

Public Abstract

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Graduation Term:SP 2017

Department:Fisheries & Wildlife

Degree:MS

Title:ABUNDANCE OF BLACK-BACKED WOODPECKERS AND OTHER BIRDS IN RELATION TO DISTURBANCE AND FOREST STRUCTURE IN THE BLACK HILLS AND BEAR LODGE MOUNTAINS OF SOUTH DAKOTA AND WYOMING

Natural disturbances, such as wildfire and mountain pine beetle (*Dendroctonus ponderosae*, hereafter MPB) infestations, are two sources of large-scale disturbance that can significantly alter forest structure in the Black Hills. The Black Hills has recently experienced one of the largest MPB outbreaks in the last 100 years, along with varying levels of wildfires throughout the forest, gives us a unique opportunity to study how birds respond to these disturbances. Three-toed Woodpecker (*Picoides dorsalis*), Brown Creeper (*Certhia americana*), Red-breasted Nuthatch (*Sitta canadensis*), and White-winged Junco (*Junco hyemalis aikenii*) are species of regional conservation concern or are sensitive to forest management practices in the Black Hills. The Black-backed Woodpecker (*Picoides arcticus*), was recently petitioned to be listed under the Endangered Species Act and more information on their population size in the region is needed. Our objectives were to 1) map abundance of Black-backed Woodpeckers and provide an estimate of population size in the region and 2) to determine densities of our five focal species in relation to vegetation characteristics and disturbance in the Black Hills and Bear Lodge Mountains of South Dakota and Wyoming. We located 124 and 115 transects, containing 1,232 and 1,138 sampling points, in 2015 and 2016, respectively. We visited each point 3 times from late-March to late-June in 2015 and 2016. We characterized vegetation around each point using GIS derived landscape variables and simple point-level measurements.

The global abundance model received the most support for Black-backed Woodpeckers. There was a negative relationship of Black-backed Woodpecker abundance with latitude, percent cover of dead trees, and green trees and a positive relationship with percent cover of beetle killed trees, and 1- to 2-, 3-, and 4- to 5-year-old wildfires. Abundance of Black-backed Woodpeckers was most strongly related to percent cover of beetle killed trees and wildfires that had burned within the last 5 years. Mean density was 0.00528 birds/ha and 0.00626 birds /ha and an estimated 2,920 (LCL: 1,449; UCL: 5,917) and 3,439 (LCL: 1,739; UCL: 6,908) individual Black-backed Woodpeckers in the Black Hills in 2015 and 2016, respectively. Our abundance model can be used with previously published demographic rates for the species in the Black Hills to assess future viability of Black-backed Woodpeckers and provide information on the levels of disturbance needed to maintain a viable Black-backed Woodpecker population in the future.

At a smaller scale, Black-backed Woodpeckers, Brown creepers, and Red-breasted Nuthatch had mixed responses to 1- to 5-year-old wildfires. With the exception of American Three-toed Woodpeckers, all species were positively related to percent cover of beetle killed trees. Brown Creepers, White-winged Juncos, and Red-breasted Nuthatches had mixed responses to percent overstory canopy cover. White-winged Juncos also had a positive association with percent ground vegetation and Brown Creepers were strongly linked with the white spruce (*Picea glauca*) vegetation type. American Three-toed Woodpeckers, which are thought to occupy spruce forest in the Black Hills, did not show a strong relationship with any covariates. Management that maintains or permits some level of disturbance and heterogeneity within stands and at the landscape-level will benefit the diverse needs of birds. Continued monitoring of these species across a variety of habitat types will improve understanding about their responses to disturbances and the effects of management practices in the Black Hills.