Habitat Characteristics at Woodpecker Nest Locations and at Non-nest Random Locations in the Elkhorn Mt, Helena National Forest Before (2002-2006) and After a Mountain Pine Beetle Outbreak (2009-2011)

PROGRESS REPORT

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To

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Introduction

Recent epidemics of mountain pine beetles (*Dendroctonus ponderosae*; MPB) will fundamentally alter Rocky Mountain forests, impacting management decisions related to fire, logging, and wildlife habitat. We are studying effects of a recent MPB outbreak on nest-site selection and nest survival of 6 woodpecker species, and on occupancy dynamics of 46 avian landbird species in the Elkhorn Mountains, Helena National Forest. Here we report a summary of habitat characteristics measured at woodpecker nest locations before (n = 89; 2003-2006) and after the outbreak (n = 124; 2009-2011). We descriptively compare habitat characteristics at nest locations to non-nest random locations (n = 76), which characterize the average conditions on the landscape in our Elkhorns study area.

Methods

Habitat Measurements: To quantify the habitat changes associated with the MPB epidemic, we measured habitat characteristics at each of our 76 non-nest random point stations once before the beetle epidemic (in 2002-03) and again after the epidemic (2010). We measured the same vegetation characteristics annually at nest locations. Data were collected in 2012 at both random and nest locations but not included in this summary because the data entry is ongoing and incomplete as of October 2012. At each random and nest location, the vegetation plot was 2.5 ha in size and consisted of intersecting nested plots within 20m x 100m rectangles in a cross plot design (Saab et al. 2006; Figure 1). These vegetation plots were centered on focal trees at point count surveys (i.e. random locations) and nest trees at nest locations. Snags were defined as any standing dead (at least 50% of the needles dead or missing) tree ≥ 1.4 m in height measured in 2 size classes (small ≥ 3-9" [≥ 8-23 cm] and large > 9" [>23 cm]) in diameter at breast height (dbh). Small snags and trees within 1 m, large snags within 10m, and large trees within 3m to either side of a 50m transect were tallied at each vegetation plot . These measurements were repeated in each cardinal direction. The total number of snags/trees counted per plot was then divided by the total area surveyed (e.g., 20x50x4 = 4000m^2 per plot for large snags) to create the snag/tree density measurement. Species and dbh of the nest tree or focal tree at random locations was also recorded.

Nest Surveys: Nest surveys were conducted from 15 May - early July along belt transects (approximately 0.2 x ~0.8 km) (Dudley and Saab 2003). Transects were surveyed with the aid of playbacks, two times during the season. Birds that were detected during surveys were subsequently followed until their nests were found. A GPS location and notes describing the location were taken to allow for future visits. Once an occupied nest cavity was determined, nests were monitored every 3-4 days until fledging or failure.

Preliminary Results (see Table 1a)

Snag densities: Vegetation was measured annually at nest locations, and once before and once after the outbreak at random locations. Measurements were completed at 89 before (2002-2006) and 124 nest locations after (2009-2011) the outbreak, and at 76 non-nest random plots once before (2002-2003) and once after (2010) the outbreak. In 2010, large (> 9" dbh) live tree (all spp.) densities were reduced by nearly half (90.3 vs. 47.7 trees/ac), while large snag densities increased > 15 times (3.5 vs. 50.3 snags/ac) compared with pre-outbreak conditions at random locations. These changes are representative of average conditions on the landscape.

Pre-outbreak, all woodpecker species selected locations of higher large snag densities than those measured at random. Post-outbreak, however, snag densities at woodpecker nests were variable compared with random locations. Post-outbreak snag densities were significantly higher at three-toed woodpecker nests compared with random locations (73.3 ± 4.6 vs. 50.3 ± 3.1 snags/ac). Higher snag densities near their nests likely provided greater foraging opportunities for this beetle-foraging woodpecker.

Tree Species: Ponderosa pine (PIPO) is the dominant tree species (> 60% of tree composition) in our study units. Aspen (POTR) is rare on the landscape (≤ 3% of all tree species) but has been highly favored for nesting substrate, particularly pre-outbreak. Once conifer snags were recruited as a result of the outbreak, Hairy and three-toed woodpeckers shifted and expanded their nesting use of primarily aspen to ponderosa and lodgepole pines. Williamson's and Red-naped sapsuckers, downy woodpecker, and Northern flicker favored aspen as nesting substrate throughout the study.

Tree Diameter: Tree diameters were apparently not limiting to nesting woodpeckers in our study area. Average nest tree diameters were similar in size as those measured at random locations.

Discussion

Snag densities and diameters were similar between nest and random locations in the Elkhorn's study area except at nest locations of the Three-toed Woodpecker, a species selecting high densities of large snags. Three-toed woodpeckers specialize in foraging on bark beetle larvae and higher snag densities surrounding their nests likely provided greater foraging opportunities. This result suggests that high snag densities after beetle outbreaks are necessary for successful breeding of American three-toed woodpecker. Another notable result was the importance of aspen to nesting woodpeckers,