

Final report

Prepared for the Nova Scotia Habitat Conservation Fund

MIGRATION AND HABITAT USE BY NORTHERN SAW-WHET OWLS IN THE MARITIMES (Project NSHCF15_16)

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PROBLEM STATEMENT

The Northern Saw-whet Owl (*Aegolius acadicus*) is a small nocturnal owl found year-round in portions of southern Canada and in parts of western and northeastern United States (Rasmussen et al. 2008). The species also winters throughout the eastern United

States. Saw-whet Owls typically prefer to breed in mature mixed forest habitats that have dense conifers for roosting and deciduous trees that offer suitable cavities for nesting (Brinker and Dodge 1993). Habitat use during migration and winter is poorly understood across the species' range; however, an abundance of small mammals and the presence of dense vegetation for roosting and perches for foraging are likely critical (Cannings 1993, Petit 1995).

Breeding bird atlas data and anecdotal observations suggest that the Northern Saw-whet Owl breeds in forested regions throughout the Canadian Maritime Provinces, especially in eastern Nova Scotia and in New Brunswick (Erskine 1992). The species is at least partly migratory in this region, as numbers of saw-whets (>800 since 1960) have been banded in autumn at concentration areas along shorelines, most notably on Bon Portage Island at the southwest extremity of Nova Scotia and along St. Mary's Bay in Church Point, Nova Scotia (Environment Canada, unpubl. data). This indicates that large numbers of Northern Saw-whet Owls may move southwest in Nova Scotia during fall, and that the western portion of the province likely provides important staging habitat for birds originating from more northern and eastern locals. Also, a small sample of saw-whets has been banded on Bon Portage Island in January, suggesting that some birds may winter in coastal locations of the Maritimes (Erskine 1992). However, given the secretive nature and nocturnal habits of this owl, we know next-to-nothing about patterns of habitat use and selection at staging and wintering sites in the Maritimes (Erskine 1992, Rasmussen 2008). Identification and characterization of important staging and wintering habitat is an important management step and is crucial for the conservation of the Northern Saw-whet Owl (Petit 1995).

Relationships between breeding, staging, and wintering sites for Northern Saw-whet Owls in eastern Canada are among the most poorly understood for the species across its range (Beckett and Proudfoot 2011). Historical banding data suggest that at least some Northern Saw-whet Owls moving south in Nova Scotia during fall cross the Gulf of Maine on route to wintering sites in the eastern United States (Environment Canada, unpubl. data). For example, one bird captured on Bon Portage Island was recaptured near the coast of New Jersey during the same fall season. Minimum straight-line distance between southwestern Nova Scotia and eastern Maine is 175 km. This is a significant migration distance in one evening for the Northern Saw-whet Owl, which is known to migrate no more than 80-90 km in one evening (Brinker et al. 1997). Mortality rates may be relatively high among owls making long-distance movements over large expanses of water (Saunders 1907). Despite this, it is generally unknown how Northern Saw-whet Owls (and many other nocturnal migrants) deal with the Gulf of Maine 'barrier' separating the Maritimes with the eastern United States. More specifically, we need to better understand how these birds minimise mortality associated with migration through: 1) overwater routes separating Nova Scotia and the eastern United States, and 2) environmental correlates (ex. wind direction and speed) favoring long-distance overwater routes.

Recent advances in animal radiotelemetry technology provide an excellent opportunity to study migration and habitat use by staging and wintering Northern Saw-whet Owls in

coastal areas of the Maritimes and in the northeastern United States. The Motus Wildlife Tracking System is an expansive network of VHF receivers on towers along the Fundy and Atlantic coasts of the Canadian Maritimes to Chesapeake Bay, Maryland. The receivers automatically detect and record signals from radiotransmitters deployed on birds at distances up to 15 km (Mackenzie and Taylor 2014).

PROJECT GOAL AND OBJECTIVES

Through tracking of radio-marked birds with the expansive Motus Network, our study aimed to provide the first information on fall movements and winter resource use (habitat and diet) by Northern Saw-whet Owls in eastern Canada. Ultimately, this information will help guide conservation efforts for this species and management practices in preferred saw-whet habitat.

