



Ecological Restoration Institute



Fact Sheet: Stand Structure and Breeding Birds: Implications for Restoring Ponderosa Pine Forests

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INTRODUCTION

Fire-adapted forests in the western United States have dramatically departed from historical reference conditions over the past century due to fire suppression, logging, grazing and other management practices. As a result, they are now susceptible to stand-replacing crown fires and ensuing damage to watersheds, wildlife habitat, and communities. Restoration treatments using mechanical thinning and prescribed fire have become the dominant management paradigm in this forest type. While many studies have examined wildlife responses to restoration treatments, single-species information is difficult for managers to synthesize and incorporate into management decisions made at large scales. Our specific objectives in this study were to determine associations between forest structural attributes and occupancy rates of (1) individual bird species and (2) bird species richness (total number of species) in ponderosa pine forests, in order to help guide restoration treatment design.

METHODS

We sampled breeding bird presence and forest structural attributes (Table 1) in 23 stands for 3 years in northern Arizona in ponderosa pine and ponderosa pine-Gambel oak forest cover types on the Kaibab and Coconino National Forests. To provide information relevant to managers in designing treatments, we assessed different diameter caps by quantifying bird associations with “medium-sized trees” that are 16–18 inches in diameter at breast height (dbh) and would remain on a landscape with a 16-inch diameter cap (i.e., all trees smaller than 16 inches dbh would be removed). An 18-inch diameter cap would retain only trees greater than 18 inches dbh, as represented by “large trees.” We used occupancy models to determine relationships between bird occupancy (probability that a site is occupied by the species) and forest structural attributes.

Forest structural attribute	Majority of individual bird species ¹	Species richness ²
Canopy cover (%)	- (11)	-
Large trees/ac (trees >18” dbh)	+ (11)	+
Medium-sized trees/ac (trees 16-18” dbh)	- (11)	-
Number of snags/ac	+ (11)	+
Tree grouping	0 (8)	+
Down wood	- (12)	-
Herbaceous cover (%)	- (13)	+

¹ The number in parentheses indicates the number of species, out of a total of 16, which exhibited the reported response (+, -, or 0).

² A total of 48 species were detected during the sampling period.

Table 1. Relationship (positive [+], negative [-], or neutral [0]) between forest structural attributes and the majority of bird species (16 total) and species richness.

The Ecological Restoration Institute is dedicated to the restoration of fire-adapted forests and woodlands. ERI provides services that support the social and economic vitality of communities that depend on forests and the natural resources and ecosystem services they provide. Our efforts focus on science-based research of ecological and socio-economic issues related to restoration as well as support for on-the-ground treatments, outreach and education.

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RESULTS

The majority of individual bird species' associations with forest structural attributes were consistent with that of the overall community (Table 1, page 1). In all cases except for down wood, species richness had a positive association with aspects of historical reference conditions of ponderosa pine forests (e.g., tree grouping, large trees, and snags). Most species are negatively associated with canopy cover, medium-sized trees, and down wood, and positively associated with large trees and snags (Table 1, page 1). Bird associations with tree grouping and herbaceous cover are less consistent.

MANAGEMENT IMPLICATIONS

Our results support the implementation of forest restoration treatments for restoring breeding bird community occupancy in ponderosa pine forests. Specific management recommendations are to:

- Emulate historical reference conditions (e.g., large trees and snags, open canopies, aggregated spatial arrangement of trees, etc.) with forest restoration treatments.
- Reduce canopy cover via thinning, and retain large trees (>18 inches dbh) and snags.
- Use caution with implementing the commonly proposed 16-inch diameter cap which retains medium-sized trees after thinning.
- Use occupancy modeling as an efficient method for assessing wildlife-habitat relationships at large scales.
- Be aware that these recommendations apply to the majority of bird species that were detected; however, there is no one treatment that will benefit all bird species. See the publication (Kalies and Rosenstock 2013) for more detail on individual bird species responses to forest structural attributes.



Grace's warbler (*Dendroica graciae*). Photo by Dominic Sherony.



Pygmy nuthatch (*Sitta pygmaea*). Photo by Tom Talbott.

Author's note: The bird species modeled in this study were pygmy nuthatch, dark-eyed junco, plumbeous vireo, Grace's warbler, yellow-rumped warbler, mountain chickadee, white-breasted nuthatch, western tanager, northern flicker, Steller's jay, violet-green swallow, red crossbill, western wood-pewee, hermit thrush, chipping sparrow, and black-headed grosbeak.

This Fact Sheet summarizes information from the following publication:

Kalies, E.L. and S.S. Rosenstock. 2013. Stand structure and breeding birds: Implications for restoring ponderosa pine forests. *Journal of Wildlife Management* 77(6): 1157-1165. <http://library.eri.nau.edu/gsd/collect/erilibra/index/assoc/D2013017.dir/doc.pdf>

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