BANDING STUDIES OF NESTING NORTHERN SAW-WHET OWLS IN NORTHWESTERN SOUTH DAKOTA

N. Saw-whet Owl peering from a natural cavity nest in the East Short Pines, April 2015. Photo: Nancy Drilling

Remainder of a nestbox after the April 1-4, 2015 Moonshine fire, Slim Buttes. Photo: Nancy Drilling

Photo: Sara Germaine

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SUMMARY

Northern Saw-whet Owl (*Aegolius acadicus*; hereafter NSWO), the most common owl in coniferous forests of western South Dakota, have readily bred in owl nestboxes placed in Custer National Forest, Harding County since 2003. Since 2012, many of the breeding adults and nestlings have been banded and some of these have been recaptured at other times and places, providing surprising and interesting information on the movements and survival of these birds.

This research continued banding in 2015, which was a peak reproduction year based on a four-year cycle. In 2015, 38% of available nestboxes were used in 47 nesting attempts. The year saw a record early start date (in February), record clutch size (9 eggs), highest average clutch size (6.0 eggs), highest hatch rate (90.2%), highest average number of fledged owlets (5.6), and highest total number of fledglings (235). We captured the female at 27 nests, 12 were already banded. Two of these gave us new discoveries to science. One female had first been banded as a nestling in 2013 and she bred in her natal nestbox in 2015. This is only the second documented instance of natal philopatry in this species. The other discovery was that of a female that successfully raised two broods, the first ever documentation of double-brooding in the wild. We also banded 92 nestlings in 21 broods and recaptured three of these (3%) at a later date. This recapture rate was well below the 12% fledgling recapture rate experienced during 2012-2014.

More banded owls increases the probability of recapture, which in the long-term contributes to our understanding of between-year site fidelity, residency status, and migration patterns of these common, but little-studied owls. Our results to date have yielded surprising and interesting information. We plan to continue both summer and migration period banding, hoping to band more breeding males to better understand their site fidelity and residency status.

INTRODUCTION

Northern Saw-whet Owl *Aegolius acadicus* (NSWO) is the most common breeding owl in the coniferous forests of North America, including in western South Dakota (Cannings 1993, Peterson 1995, Drilling 2010, U.S. Forest Service 2009). Despite this, little research has been conducted on this species during the breeding season, especially longer-term banding studies of breeding fidelity, residency status, and movements (Cannings 1993, Rasmussen *et al.* 2008). No such research has occurred in South Dakota or the Great Plains (Johnson and Anderson 2003, Rasmussen *et al*. 2008). In particular, studies of banded nestlings are almost non-existent.

One reason for the lack of research is because finding enough natural nests for a population study is very difficult and there are few nestbox projects (Project Owlnet online, unpubl. data; Marks *et al.* 2015). Most nestbox projects that do exist either have too few boxes or too low of an occupancy rate to produce an adequate sample size for many research questions. Fortunately in South Dakota, there is an ongoing owl nestbox project that does not have these problems. Begun in 2003 by Charlie Miller, there are now 122 nestboxes in the five subunits of Custer National Forest located in Harding County; the North Cave Hills, South Cave Hills, Slim Buttes, East Short Pines and West Short Pines.

One intriguing result from this long-term data set is the hint of a four-year breeding cycle, in which there were significantly higher numbers of nests and fledglings produced in 2007 and 2011, followed by an 'average' year (2003 & 2004, 2008, 2012), then a very low year (2005, 2009, 2013). The possibility of a four-year cycle in NSWO reproduction has been put forward as an explanation for four-year cycles in number of hatch-year owls caught at fall banding stations, but this has never been documented in a breeding population (Marks 1997, Rasmussen *et al.* 2008, Brittain *et al*. 2009). If this pattern holds, the 2015 breeding season was expected to be a peak year in the cycle. If so, the results of the 2015 breeding season provide strong support that this phenomenon actually occurs.

Throughout its range, including in western South Dakota, another knowledge gap concerns NSWO movements. One enduring debate has been whether NSWO are nomadic, as are some other owl species such as Long-eared and Short-eared owls, or rather, have high site fidelity to breeding sites and migratory pathways (Marks and Doremus 2000, Beckett and Proudfoot 2011). Another question which applies to South Dakota populations, is whether this species, which can be found year-around in appropriate habitat, is resident, partially migratory, or migratory (Backlund and Dowd-Stukel 2006, Rasmussen *et al*. 2008). Concerning fledgling movements, Drilling (2012) caught an unusually high proportion of hatch-year birds in Custer National Forest after a very successful breeding season during the 2011 fall migration season. Did these owls hatch at the site, or were they migrants from elsewhere? And, to where do the NSWO produced in the nestboxes disperse?

