



Evidence-based Restoration Systematic Review



Ecological Restoration Institute

Effects of Restoration on Wildlife Density and Populations

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Background

Ecological restoration treatments, including thinning and/or burning, expose wildlife species to short- and long-term alterations to their habitat. Restoration treatments are an effort to return forest structure and composition to within the range of natural variability, which should benefit native wildlife species. However, these treatments are being planned and implemented across thousands of acres of forest in the southwestern United States with only limited quantitative data about wildlife responses across multiple species or taxa.

Primary objective: How do thinning and burning treatments in southwestern conifer forests in the United States affect wildlife density and population performance?

Secondary objective: Which wildlife species are most vulnerable to habitat alteration? How do the effects of thinning and burning treatments compare to those of selective harvesting, wildfire, and overstory removal?

Methods

The systematic review was conducted following the Centre for Evidence-Based Conservation guidelines at: <http://www.environmentalevidence.org/Authors.htm>.

Results

Our review identified 56 relevant studies, which were dominated by avian studies and generally occurred less than ten years post-treatment. Although the qualitative analysis resulted in broadly neutral or positive responses to treatments in terms of species abundances, the meta-analysis revealed a pattern of generally positive density responses to the restoration-like treatments (small-diameter tree removal, burning, and thin/burn) and negative responses to the high-severity treatments (wildfire and overstory removal; Figure 1).

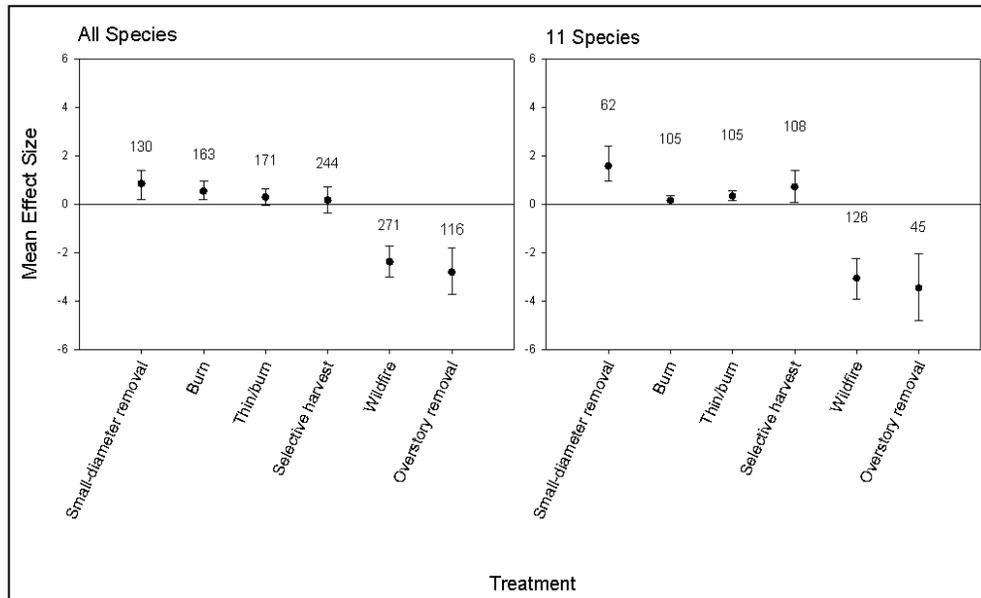


Figure 1. Mean effect size, bootstrapped confidence interval, and number of observations a) across all species for the six treatment types and b) for the 11 species for which data were available in each of the six treatment types.

The Ecological Restoration Institute is dedicated to reversing declines in the condition of forested communities throughout the Intermountain West, particularly those affected by severe wildfires and insect outbreaks. Our efforts focus on science-based research of ecological and socio-economic matters related to restoration as well as support for on-the-ground treatments, outreach, and education.

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We recorded more positive responses by individual species to the high-severity treatments using the qualitative analysis compared to the meta-analytic approach. Additional information on species-specific responses can be found in the full [systematic review document](#). Reproductive responses were generally positive in the restoration treatments and negative in the high-severity treatments, but were compromised by low numbers of observations (Table 1).

Species ¹	Positive	Neutral	Negative	Total	Overall Response
Restoration Treatments					
Tassel-eared squirrel			1	1	-
Dark-eyed junco	1		5	6	-
Wild turkey		1		1	0
Plumbeous vireo	6		1	7	+
Western bluebird	11	17	3	31	+
Western tanager	1			1	+
High-severity Treatments					
Black bear	2	3	3	8	-
Mexican spotted owl ^{2,3,4}			1	1	-

Table 1. Species’ reproductive responses to restoration (small-diameter tree removal, burn, and thin/burn) and high-severity (wildfire and overstory removal) treatments, followed by the total number of observations and the overall response.

- 1 Species’ scientific names provided in Appendix 4.
- 2 Arizona Species of Concern
- 3 US Forest Service Sensitive Species
- 4 Federally threatened

Management and Research Recommendations

This review suggests that thinning and prescribed burning of southwestern ponderosa pine and dry mixed conifer forests will benefit passerine birds and small mammals. The existing literature indicates that small-diameter tree removal and/or burning does not negatively affect species’ densities compared to unmanaged forest stands, and is less detrimental than overstory removal or wildfire. However, no one treatment benefitted all species, at least in the short term. Thus, a combination of various treatments in a patchy arrangement in time and space across the landscape is likely to result in higher animal diversity than any one treatment.

The majority of studies in the analysis examined responses of birds to treatment, and we suggest that existing studies be carefully consulted before initiating similar research in order to eliminate duplication of effort. Other under- or unrepresented taxa include reptiles and amphibians, rare birds and small mammals, medium and large mammals, including both predators and ungulates, and birds of prey. However, we suggest studies use holistic, focal species or food web approaches representative of many trophic levels and taxa, rather than focusing on single or similar species. Furthermore, the lack of studies that assess reproductive responses across all species indicates a paucity of research about this important fitness parameter. Finally, studies need to be conducted at larger temporal and spatial scales in order to understand both short- and long-term implications of treatments at the landscape level.

References and Links

The full systematic review and all references can be accessed at:
<http://www.eri.nau.edu/en/evidence-based-restoration-projects>