The specific objectives of the study are:

- 1) To quantify orientation of radio-marked Northern Saw-whet Owls moving away from two stopover (marking) sites, and to evaluate the potential role of age and body condition on orientation decisions
- 2) To quantify regional movements of marked owls (e.g., telemetry locations away from stopover sites)
- 3) To examine patterns of resource selection and use (habitat and diet) by marked owls wintering near stopover sites

OUTLINE OF WORK COMPLETED TO DATE

Study Sites

Twenty Northern Saw-whet Owls were captured and radio-marked at Church Point, NS, and 5 saw-whets were marked on Bon Portage Island during October-November 2015 (Figure 1).

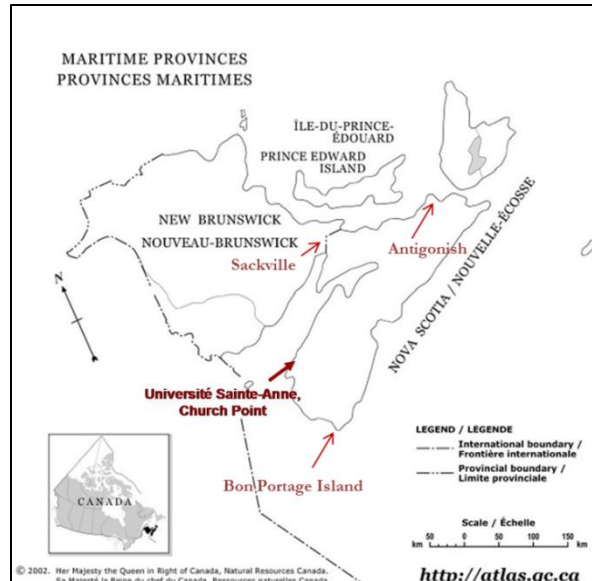


Figure 1. Northern Saw-whet Owl capture sites at Church Point and Bon Portage Island, NS, 2015.

Data Collection

Capture procedures followed closely those outlines by project OwlNet, an organization for coordinating and standardizing Northern Saw-whet Owl migration monitoring in North America (Huy 2010). At each site, Northern Saw-whet Owls were captured with 12-m long mist nets (60 mm nets in 120 dernier; Avinet, Inc., Dryden, NY). A 100 dB audiolure (FoxPro Inc., Lewiston, PA) was placed in the centre of the net line and broadcasted the Northern Saw-whet Owl advertising call.

Each captured bird was aged and sexed (Pyle 1997), weighed, and equipped with a NTQB-4-2 Nanotag (Lotek Wireless Inc., Newmarket; Figure 2). Each tag weighed 1.65 g (approximately 1-2% total body weight), measured 20 cm, and emitted a radio signal every 15 seconds for up to 306 days. Tags were fixed to birds using a leg harness adapted from that of Rappole and Tipton (1991) and Streby et al. (2015). Radio-marked Northern Saw-whet Owls were tracked during fall migration with the Motus Wildlife Tracking System. The Motus receivers detect and record signals from radiotransmitters using an on-site computer system (Mackenzie and Taylor 2014). Two telemetry towers (3 yagi-antennae each) were erected at Church Point and one tower (4 yagi-antennae) was at Bon Portage to detect orientation of birds moving away from the site and to monitor presence of wintering birds.

Wintering birds were tracked at Church Point every 3-4 days using a hand-held receiving system. We evaluated winter habitat use and selection at two spatial scales: landscape and tree-level. For landscape-level use, we determined forest type (wet coniferous forest, coastal forest, or hardwood forest) of the roost tree and tree density within a 5-m radius of the roost. For tree-level habitat use, we determined roost tree species, roost height above ground, tree trunk circumference at breast height, and lateral and overhead concealment at the perch site. To evaluate the potential for habitat preference, we

compared tree density, roost height, trunk circumference and concealment at roost sites to those same variables at randomly chosen sites within 50 m of a roost.