To answer these questions, adults and nestlings need to be marked. We began banding breeding females and nestlings in 2012, with 18 nestlings banded in 2012, two nestlings in 2013, and 39 nestlings in 2014. To date, seven nestlings (12% of banded nestlings) have been recaptured. To our knowledge, the recapture of a NSWO first banded as a nestling at another location has never before been documented. This report gives the results of adult and nestling banding and recaptures in 2015

PROJECT OBJECTIVES

1. Band all NSWO nestlings and as many breeding adults as possible. In conjunction with fall migration banding in Custer National forest, this will enable us to:
    a. Determine residency status of SD owls
    b. Determine level of nest-site or natal-site fidelity in subsequent breeding seasons
    c. Understand post-breeding movements and migration pathways in the Great Plains
2. Provide opportunities for young scientists to participate in field research.

METHODS

Nestbox Construction and Study Area

Nestboxes were made of wood with a detachable lid. On the inside, boxes were 8" square, and front and back panels are 20"and 21" high, respectively. The top of the 3" circular opening was 2" below the lid. Below the opening on the inside were a series of 1/4" shallow saw curves to allow the birds to easily climb out of the box. The bottom had three or four 1/2" drainage holes

while several 1/2" ventilation holes were drilled near the top. Nestboxes were mounted approximately 2.5 – 3 m high on tree trunks.

Nestboxes were located on the scattered tablelands which arise 100-200 m above the surrounding grasslands in Custer National Forest, Harding County, South Dakota. Of the 122 boxes, nine were in the East Short Pines unit of Custer National Forest, two were in West Short Pines, 11 in North Cave Hills, nine in South Cave Hills, and the remaining 91 were in Slim Buttes.

Many boxes were placed in wooded ravines, dominated by Green Ash (*Fraxinus pennsylvanica*) and Chokecherry (*Prunus virginiana*). Some boxes were in Ponderosa Pine (*Pinus ponderosa*) stands which occur on upland areas and slopes. Other major woody vegetation species included Skunkbrush (*Rhus aromatica*), Western Snowberry (*Symphoricarpos occidentalis*), Creeping Juniper (*Juniperus horizantalis*), and in drier areas, Rocky Mountain Juniper (*Juniperus scopulorum*) (Hansen and Hoffman 1988).

Owl Banding and Marking

Female owls were caught at the nestbox while they brooded their young, during the first 15 days after hatching. We waited to attempt capture until after the nestlings hatched, to avoid the chance that the female would abandon her nest (Cannings 1993). We captured brooding females by covering the entrance hole with a long-handled fishing landing net into which they flushed when they heard noises.

Once extracted from the nestbox or net, each owl was taken to a nearby processing area for banding, measuring, and aging. Each unbanded owl received a uniquely numbered federal aluminum band on the right leg. All owls were weighed and measured. Measurements included relaxed wing chord and tail length. During the breeding season, only the female has a brood patch. If a bird did not have a brood patch, sex was determined using a regression equation that utilizes mass and wing chord measurements (Project Owlnet 2001). All adult owls were aged by wing feather molt pattern (Pyle 1997).

Nestlings were banded and weighed when they were adult-sized, at approximately 28-35 days old. Nestlings were banded with a uniquely-numbered aluminum band distributed by the U.S.G. S. Bird Banding Laboratory. Because most of the owlets were near fledging age, we blocked the entrance hole with a wadded sock for 5to10 minutes after we put the owlets back into their nest. This allowed the birds to calm down and prevent premature fledging.

Owls were banded under the Bird Conservancy of the Rockies federal Master permit #22415, administered by BCR biologist Nancy Gobris in Brighton, CO. All protocols, including animal safety guidelines and the Bander's Code of Ethics, were written into a Field Protocol manual and kept in the Field Banding Notebook. The Field Notebook also had copies of all permits and project proposals.

