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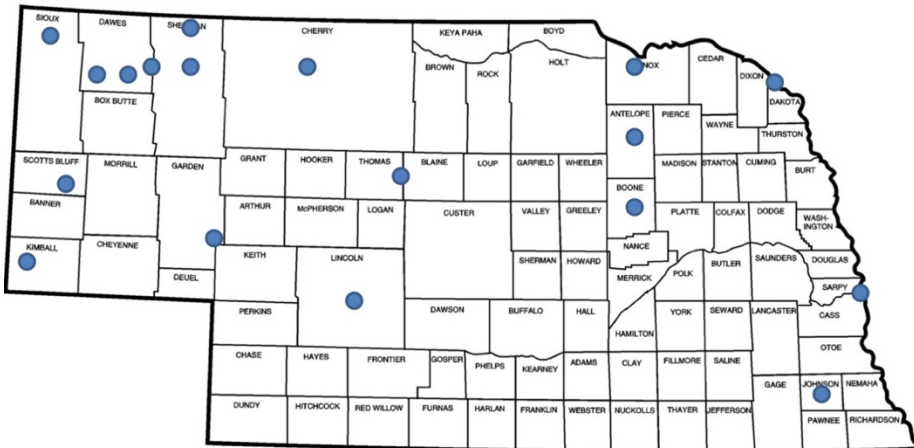
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Northern Saw-whet Owl (*Aegolius acadicus*) Nest Box Project: The First Seven Years

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Introduction

This report summarizes the first seven years of the nest box project for the Northern Saw-whet Owl in Nebraska. The project was initiated with several goals in mind: 1) to document breeding in Nebraska, 2) to get an idea of the breeding range of saw-whet owls, and 3) to establish their breeding phenology. The project started in 2012 with the placement of 29 boxes. Six boxes were added in 2015, four more in 2016, and eight in 2017. Below is a map of current nest box locations.



Methods

The initial boxes were built on a widely-available kestrel and screech-owl nest box pattern, with outside dimensions approximately 8" x 10" x 18", a flat roof, and a bottom-hinged front that drops open (Barquest and Ellarson undated). As more boxes were built, I made a series of modifications which resulted in a sloping, waterproof roof and a front that opened fully to allow cleaning. Dimensions varied somewhat through use of salvaged lumber. Dried chainsaw sawdust is used as bedding. Kestrels and both saw-whet and screech-owls have used all types of boxes in use and have shown no preference for any of the various patterns.

The boxes were placed in a variety of habitats, with 2-4 boxes placed at each site. The boxes are scattered across more than 75% of the state, an area of about 150,000 sq. km. (58,000 sq. mi.), and are located in Sioux, Scotts Bluff, Kimball,

Dawes, Sheridan, Garden, Cherry, Lincoln, Thomas, Knox, Antelope, Boone, Dixon, Sarpy, and Johnson counties. (See map.) Most of the boxes are located on public lands, either Nebraska Game and Parks or US Forest Service properties, with others placed on private lands. When the project began, a complete circuit of the route was made in February, March, April and May. More recently, a post-breeding season trip was added to empty the boxes of other species' nests, especially of House Wrens, to enable male saw-whets to occupy a box and establish a territory during the winter. A complete circuit of the route entails a drive of about 3060 km. (1900 mi.), with a separate trip usually required when there are chicks to be banded.

Beginning in 2014, the third year of the project, one or more of the boxes has been used by the owls each year (Mollhoff 2014). Breeding has also been documented at separate sites on two other occasions by the presence of fledged young.

Breeding activity, clutch size and young fledged

YEAR	CLUTCH	NUMBER	NUMBER	NOTES
COUNTY	SIZE	FLEDGED	BANDED	
2014				
Scotts Bluff	5	4	0	1 infertile egg
2015				
Scotts Bluff	7	6	6	1 chick cannibalized
Dawes	2	0	0	eggs abandoned
Dawes	not in box			3 chicks noted at other site
Dawes	6	6	6	
2016				
Scotts Bluff	not in box			1 roadkill chick at other site
Thomas	6	6	6	
2017				
Scotts Bluff	6	6	4	2 youngest chicks cannibalized
Blaine	not in box			2 chicks noted at other site
2018				
Garden	6	0	0	abandoned, female died?

Phenology

Eggs are usually laid at two-day intervals, with incubation beginning when the first egg is laid. The published incubation period is 26-28 days, with a nestling period of 27-34 days (Baicich and Harrison 1997, Cannings 1993).

