Cavity, Tree and Habitat Preferences of Winter Roosting Birds and Resting Mammals in Southern Yukon

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Summary Report: Cavity, Tree and Habitat Preferences of Winter Roosting Birds and Resting Mammals

Introduction

Many studies have investigated the tree and nest preferences of cavity-using bird and mammal species for breeding (Rothwell 1979; Rendell and Robertson 1989; Steeger and Hitchcock 1998; Wiebe 2001; Aitken and Martin 2004), but relatively few studies have examined winter tree-cavity use. Furthermore, most published research on winter cavity use has focused on species and populations within southern and sub-boreal forest regions. Currently, no known research has investigated the potential cavity, tree or habitat preferences of over-wintering, northern boreal species that use tree-cavities as a strategy for coping with extreme cold. In southern Yukon, 14 resident bird and mammal species are known to depend on tree cavities for nesting and/or roosting. These species include: boreal chickadee (Poecile hudsonica), black-capped chickadee (Poecile atricapilla), mountain chickadee (Poecile gambeli), red-breasted nuthatch (Sitta canadensis), downy woodpecker (Picoides pubescens), hairy woodpecker (Picoides villosus), American three-toed woodpecker (Picoides tridactylus), black-backed woodpecker (Picoides arcticus), boreal owl (Aegolius funereus), northern saw-whet owl (Aegolius acadicus), American marten (Martes americana), fisher (Martes pennanti), red squirrel (Tamiasciurus hudsonicus) and northern flying squirrel (Glaucomys sabrinus). The purpose of this research was to examine which cavity, tree and habitat characteristics are preferred for roosting and resting by overwintering bird and mammal species in southern Yukon. This research will provide data that can be used in the conservation and management of cavity-using birds and mammals in northern boreal forest communities. Furthermore, by identifying the cavity and tree preferences of winter cavity users, this study can help guide forest use and management practices such as salvage logging of burned and beetle-killed stands, firewood cutting and FireSmart, in Canada's northern forests, and can help ensure that cavity-trees with preferred characteristics are retained on the landscape.

Four study areas have been established throughout southern Yukon, each containing three 40-hectare sites that represent the forest types within each area. These study areas are located near the communities of Haines Junction, Mendenhall, and Whitehorse. Tree-cavities within each site have been surveyed during the day and night, throughout the winter months, using the combination of a Peeper and endoscopic camera system (lit cameras attached to a telescopic pole, and connected to a monitor). These camera systems were used to find occupied cavities, and to identify the species and number of individuals occupying a cavity. Cavity-use surveys were conducted during daylight hours to detect roosting/resting nocturnal species (i.e. boreal owls and northern flying squirrels) and during the night to detect diurnal species (i.e. woodpeckers, chickadees, nuthatches, red squirrels, and weasels). To identify the resource preferences of over-wintering birds and mammals, cavity and tree characteristics for each used cavity site were compared to the characteristics of those not being used. Information on habitat type and structure were also collected to determine whether broader habitat characteristics affected cavity selection.

Research activities completed

During the winter months (November to April) 2017-2019, 22 rounds of winter cavity use surveys were conducted within each of the 12 study sites. This included 11 rounds of both day and night use surveys. To determine which cavity-using species occur within each study site, transect point count surveys were conducted by walking 7 transects and stopping every 50 meters to watch and listen for birds and mammals. Weasel snow tracks were also noted during these surveys. To detect the presence of nocturnal

species such as northern flying squirrels and boreal owls, automated recording units were set up in each site, on three separate occasions, throughout the winters of 2017/18 and 2018/19. To measure the differences between internal cavity temperatures and external air temperatures, temperature dataloggers were installed on each cavity tree used for winter roosting, as well as on the five nearest unused cavity trees, for comparison. Finally, cavity, tree and habitat characteristics were measured for all cavity sites, between April and June 2019, to understand the winter cavity preferences of birds and mammals.