Northern Saw-whet Owl pellets were collected opportunistically under perches. Pellet contents were sorted and identified using standard keys.



Figure 2. Northern Saw-whet Owls equipped with nanotag, Church Point, NS, October 2015.
Photo courtesy of Université Sainte-Anne.

PRELIMINARY RESULTS

Orientation of saw-whets away from stopover sites

A total of 20 female Northern Saw-whet Owls (15 at Church Point and 5 at Bon Portage) provided telemetry data.

Nearly fifty percent of Northern Saw-whet Owls marked at Church Point were last detected to the S or SW, consistent with a movement toward the Gulf of Maine (Figure 3). These saw-whets moved from Church Point within ten days of marking. Five (33%) saw-whets remained around the Church Point area for at least a portion of the winter. All five marked birds at Bon Portage Island subsequently oriented away from the Gulf of Maine (toward the NW, N, NE or E) within a week of marking (Figure 3).

At Church Point, the majority of all hatch-year birds ($n=6$) oriented to the S or SW, whereas nearly half of all adult birds ($n=9$) remained around the site into winter (Figure 4). Body condition at marking did not have an effect on orientation decision ($F_{2,12} = 0,7$; $P = 0,5$).

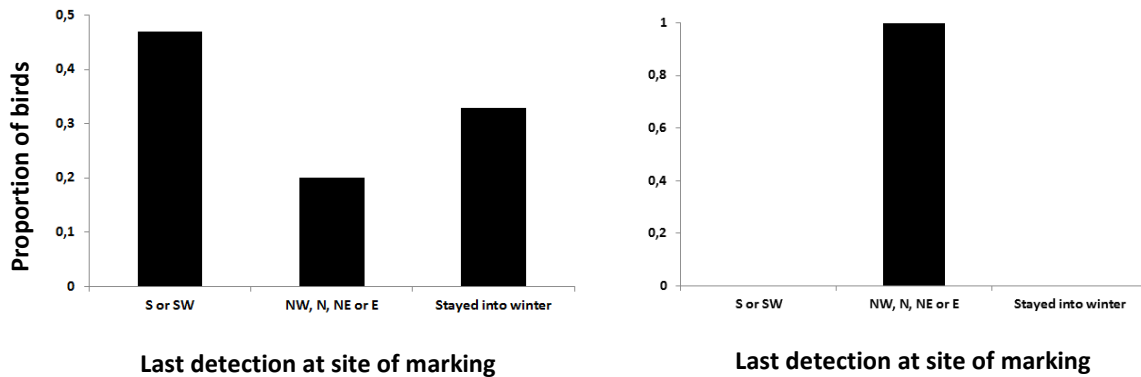


Figure 3. Orientation of last detections of Northern Saw-whet Owls at Church Point (left) and Bon Portage Island, NS (right), 2015-2016.

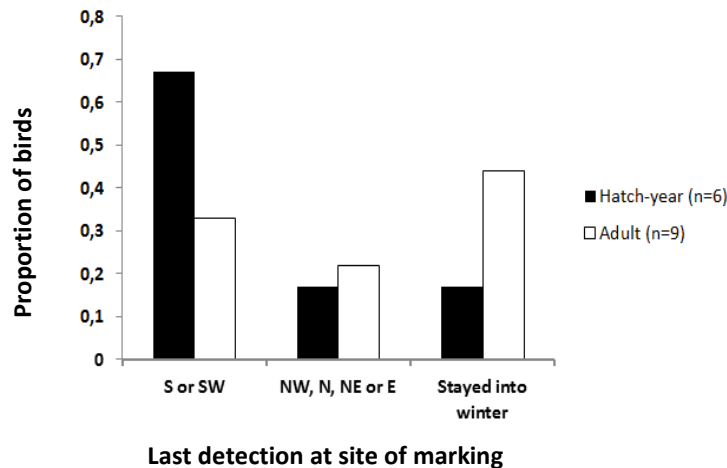


Figure 4. Orientation of last detections of hatch-year and adult Northern Saw-whet Owls marked at Church Point, NS, 2015-2016.