Boxes were checked in early February, mid-March, mid-April, and mid-May. Most nests were discovered either while a clutch was still incomplete, or before the clutch was completely hatched. Thus it was usually possible to estimate the date of the first egg with reasonable accuracy. Throughout the project, the chicks were photographed to help define the appearance of known-age chicks. These pictures, combined with published descriptions of natal development, aid in estimating the initial date of egg-laying.

Estimated dates of the first egg: 5 February 2015 (Dawes Co.), 3 March 2016 (Thomas Co.), 12 March 2015 (Scotts Bluff Co.), 12 March 2018 (Garden Co.), 22 March 2014 (Scotts Bluff Co.), 23 March 2017 (Scotts Bluff Co.), and 1 April 2016 (Dawes Co.).

In one instance, a box was checked and there was no indication of nesting on 21 March, while 29 days later on 19 April, the completed six-egg clutch was well incubated. A follow-up visit 11 days later revealed all eggs hatched, with chicks ranging in age from 3-11 days. In this nest, the six eggs hatched within a period of 8-10 days, rather than the expected 11-13 day interval, implying that the eggs may have been laid at a shortened interval. When the chicks were banded on 17 May, it was difficult to interpret the order of hatching from the appearance of the chicks.

Prey

Boxes used by the owls are cleaned after the young fledge. The contents are dried and prey items identified. Boxes are left empty to dry out over summer. In the fall, fresh dry sawdust is added as roosting material for the males to overwinter and establish a territory, and his mate to shape the cup to hold her clutch of eggs in the spring.

As expected, small mammals comprised the bulk of prey items found in the boxes after the young fledged. Nomenclature follows Genoways et al. (2008.) The following table shows the breakdown by species and number of each prey item.

Because the nest is kept free of pellets and excreta until after the young hatch and the female typically leaves the nest only once a day to defecate (Cannings 1993), items found only represent prey delivered to the growing young and represent a minimum number of prey. When checking the boxes, I often found uneaten headless mice and voles. This may indicate that the brooding female may first devour the head, or that the male had eaten the prey's head before delivering the food. Others have also noted this activity (Mikkola 1983). Even when prey was delivered intact, the skull is usually fragmented by digestion. Occasionally only a single identifiable bone of a prey

prairie vole	<i>Microtus ochrogaster</i>	86
meadow vole	<i>Microtus pennsylvanicus</i>	6
vole species	<i>Microtus</i> spp.	33
deer or white-footed mouse	<i>Peromyscus</i> spp.	27
harvest mouse	<i>Reithrodontomys</i> spp.	8
kangaroo rat	<i>Dipodomys ordii</i>	1
silver-haired bat	<i>Lasionycteris noctivagans</i>	1
bird	probably a native sparrow	2

species was found, as in the case of the kangaroo rat listed above. Thus, analysis of items found in the box is only a partial accounting of the prey taken.

Use of nest boxes by other species

Charlie Miller reported other species using owl nest boxes (Miller 2010). This project confirmed that finding, with a variety of opportunistic cavity nesters taking advantage of the boxes. Data showed that 26.7% of the nest boxes were used by other species. These included white-footed mice (*Peromyscus leucopus*), eastern woodrat (*Neotoma floridana*), and fox squirrels (*Sciurus niger*), as well as cavity-nesting birds. The most common avian inhabitant was House Wren (*Troglodytes aedon*) n=44, followed by Mountain Bluebird (*Sialia currucoides*) n=10, Eastern Screech-Owl (*Megascops asio*) n=7, American Kestrel (*Falco sparverius*) n=4, Great Crested Flycatcher (*Myiarchus crinitus*) n=2, and Northern Flicker (*Colaptes auratus*), n=1.

On opening one box, I found most of the feathers of an adult male American Kestrel, (*Falco sparverius*) utilized as additional bedding by an Eastern Screech-Owl, with the remaining kestrel feathers in another box about 300 m. (330 yds.) away. When cleaning the first box later, I found a crushed kestrel egg beneath the kestrel feathers. Evidently the female screech-owl caught and killed the male kestrel incubating the egg at night and later nested atop his feathers.

Mortality

Two hatch-year fledglings were found road-killed.