Reproductive Success

Before the nesting season, all nestboxes were cleaned out, and fresh wood shavings added by Charlie Miller of Buffalo, SD. Nestboxes were monitored for nesting activity between early March and mid-July 2015. Before mid-April, checks consisted of walking by a box; the female

usually looks out if she is present. Starting the second week of April, all boxes were opened. If a box had a nest, the number of eggs and nestlings, number of stored prey items visible and approximate age of nestlings were recorded . After the owls fledged, the prey mat at the bottom of the box was examined for unhatched eggs, nestling remains, and prey remains. From these checks, clutch size, number of eggs hatched (hatching success), and number of fledged owls (fledging success) was calculated.

RESULTS and DISCUSSION

2015 Nesting Season

Nesting in 2015 began in late February, a record early date, and at least 20 nests were active by mid-March, the usual start date for nesting. On April 1-4, 2015 the Moonshine fire burned 2800 acres of north Slim Buttes, where there were 44 nestboxes and 18 nesting saw-whet owls (Miller 2015). The fire burned four nestboxes (one had a nest) and caused the abandonment of three other nests. However, 15 nests in the fire zone survived and eventually fledged young.

By the end of the season, Northern Saw-whet Owls attempted nests in 47 of 122 available nestboxes (Table 1, Figure 1). Of these, 89.4% fledged at least 1 owlet. In addition, two nests in natural cavities were found, one in the East Short Pines and one in the North Cave Hills, but these nests were not accessible and the nest outcomes are unknown.

Table 1. Summary of 2015 Northern Saw-whet Owl reproductive success in nestboxes in Custer National Forest, South Dakota, compared to 2004-2014 combined data.

	2004-2014	2015
Median percent nestboxes used per year	13	38.5
Percent attempted nests that were successful	85.4	89.4
Percent of eggs in full clutches that hatched	84.1	90.2
Percent of hatched eggs that fledged	85.9	94.8
Average clutch size (full clutches only)	5.2	6.0
Average brood size (hatched nests only)	4.8	5.9
Average number of fledglings per hatched nest	4.4	5.6
Total number of fledglings produced per year (range)	2 - 204	235

Number of eggs laid in full clutches ranged from four to nine eggs, with an average clutch size of 6.0. This average equaled the highest average clutch size of any year, also achieved the first year of the project (Figure 2). In addition, a clutch of nine eggs has never been observed during this study and is considered exceptionally rare (Rasmussen *et al.* 2008). Of the 275 total eggs laid in 2015 nests, 248 hatched (90.2% hatch rate). This was the highest hatch rate of any year of the project that had at least 5 nests (Figure 3). The number of fledglings per nest ranged from 1 to 9 and averaged 5.6, the highest average ever (Figure 4). In total, 238 owlets fledged, the most number of fledglings produced during the 11 years of this project. Thus, arguably, 2015 was the

best breeding season thus far and confirms the existence of a four-year peak breeding cycle in this study area.

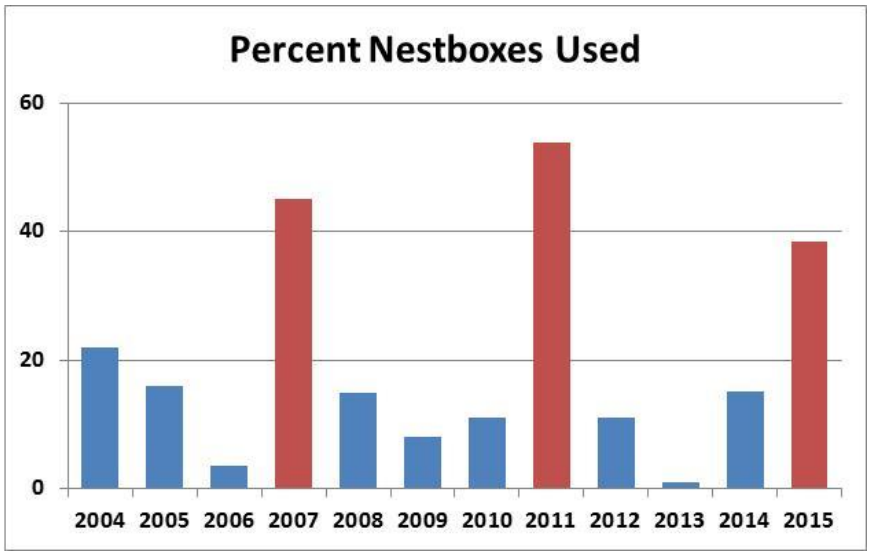

Figure 1. Percent of available nestboxes used by Northern Saw-whet Owls each year in Custer National Forest, South Dakota. Number of nestboxes available ranged from 36 boxes in 2004 to 122 boxes in 2015.Rose-colored bars are peak years, in terms of number of nests initiated.