Preliminary results

Over the course of three winter seasons, 5 bird species were observed using 17 different tree-cavities. These species included American three-toed woodpecker (n = 14), boreal chickadee (n = 2), hairy woodpecker (n = 1), downy woodpecker (n = 1), and brown creeper (n = 2). One cavity was used by both a downy Woodpecker (throughout the winter of 2017) and a pair of communally-roosting brown creepers (throughout December 2018). Another cavity was used by two different three-toed woodpeckers, on separate nights, in the winter of 2018/19. A total of 20 individual birds were observed roosting in tree-cavities, 13 of which re-used the same cavities on multiple nights. No mammals were observed resting in tree-cavities during the day or night; however, six red squirrels were observed visiting cavities to cache or eat spruce cones (n = 4, confirmed) or possibly for temporary shelter during the day. Two northern flying squirrels and one red squirrel were observed feeding hairless, newborn babies in tree-cavities, in early June 2018, suggesting that squirrel spp. use tree-cavities for nesting but not for winter-resting, even though they are present throughout the winter in all study sites. Boreal owls were also found nesting in tree-cavities but were not observed using them for winter roosting. In the spring of 2018 and 2019, boreal owls were observed nesting in two different tree-cavities. They began defending and readying cavity-nests in early April, and hatchlings were fledged by mid-June. Interestingly, no tree-cavities were used by other nesting bird species; however, all resident woodpecker species are believed to only use newly excavated cavities for nesting, and other resident bird species are not restricted to tree-cavities for nesting.

American three-toed woodpeckers preferred cavities with vertical depths between 5 cm and 18.5 cm (ave = 13 cm), and those with volumes between 1847 cm^3 and 4992 cm^3 (ave = 3234.25 cm^3). They also had a roosting preference for broken spruce trees with 50-75% decay. There appeared to be a somewhat significant preference for thicker cavity walls (between 2.4 and 4.4 cm), with an average thickness of 3.1 cm. For all but one of the cavities used by three-toed woodpeckers, there was a thick lining of wood chips; the other cavity had a deep grass lining, likely left by red squirrels. Cavities with greater temperature increments (internal cavity temperature – air temperature) appeared to be preferred for roosting as the warmer cavities were used more frequently, particularly on nights with average temperatures below -20°C. The temperature increments of used cavities ranged between 2.15°C and 6.61°C (increments of unused cavities have not yet been calculated). Finally, all but two three-toed woodpecker roost-cavity trees were either in open gaps within dense spruce forest (66.7%) or on the edges of dense forest (33.3%), suggesting that dense forests are preferred for roosting but open flyways in front of cavity entrances are also important, perhaps for reasons related to predator avoidance or evasion.

Both cavities used for winter roosting by boreal chickadees were relatively shallow (6.7cm and 7.0 cm), when compared to woodpecker roost cavities; however, both cavities were likely originally excavated by woodpeckers. Furthermore, chickadees may select cavities with thicker walls (ave = 4.3 cm)

relative to woodpeckers. All other cavity, tree and habitat preferences were similar to those of three-toed woodpeckers. Only one cavity was used by a hairy woodpecker and all characteristics were similar to those of thee-toed woodpecker roost cavities. The cavity used by both the downy woodpecker and the pair of brown creepers was in an open aspen-dominated mixedwood forest, in a rotten aspen stump. The cavity appeared to have been originally excavated by a downy woodpecker as they are not strong excavators, and rotten deciduous trees are easier to excavate (Jackson 1976; Conner et al. 1976). Notably, no other brown creepers have been documented roosting or nesting in woodpecker cavities anywhere in their North American range. Perhaps this behaviour is an adaptation to Yukon winters, but as this species is new to the Yukon and is still very rarely seen, not much is known about how they endure winters in the northern boreal forest. As only a combined four tree-cavities were used by boreal chickadees, hairy and downy woodpeckers, and brown creepers for winter roosting, not much can be inferred about cavity, tree or habitat preferences.

At this time, there have not been any advanced or predictive statistical analyses done with the research data. The results and discussions of further analyses will be included in the form of a thesis, which should be complete by the winter of 2019/2020. The data from the bird and mammal transect counts, the audio recorders, and the temperature dataloggers have not yet been processed or analyzed at this time, but the results from these surveys will also be included in the thesis. Many other cavity, tree and habitat characteristics have also been measured, but have not yet been processed or analyzed and, therefore, have not been discussed in this report.