I found one case of apparent predation on a Northern Saw-whet Owl. It consisted of the primary and secondary feathers of a saw-whet's wing, most of the rectrices, and a few contour feathers of the owl in a small area at the base of a tree where a box was located. From the amount of fallen pine needles and the appearance of the feathers, it was obvious that the feathers had been lying there for some months before I found them on 15 February 2017. From the fact that the feathers were

concentrated in a small area, I surmised that the predator had plucked the owl on the ground. This saw-whet may have fallen victim to another owl or to an accipiter. The feathers were visually compared to known-age specimens in the collection at the University of Nebraska State Museum, as well as examined under an ultra-violet light, but the age could not be determined.

Two instances of cannibalism were found.

In one instance, after the six chicks had been banded, the remains of the two youngest chicks were later found while cleaning the nest box, apparently having been cannibalized by their siblings. Had they been killed by a larger owl, such as an Eastern Screech-Owl, they would likely have been plucked, including the flight feathers, and eaten there or taken elsewhere, as I found in the case of the adult kestrel mentioned above. It appeared that the second youngest was the first to die, as only the cervical vertebrae and the pelvis, legs and feet were still articulated. The youngest chick was only partially eaten; the skeleton was almost entirely articulated and the flight feathers were still attached. Only the skull had been detached. At the time of banding, all six appeared to be well-fed and healthy. Similar activity has been reported elsewhere (Cannings 1987).

In a second instance of cannibalism, the partial remains of probably the youngest chick were found among the prey items.

Resident vs. migratory population

The common assumption, based on banding migrants, is that much of the northern population is migratory. The bulk of the birds banded during fall migration are females and hatch-year birds. The small number of after-hatch-year males banded during fall migration has led banders to suspect that many of the adult males remain on territory through the winter (Weidensaul 2015). There are recent reports of wintering saw-whets remaining in northern Arkansas and northern Iowa until mid-March before beginning the return migration in the spring (Jerry Toll, personal communication). My discovery of a female laying eggs no later than 5 February (Silcock 2015), along with a recent report of egg-laying in northwestern South Dakota in February (Nancy Drilling, personal communication), make it seem likely that parts of our populations in Nebraska and South Dakota also have at least some non-migrant female residents.

I suspect that one female used the same box in successive years. In the first year, while I was examining the chicks at the box, a female sat 3 - 5 m. (10 - 16 ft.) away, clicking her beak in protest. The following year, while I was doing the same thing, the female acted more agitated while sitting in the same approximate location. She was clicking her beak and then flew over and struck my elbow with her wing as I put one of the chicks back in the box. However, since the bird was not banded, I could not confirm that she was the same bird as the one I had observed in the previous year. Since that time, we have been attempting to catch and band the adults as well as the chicks.

Conclusion and questions

This study, along with an ongoing study in South Dakota (Drilling 2015), makes it appear that we share an isolated breeding population. However, a continent-wide study thus far indicates that the birds show little local, or even regional, site fidelity. Increased research including banding and genetic study remains to be conducted before any conclusion can be made.

Since 1978, breeding has been confirmed in Scotts Bluff, Dawes, Garden, Cherry (Len McDaniel, pers. comm.), Thomas, and Antelope (Dave Heidt, pers. comm.) counties. Confirmation has occurred annually in Scotts Bluff County for four of the past five years, and in two of the past four years in Dawes County. Additionally, breeding season birds have been reported on territory in Sioux, Sheridan, Kimball, Lincoln, and Keith counties (Bart Bly and Peter Hill, pers. comm.). Calling birds have also been reported during the breeding season in Dixon and Knox counties (Ed Brogie, pers. comm.). Thus it seems likely that the birds breed at least occasionally over much of the Panhandle and northern Nebraska. Only time will tell if this is an aberration or a regular occurrence.

There are too few reports from this project to speculate on a population estimate, but the earlier carefully-designed calling survey in the Panhandle indicated a population of 48 pairs in the Wildcat Hills and Pine Ridge areas of western Nebraska (Bart Bly, pers. comm.).

There have been too few chicks banded at their natal sites in North America to develop any pattern of dispersal; indeed, banding returns suggest random dispersal and little or no site fidelity by either females or hatch-year young. Even the habitats used have been inconsistent with those found in published literature. It would be a vast understatement to say that much more work remains to be done.

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Editor's Note: Readers are reminded that all native birds and their nests are protected by state and/or federal law. Individuals handling adult birds, nestlings or eggs are required to obtain both state and federal permits. All individuals are encouraged to avoid unnecessarily disturbing or harassing birds, particularly during the breeding season.

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