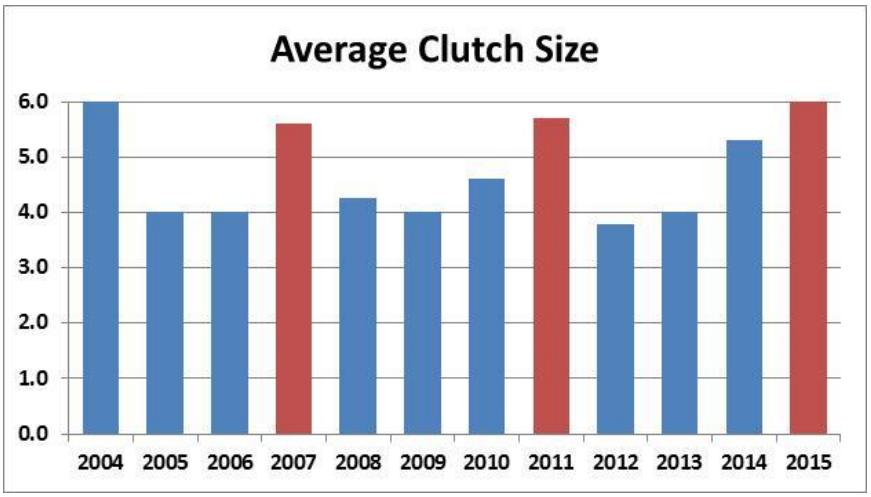

Figure 2. Average clutch size per year in Northern Saw-whet Owl nests in Custer National Forest, South Dakota. Rose-colored bars are peak years, in terms of number of nests initiated.

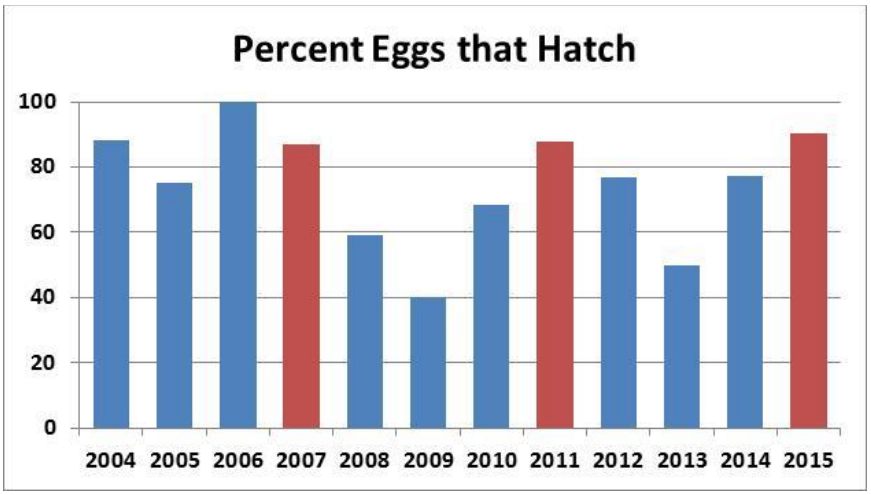

Figure 3. Annual percentage of eggs that hatch of Northern Saw-whet Owl nests with full clutches, in Custer National Forest, South Dakota. 2006 had just 2 nests and 8 eggs. Rose-colored bars are peak years, in terms of number of nests initiated.