Large-scale movements

Owls marked at Church Point - None of the seven birds initially orientating to the south or southwest were detected by telemetry towers to the south or southwest of Church Point (e.g., Port Maitland, Yarmouth, Pubnico). One of these birds (ID 134; adult female) was detected near the Maine-New Brunswick border two days following detection by the tower on Digby Neck (Figure 5). The bird likely crossed the Bay of Fundy as a circumnavigation of the entire Bay of Fundy during a 52-hour period was unlikely (Rasmussen et al. 2008).

Of the three birds initially orientating to the NW, N, NE or E, one hatch-year bird was detected on Grand Manan Island, NB approximately two days after being detected by the tower on Digby Neck (Figure 5). The female was detected by the towers on Grand Manan

for about ten hours, suggesting the bird staged on the archipelago for a short period following a Bay of Fundy crossing. The bird was detected two weeks later moving south along the Connecticut River Valley in northern Massachusetts (Figure 5).

Owls marked at Bon Portage- Four of the five birds originally orienting to the NW, N, NE, or E were subsequently detected to the north or northeast of Bon Portage Island, which was consistent with movements that were not directed over the Gulf of Maine (Figure 6). The fifth bird was not detected after departing Bon Portage Island.

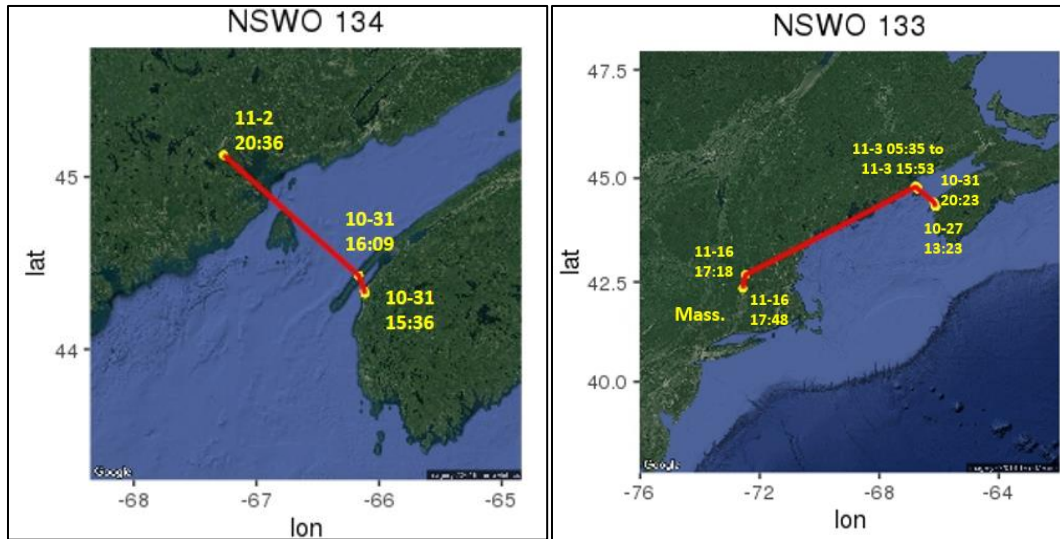


Figure 5. Large-scale movements of Northern Saw-whet Owls radio-marked at Church Point, NS, 2015.

