-year period (2008-2018), and sites were primarily located within persistent PJ (Figure 1) characterized by Utah juniper (*Juniperus osteosperma*) and two-needle pinyon pine (*Pinus edulis*). However, sites at BAND contained primarily oneseed juniper (*J. monosperma*), having undergone a mass die-off (> 95%) of pinyon pines in 2002-2003 along with mechanical thinning of ~2,000 ha of woodlands from 2007-2010.

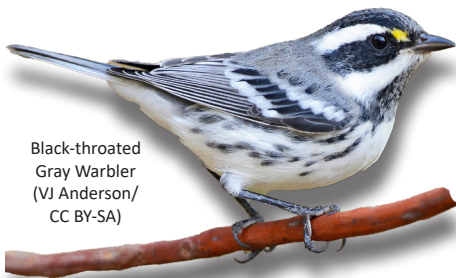
The study found supported associations with microhabitat variables in 18 of 25 species, though park-level effects had larger effect sizes than microhabitat measures. Structural features played a more important role in explaining PJ bird densities compared to plant species compositions.



Ash-throated Flycatcher (Becky Matsubara/CC BY)

Birds did not generally show associations with pinyon-pine- or juniper-dominated microhabitats or with specific shrub species. PJ birds may select for both junipers to nest in and pinyon pines to forage in, favoring a balance of both. The exceptions were cavity nesting birds (Mountain Chickadee, Juniper Titmouse, Ash-throated Flycatcher) which were associated with greater pinyon pine basal area and species that prefer woodland edge or treefall gaps (e.g., Mourning Dove, Black-chinned Hummingbird, Brown-headed Cowbird) that were associated with reduced pinyon pine basal area.

On the structural side, the study found few effects of canopy cover or height on the density of PJ-specialist birds despite a large range of canopy cover included in the study (~10-40%). This may reflect that PJ-specialist birds evolved to exploit the large range of variation in PJ landscapes and therefore are resilient to small scale thinning and die-offs. By contrast, many of the generalist forest and woodland birds (Mountain Chickadee, White-breasted Nuthatch) were sensitive to declining local canopy cover. However, landscape level effects of loss of canopy cover may be more pronounced, such as the large-scale die-off at BAND which likely resulted in the near extirpation of six species, including Gray Vireo, Black-throated Gray Warbler, and Pinyon Jay.



Black-throated
Gray Warbler
(VJ Anderson/
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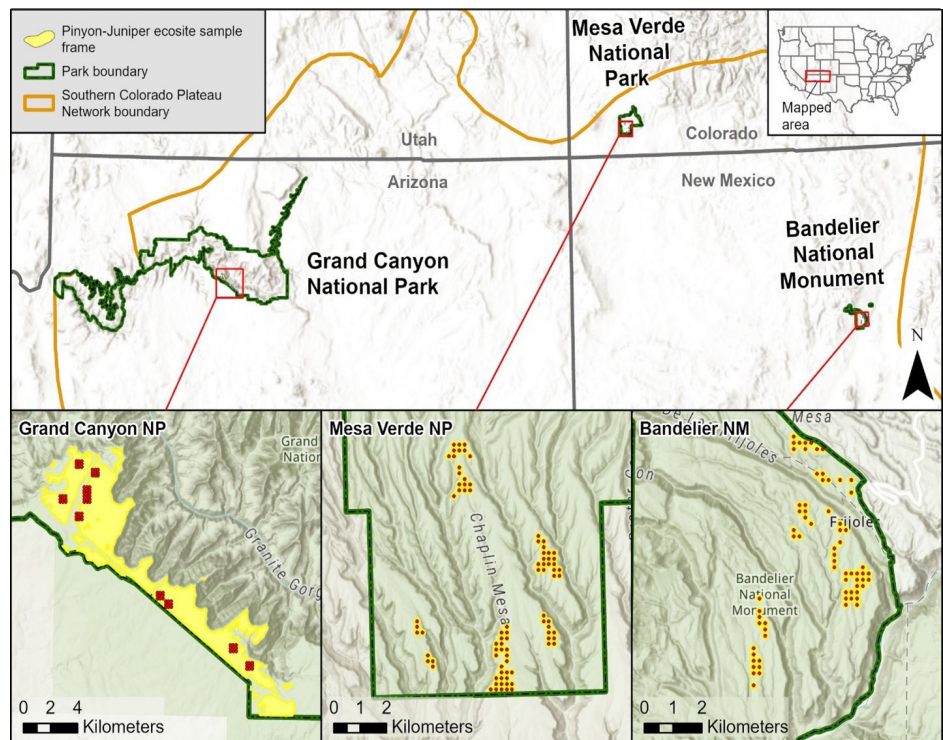


Figure 1. Location of point-count stations in three Southern Colorado Plateau Network parks and monuments. Count stations were placed in persistent pinyon-juniper woodland. (Kristin Straka/NPS)

Unlike canopy cover and height, the amount of shrub foliar cover was an important determinant of the breeding-season density of many species. Several foliage-gleaning insectivores showed 150-200% increases in local density with a shrub foliar cover of 25-50% compared to when shrubs were absent. The most shrub associated species included Blue-gray Gnatcatcher, Black-headed Grosbeak, Brown-headed Cowbird, Plumbeous Vireo, and Spotted Towhee. Several aerial insectivores (Gray Flycatcher, Ash-throated Flycatcher) and a bark forager (White-breasted Nuthatch) were negatively associated with shrub cover. Changes in shrub cover is therefore likely to lead to changes in the composition of the insectivore guild.

Pinyon-juniper covered canyon rim and slopes at Tyuonyi Overlook Trail, Bandelier National Monument (NPS)

Management Implications

- Small-scale thinning and pinyon pine die-offs are unlikely to have major impacts on PJ specialist bird densities, though forest generalists such as Mountain Chickadee and White-breasted Nuthatch will be negatively affected by declining local canopy cover.
- Large-scale thinning and die-offs (landscape loss of canopy cover) may result in local extirpation or declines of PJ specialist species, especially Plumbeous and Gray Vireo, Pinyon Jay, Bushtit, and Black-throated Gray Warbler. Managers seeking to maximize habitat for birds during such interventions should thin moderately and patchily
- Methods of thinning that leave understory shrubs in place are likely to increase or maintain bird densities after treatment. Prescribed fire has led to the long-term (10+ year) loss of shrub cover and is not recommended in persistent PJ woodlands.
- Pinyon Jay showed an unusual response to microhabitat variables, with higher densities in late-successional woodlands with low vertical vegetation complexity. It is unlikely to serve as an umbrella species for PJ bird communities.