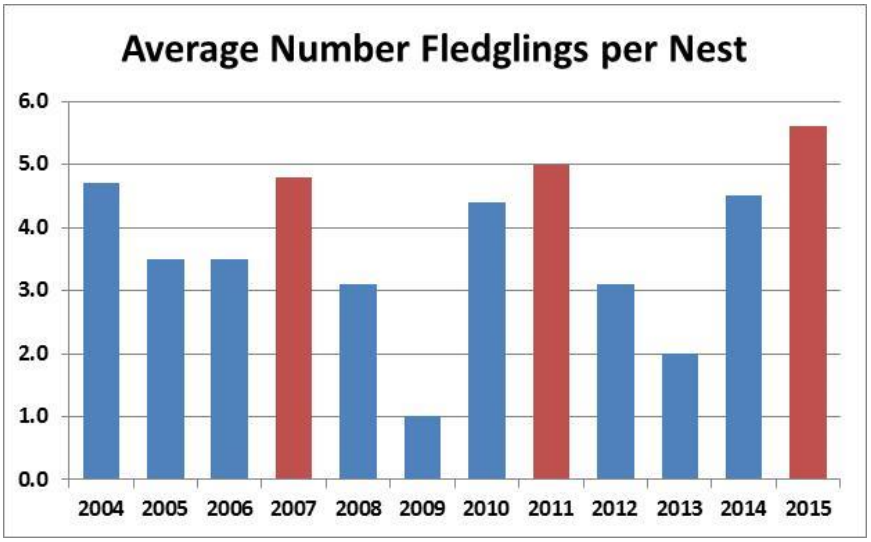

Figure 4. Annual average number of Northern Saw-whet Owl fledglings produced per nest that hatched at least one owlet in Custer National Forest, South Dakota. Rose-colored bars are peak years, in terms of number of nests initiated.

Breeding Adult Banding

We captured the female at 27 nests. Of the captured females, 12 (44%) were already banded while 15 were unbanded. Of the 12 recaptures, eight were first banded the previous autumn at the North Slim Buttes banding station, two were known to have previously bred in Custer National Park, and two were special discoveries (see below). Also of interest, one of the breeding females was first banded as a HY bird in November 2011 and has since nested at least three times at Slim Buttes (2013, 2014, 2015), fledging a total of 14 owlets.

Two recaptures are new discoveries. First, a female banded as a nestling at Slim Buttes in 2013 was recaptured incubating eggs this summer, in the same nestbox in which she was raised. She started her nest in June, relatively late in the season, and five nestlings hatched, but only one appears to have fledged. This is only the second documentation of natal philopatry in this species (J. Marks, *pers. commun.*).

Second, for the first time in this species, we have documented double-brooding by a female. This bird laid seven eggs and fledged five owlets in mid-May. She then moved about 400 m away to raise her second brood, which fledged four owlets in early August. We did not capture the male at either nest. While both parents often feed the fledglings, the male is the primary provisioner and females often abandon the brood before they are fully independent (Hinam and Clair, 2008, Rasmussen *et al.* 2008). We assume that this allowed the female to raise two broods.

Nestling Banding

In 2015, nestling banding was hampered by the Mother's Day blizzard, which occurred over the four-day period that was the peak nestling banding period. We had to wait for the snow to melt until we were able to access the nests and thus, missed banding at least 24 owlets in 10 nests that fledged before we could get to them. Over the entire summer, we banded 92 nestlings from 21 nests. All 92 nestlings appeared to have successfully fledged.

Three birds banded as nestlings were recaptured after they fledged, just 3.3% of all banded nestlings (Table 2). Prior to 2015, 12% of all banded nestlings had been recaptured at a later date. In 2015, all recaptured owls banded as nestlings were recaptured during the fall banding season at the North Slim Buttes banding station. One had been banded in May, but the other two had been banded at the very late date of August 2nd, suggesting that they may have just become independent from their parents and not yet left their natal area.

Table 2. Recapture details of Northern Saw-whet Owls banded as nestlings in Custer National Forest, Harding County, SD between 2012 and 2015. 2015 recaptures are highlighted in green.

Original Banding Location	Recapture Location	Approximate Distance	Original Banding Date	Recapture Date	Number of Days
Slim Buttes	Slim Buttes	0.4 miles	5/31/2012	9/8/2012	100
Slim Buttes	Slim Buttes	0.5 miles	7/12/2013	10/22/2013	102
Slim Buttes	Slim Buttes	7.9 miles	5/31/2012	10/14/2012	136
Slim Buttes	T.Roosevelt Nat.Prk, N.D.	100 miles	7/12/2013	11/2/2013	113
Slim Buttes	Slim Buttes	0.5 miles	5/18/2014	10/13/2014	148
Slim Buttes	Slim Buttes	0.9 miles	7/20/2014	10/26/2014	98
S. Cave Hills	Beaver Crk Reserve, WI	600 miles	5/18/2014	10/16/2014	151
Slim Buttes	Slim Buttes	0.6 miles	8/2/2015	10/15/2015	74
Slim Buttes	Slim Buttes	0.9 miles	5/30/2015	10/18/2015	141
Slim Buttes	Slim Buttes	1.9 miles	8/2/2015	11/5/2015	95

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