Proceedings of the Fourth International
Partners in Flight Conference: Tundra to Tropics
565–568

USING NEST BOXES FOR LEWIS'S WOODPECKER CONSERVATION IN CENTRAL OREGON

Diane Kook[1] and James D. Moodie[2,3]

[1]*22089 Sweetgrass Drive, Bend, Oregon 99702, USA; and*
[2]*Science Department, Central Oregon Community College, Bend, Oregon 97701, USA*

Abstract. The Lewis's Woodpecker (*Melanerpes lewis*) is a North American picid that is in decline over the past 40 years, due in large part to a lack of suitable breeding sites. We explore the efficacy of efforts to enhance breeding opportunities for Lewis's Woodpeckers through the employment of nest boxes. Currently, it is unknown if this species will use artificial nest cavities. We placed nest boxes on live Ponderosa Pine (*Pinus ponderosa*) trees within burned forest tracts, where burning occurred between seven and 13 years prior to the initiation of the study. After three years of essentially no use by the birds, we observed increased nest box usage during the breeding season the following two years. Our data suggest that Lewis's Woodpeckers will use nest boxes with greater frequency as natural cavities become less available. We propose the use of nest boxes as part of a conservation strategy to expand Lewis's Woodpecker populations.

Key Words: conservation, Lewis's Woodpecker, *Melanerpes lewis*, nest box.

EL USO DE CAJAS NIDO PARA LA CONSERVACION DEL CARPINTERO DE LEWIS EN EL OREGON CENTRAL

Resumen. El Carpintero de Lewis (*Melanerpes lewis*) es un picid norteamericano que se ha declinado desde hace los últimos 40 años, debido, en gran parte, a una falta de adecuados sitios de reproducción. Exploramos la eficacia de los esfuerzos de aumentar las oportunidades de reproducción para los Carpinteros de Lewis por el empleo de cajas de nido. Actualmente, no se sabe si esta especie utilizará cavidades artificiales de nido. Colocamos cajas nido en árboles de Pino de Ponderosa (*Pinus ponderosa*) en tractos de bosque ya quemados, donde la quemadura había ocurrido entre siete y 13 años antes del comienzo del estudio. Después de tres años de casi ningún uso por los pájaros, nosotros observamos un aumento del uso de las cajas nido durante la temporada de reproducción los dos años siguientes. Nuestros datos sugieren que los Carpinteros de Lewis utilizarán cajas nido con mayor frecuencia al llegar a ser menos disponibles las cavidades naturales. Proponemos el uso de cajas nido como parte de una estrategia de conservación para expandir poblaciones del Carpintero de Lewis.

INTRODUCTION

Lewis's Woodpeckers (*Melanerpes lewis*) occur throughout the western United States and Canada. The species has declined in numbers for several bioregions within its range since the 1960s by as much as 60% based on breeding bird survey (Sauer et al. 2008) and Christmas bird count (Tashiro-Vierling 1994) data. It is considered a high priority species among conservation groups and the federal government (Rich et al. 2004, Butcher et al. 2007). Analysis of Lewis's Woodpecker population declines points to the loss of appropriate breeding habitat, notably the loss of large snags from burned over forest (Saab and Dudley 1998). Lewis's Woodpeckers are unusual as a Piciform species in that they occupy existing tree cavities or require soft, decaying trees in which to excavate a nesting cavity (Winkler et al. 1995). Typically, nest holes are located near the top of large diameter snags at heights greater than five meters (Vierling 1997, Gentry and Vierling 2007). There are, however, no published reports of Lewis's Woodpeckers using nest boxes of which we are aware.

Supplementing natural tree cavities with nest boxes has been used as a conservation strategy for many species that are obligate tree hole nesters with success in halting or even reversing declining populations (e.g. American Kestrel, *Falco sparverius:* Toland and Elder 1987, Eastern Bluebird, *Sialia sialis,* Sauer et al. 2008). We initiated a study to ascertain if a similar approach could be used to enhance local breeding Lewis's

[3] E-mail: jmoodie@cocc.edu

Woodpecker populations. Specifically, we explored whether Lewis's Woodpeckers would use nest boxes for breeding purposes.

METHODS

The study site consisted of three separate areas within the Deschutes National Forest, located in Central Oregon, USA. The approximate sizes of each study area are: Entrada 1.12 ha, Shevlin Commons 0.56 ha, and Horse Butte 0.56 ha. Sites were selected because each is part of a burned over forest (Entrada and Shevlin Commons burn dates: 1990; Horse Butte: 1996), and Kook observed several *M. lewis* at each location. Additionally, habitat for the three study areas are similar, comprised of previously burned standing snags with a mix of open Pondersosa Pine (*Pinus ponderosa*) and Western Juniper (*Juniperus occidentalis*). Major understory brush includes Manzanita (*Arctostaphylos patula*) and Bitterbrush (*Purshia tridentata*).