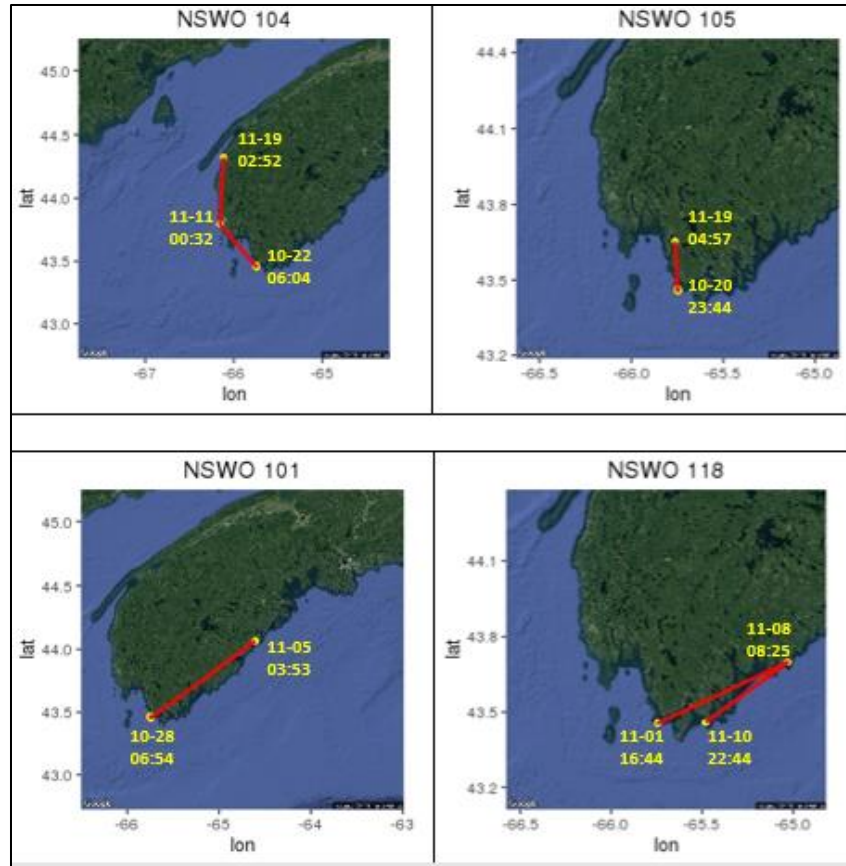


Figure 6. Large-scale movements of Northern Saw-whet Owls radio-marked at Bon Portage Island, NS, 2015.

Winter habitat use and diet

Landscape-level habitat use- A total of seven Northern Saw-whet Owl roost sites were identified on the campus of Université Sainte-Anne; the roosts were used by three owls. The 40-ha forest on the campus is composed of three macrohabitats: wet coniferous forest, coastal forest and hardwood forest. All but one roost site was located in wet coniferous forest dominated by eastern larch (*Larix laricina*), balsam fir (*Abies balsamea*) and spruce (*Picea* spp.). One roost was located in coastal forest. Tree densities within a 5-m radius of roost sites were not different than those around random sites.

Tree-level habitat use- Northern Saw-whet Owls preferred to place perches on eastern larch and balsam fir (Figure 7). Roost trees were not larger at breast height than random trees. Overhead and lateral concealment at roost sites was generally 3x greater than that at random sites (Figure 8).

Diet- Seventeen pellets were discovered under roosts on the campus of Université Sainte-Anne. Preliminary analyses of their contents indicate that the majority of Northern Saw-whet food items were voles (n = 16; *Microtus* and/or *Clethrionomys*). One pellet contained the remains of a shrew (Soricidae).

