Nest Provisioning in a Fire Disturbed Landscape

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11/8/2020

Introduction

Fire plays an important role as a consistent disturbance in maintaining open stands of old-growth Ponderosa Pine (*Pinus ponderosa*) forests by helping to eliminate understory and limit fuel loads [Veblen et al., 2000]. Before human intervention, Ponderosa Pine forests naturally underwent forest fires in 5-50 year intervals [Veblen et al., 2000]. Over the past century, however, tree planting initiatives and increased implementation of fire suppression have led to increased density of stands [Griffis et al., 2001], making forest stands that are already drought stressed even more susceptible to high severity crown fires [Veblen et al., 2000]. In 2002, a human-caused wildfire, the Hayman Fire, burned 138,000 acres of old-growth Ponderosa pine forests in Colorado's Pike National Forest [Graham, 2003].

The Flammulated Owl (*Psiloscops flammeolus*) is a territorial, insectivorous, and nocturnal raptor native to montane forests in portions of the Rocky Mountains, Sierra Nevada Mountains, and the Occidental Mountains [Linkhart and McCallum, 2013]. The diet of the owl primarily consists of moths native to these regions [Linkhart and McCallum, 2013]. As a highly specialized secondary cavity nesting raptor, the Flammulated Owl is deemed an indicator species, meaning that the health of an ecosystem can be estimated based on the health of their population. Survival models have shown that Flammulated Owl survival in the HFSA is currently lower than survival in MGSA, suggesting that mortality, rather than emigration, explains most of the population declines following the Hayman Fire (Linkhart and Yanco, unpublished data).

Here, I examine one possible explanation for increased mortality in HFSA: prey availability. High severity burns dramatically alter vegetation structure, which in turn alters insect communities. Over time, insect communities within high intensity burn scars can crash, leaving avian predators without important food resources [Nappi et al., 2010]. If Flammulated Owls are adapting their behavior in response to changing prey availability, I would expect that the rate of prey deliveries to active nests would increase or decrease (increase if prey is lower quality, decrease if prey is more scarce or difficult to detect) [Zárybnická et al., 2009]. If Flammulated Owls are not adapting their behavior, this could mean that prey availability has either not changed or, more likely, that Flammulated Owls, which do not occupy landscapes prone to high severity burns, do not adapt their behavior in response to large-scale landscape changes.

References

Russell T Graham. *Hayman fire case study*. US Department of Agriculture, Forest Service, Rocky Mountain Research Station, 2003.

Kerry L Griffis, Julie A Crawford, Michael R Wagner, and WH Moir. Understory response to management treatments in northern arizona ponderosa pine forests. *Forest Ecology and Management*, 146(1-3):239–245, 2001.

Brian Linkhart and DA McCallum. Flammulated owl (psiloscops flammeolus). *The Birds of North America (PG Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://birdsna. org/Species-Account/bna/species/flaowl*, 2013.

Antoine Nappi, Pierre Drapeau, Michel Saint-Germain, and Virginie A Angers. Effect of fire severity on long-term occupancy of burned boreal conifer forests by saproxylic insects and wood-foraging birds. *International Journal of Wildland Fire*, 19(4):500–511, 2010.

Thomas Veblen, Thomas Kitzberger, and Joseph Donnegan. Climatic and human influences on fire regimes in ponderosa pine forests in the colorado front range. *Ecological applications*, 10(4):1178–1195, 2000.

Markéta Zárybnická, Ondřej Sedláček, and Erkki Korpimäki. Do tengmalm's owls alter parental feeding effort under varying conditions of main prey availability? *Journal of Ornithology*, 150(1):231–237, 2009.