Placement and observation of nest boxes began in the spring of 2003 and additional boxes were located on the study sites through 2007. We based nest box size on observations of Lewis's Woodpecker natural cavity parameters (Hardie, unpublished data). Nest boxes were constructed from Cedar or Breckenridge siding material (Roseburg Forest Products, Roseburg, OR). Box dimensions were approximately 19 x 19 cm with depths ranging from 36 to 53 cm. We placed ~15 cm of mixed wood shavings in the bottom of each box for insulation. Three entrance hole diameters were used following Winkler et al. (1995) and Hardie (unpublished data): 5, 6.5 or 8 cm. We located each box on a snag at one of three heights: 2.13, 3.35 or 4.57 m, based on heights of natural cavities occupied by this species locally (Hardie, unpublished data). After the first year, however, we placed nest boxes on live trees because snags tended to fall over, often destroying the box. We attempted to evenly distribute boxes throughout each study area. Additionally, during the third year of the study, we modified the fronts of each new box by adding bark pieces from Ponderosa Pine.

For each area, we positioned four boxes within the site. Subsequently, additional boxes were added to only one of the study areas (Entrada site) due to greater concentrations of birds at this site. These new boxes all had an entrance hole diameter of 6.5 cm and were set at 3.35 m from the ground.

Kook or a volunteer checked nest boxes one to two times weekly beginning in late April and continuing through early July. We looked for evidence of nest box use, including mate flight displays around the nest box tree, drumming on the box, adult bird entering or leaving the box, occupation of the box by two adults, and feeding of young at the box. We considered successful occupancy to be when we observed a pair of birds going into and out of a nest box for four consecutive weeks.

Statistical Analyses

We tested bird preferences for nest box entrance hole diameter and height placement using chi-square contingency tests, and tested preference for nest boxes with or without bark on the face of the box using the Fisher's Exact Test (Zar 1984). For all tests, we combined 2006 and 2007 data as data suggest Lewis's Woodpeckers have fidelity <50% for reusing nest cavities from year to year (Saab et al. 2004).

RESULTS

In 2003, one nest box at the Entrada site was occupied and a volunteer observed six eggs in the box. Two days after, the eggs were missing and no other activity by the Lewis's Woodpecker pair at the box was observed. All other boxes at each of the three areas went unoccupied. For the following two years, we observed no nest boxes being used. During this time, we estimated between 27 and 36 individuals using Entrada, eight birds at Shevlin Commons and 12 individuals at Horse Butte per year based on the number of birds observed visiting nest boxes and natural cavities combined.

In 2006, we observed occupation for eight of 16 boxes (50%) at the Entrada site. For seven of the eight occupied boxes (88%), *M. lewis* successfully fledged young. We observed no nest box use at the Shevlin Commons or Horse Butte sites. In 2007 at Entrada, Lewis's Woodpecker pairs occupied 18 of 25 boxes (72%); of those 18 occupied boxes, 16 (89%) produced fledglings. We estimated 48 adult birds present at this site during the breeding season. At Shevlin Commons and Horse Butte, we estimated four birds at each site, but we detected no boxes being occupied at these sites. Birds used boxes independent of nest box entrance hole diameter ($\chi^2 = 1.9$, df = 2, $P = 0.387$; Table 1). However, for nest box placement height, birds avoided the lowest placed boxes ($\chi^2 = 7.2$, df = 2, $P = 0.02$; Table 1). In addition, for the presence or absence of bark on the front of the boxes, we observed a trend toward favoring those boxes with bark (Table 1). In 2006 we observed six of nine boxes with bark and two of seven boxes without bark occupied by nesting Lewis's Woodpeckers. In 2007, 15 of 18 boxes with bark and only three of seven boxes without bark

TABLE 1. Nest box usage patterns for Lewis's Woodpeckers on Entrada site, 2006–2007. Bark refers to tree bark placed on the front (face) of the nest box.

	Nest Box Parameter							
	Entrance Hole Diameter (cm) [a]			Height on Tree (m) [b]			Box Face Surface [c]	
	5.0	6.5	8.0	2.1	3.4	4.6	Bark	No Bark
No. Occupied	21	4	2	2	18	6	21	6
No. Available	29	8	4	8	23	10	5	9

[a] $\chi^2 = 1.90$, df = 2, $P = 0.387$.
[b] $\chi^2 = 7.32$, df = 2, $P = 0.026$.
[c] Fisher Exact Test, $P = 0.02$.

were occupied by nesting birds. When we combined years, we found a significant preference for barked boxes (21 of 27 barked boxes occupied versus five of 14 un-barked boxes, Fisher's Exact test, $P = 0.02$).