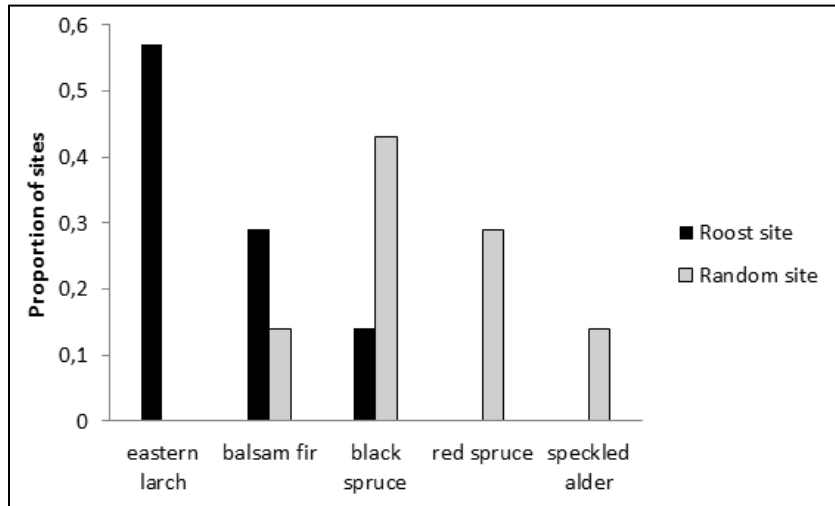


Figure 7. Tree species used by Northern Saw-whet Owls for roost sites during winter on the campus of Université Sainte-Anne, Church Point, NS, 2015-2016.

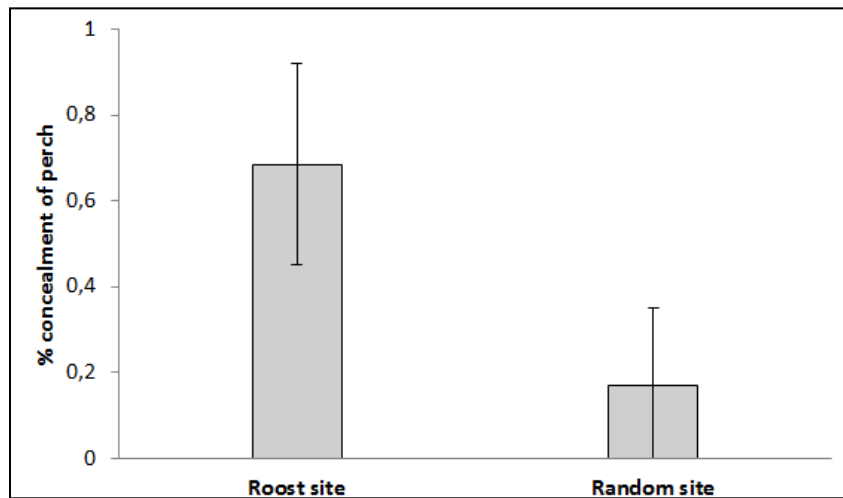


Figure 8. Mean (\pm SD) percent overhead and lateral vegetative concealment at Northern Saw-whet Owl roost sites and at random sites on the campus of Université Sainte-Anne, Church Point, NS, 2015-2016.

ANIMAL USE PERMIT

Please see APPENDIX B for a copy of the animal use protocol approval form.

ASSESSMENT OF ACHIEVEMENTS AND LESSONS LEARNED

Overall, the 2015-2016 project was a success as we met the main objectives of the study.

Important achievements include:

- the design of a safe method for radio-marking Northern Saw-whet Owls
- conclusion that at least some Northern Saw-whet Owls captured during fall migration in southwest Nova Scotia minimize overwater travel by moving over the Bay of Fundy
- gaining a better understanding of resource use (habitat and diet) by Northern Saw-whet Owls wintering in southwest Nova Scotia (preference for dense wet coniferous forests and utilisation of voles)
- that fall decisions by Northern Saw-whet Owls in this region may be related to age of birds

RECOMMENDATIONS FOR FOLLOW-UP STEPS FOR THE PROJECT

We recommend the following actions as extensions to work carried out during 2015-2016 (the first four recommendations are currently being carried out as part of a second field season):

- a second field season of radio-marking Northern Saw-whet Owls during fall migration at the Church Point site
- addition of a third tower in the Clare area, specifically situated inland of Church Point, to examine potential of inland movements from the Church Point stopover area
- marking birds during an irruptive year to examine the possible role of intraspecific competition on Northern Saw-whet Owl decisions
- radio-mark a sample of birds in northern Nova Scotia to examine decisions made by these birds (e.g., possible movements through the NS-NB isthmus)
- radio-marking a larger sample of owls on Bon Portage Island to facilitate a study of factors influencing movements by Northern Saw-whet Owls away from a stopover site and overwater (future study)

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