Contribution to the protection, enhancement and restoration of fish and wildlife and their habitat

This research meets the Yukon Fish and Wildlife Enhancement Trust's criteria as the information learned can be used to help to protect and enhance wildlife habitat. For example, cavity, tree and habitat characteristics that are preferred or required by birds and mammals may be preserved in managed forests, or conditions that improve winter habitat suitability can be created, thus, enhancing wildlife habitat. This research may also contribute to the achievement of many of the objectives laid out in Chapter 16 of the Umbrella Final Agreement, such as:

16.1.1.1 - ensuring conservation in the management of wildlife resources and their habitat,

16.1.1.2 - preserving and enhancing the renewable resources economy (for example, preserving or enhancing wildlife populations, thus, increasing trapping and hunting opportunities),

16.1.1.6 - integrating the management of renewable resources (for example, wildlife and forest management), and

16.1.1.8 - developing responsibilities for resource management at the community level (for example, developing guidelines for and/or informing local woodcutting, salvage logging, and FireSmart activities).

This project may also have indirect impacts on other wildlife if the information learned is used to inform forest use and management. For example, the availability of suitable cavity trees is critical to maintaining communities of cavity users that, in turn, support many predator species such as hawks, owls, lynx, red fox, etc. The information gained from this study may have long-term benefits for entire wildlife communities if used to protect or enhance resources and habitat for future generations.

Communications

Numerous governments and other organizations have granted me permissions to conduct this research through the issuance of permits, licenses and certificates, and will be given a final report by December 31st, 2019. Also, all funding organizations have been given, or will be given, a final report on my research results. Furthermore, once completed, I intend to present my research at public events (e.g. the 2020 Biodiversity Forum) and to the affected First Nation communities (Champagne Aishihik, Kwanlin Dün and Ta'an Kwäch'än). By sharing the knowledge gained from my research with all affected communities, I hope that I can help ensure that practices such as wood-cutting and FireSmart can continue with minimal effect on the ecological communities that depend on tree-cavities for enduring long, cold northern winters.

To date, this research has been presented at academic presentations, seminars and peer discussions at venues such as the 2018 Biodiversity Forum, Yukon Bird Club 25th Anniversary Celebration, 2018 ACUNS Student Conference in Edmonton, and the 2018 International Ornithological Congress in Vancouver. At these venues, I have promoted the Yukon Fish and Wildlife Enhancement Trust and recognized its contribution to the protection, enhancement and restoration of fish and wildlife habitat through the financial support of my research. On all past and future reports, presentations, posters and publications, the Enhancement Trust has and will be recognized as a generous supporter of my research, through written and verbal acknowledgements and through the placement of their logo on all documents related to this project. Furthermore, the contribution of my work to the protection, enhancement and restoration of wildlife and their habitat will be stated and emphasized on all documents and when presenting my work.

References

Aitken KEH and Martin K. 2004. Nest cavity availability and selection in aspen-conifer groves in a grassland landscape. *Canadian Journal of Forest Research*; 34: 2099-2109.

Conner RN, Miller OK and Adkisson CS. 1976. Woodpecker dependence on trees infected by fungal heart rots. *Wilson Bulletin*; 88: 575-581.

Jackson JA. 1976. How to determine the status of a woodpecker nest. *Living Bird*; 15: 2015-221.

Rendell WB and Robertson RJ. 1989. Nest-site characteristics, reproductive success and cavity availability for tree swallows breeding in natural cavities. *The Condor*; 91: 875-885.

Rothwell R. 1979. Nest sites of red squirrels (*Tamiasciurus hudsonicus*) in the Laramie range of southeastern Wyoming. *Journal of Mammology*; 60(2): 404-405.

Steeger C and Hitchcock CL. 1998. Influence of forest structure and diseases on nest-site selection by red-breasted nuthatches. *Journal of Wildlife Management*; 62(4): 1349-1358.

Wiebe KL. 2001. Microclimate of tree cavity nests: is it important for reproductive success in northern flickers? *The Auk*; 118(2): 412-421.