DISCUSSION

Lewis's Woodpeckers responded positively to placement of nest boxes within one of their natural breeding areas, the Entrada site. Our results, based on estimates of number of adult individuals at the Entrada site, suggest that adding nest boxes can support greater numbers of breeding pairs than depending on natural cavities alone. While the birds responded positively at the Entrada, we found no such results at either Shevlin Commons or Horse Butte. Shevlin Commons burned intensively with few live trees remaining. Snags fell over throughout the study, which may have led birds to avoid the area over time (estimated number of birds present in 2005: 12 vs. 4 in 2007). Reasons for Lewis's Woodpeckers not using boxes at Horse Butte are unclear. Perhaps, given the size of the burn (>7500 ha), it is possible that the demand for nest cavities is low as there are numerous standing snags outside of the study area, but this remains untested. While we did find Lewis's Woodpeckers responding positively to one of our three sites, further studies to clarify burned forest parameters that promote nest box usage are warranted.

An important aspect of our study is that when Lewis's Woodpecker pairs employed artificial nest sites these pairs were very successful at rearing chicks to fledging. While a comparison of reproductive success for the Lewis's Woodpecker between natural cavities and nest boxes is unavailable, it appears likely that nest boxes can be used to improve breeding opportunities of populations where potential nesting sites are declining given that nesting success by breeding pairs using nest boxes was higher (88%) than published nesting success for birds using natural nesting cavities (Saab and Vierling 2001: range: 46–78%). For Bluebird species, the North American Bluebird Society is using a nest box program on a grand scale to counter the effects of reduced natural nesting sites for the birds. While the effectiveness of a wide spread and long term Lewis's Woodpecker conservation program using nest boxes is unknown as a replacement for the lack of natural cavity sites, such as snags, for the health of woodpecker populations, our results suggest this technique can be beneficial for curtailing population decline in the short term. We encourage other conservation professionals to initiate nest box studies to replicate our results and test the robustness of our results in other habitats.

We found no preference for nest box entrance hole diameter among the three sizes we used, but the woodpeckers did show an avoidance of boxes placed at lower heights on snags or tree. This is not surprising considering this species is known to use nest cavities that are located on average near five meters on snags (Vierling 1997, Gentry and Vierling 2007). One important aspect of Lewis's Woodpecker nest boxes that merits further study is the application of bark to the front of the box. We frequently observed adult and fledging birds clinging to the bark prior to entering the box or upon exiting the box. Adults also used the bark to manipulate insects in preparation of feeding young or to stash food. We contend that bark is a key factor in *M. lewis* choosing to nest in these boxes, but further investigation is needed.

Given the positive response to nest boxes placed on live trees by birds at the Entrada site, it may be possible to enhance degrading Lewis's Woodpecker habitat allowing populations to even out or rebound. This management technique could be especially useful to stabilize populations where breeding opportunities have become limited due to a diminished number of potential nest sites as snags fall over due to age or weather or intentional removal.

ACKNOWLEDGMENTS

We enthusiastically voice our appreciation of the volunteers that assisted throughout all

aspects of this citizen science study. Thanks to Judy Meridith, Dean Hale, Howard Horvath, David Davis, Peter Low, Cort Vaughn, Chris and Lynn Iverson, Kristi Johnson, Candice Cobb, Kevin Smith, Marion Davidson, and Liz O'Connell. Special thanks to Dean Hale for constructing the nest boxes and Don McCartney for advice on nest box design and placement. We also thank A. Dayer and S. Melvin for constructive suggestions on an earlier draft of the manuscript. The East Cascades Bird Conservancy and Andy Crosby of Shevlin Commons provided funding.

LITERATURE CITED

Butcher, G. S., D. K. Niven, A. O. Punjabi, D. N Pashley, and K. V. Rosenberg. 2007. The 2007 WatchList for United States Birds. American Birds 61:18–25.

Gentry, D. J., and K. T. Vierling. 2007. Old burns as source habitats for Lewis's Woodpeckers breeding in the Black Hills of South Dakota. Condor 109:122–131.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elaias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American landbird conservation plan. Cornell Lab of Ornithology, Ithaca, NY.

Saab, V. A., and J. G. Dudley. 1998. Responses of cavity-nesting birds to stand-replacement fire and salvage logging in Ponderosa Pine/Douglas-fir forests of southwestern Idaho. USDA Forest Service Research Paper RMRS-RP-11.

Saab, V. A., J. Dudley, and W. L. Thompson. 2004. Factors influencing occupancy of nest cavities in recently burned forests. Condor 106: 20–36.

Saab, V. A., and K. T. Vierling. 2001. Reproductive success of Lewis's Woodpeckers in burned pine and cottonwood riparian forests. Condor 103:491–501.

Sauer, J. R., J. E. Hines, and J. Fallon. 2008. The North American Breeding Bird Survey, Results and Analysis 1966–2007. Version 5.15. 2008. USGS Patuxent Wildlife Research Center, Laurel, MD.

Tashiro-Vierling, K. Y. 1994. Population trends and ecology of the Lewis' woodpecker (*Melanerpes lewis*) in southeastern Colorado. University of Colorado. Boulder: CO. 73 p. M.A. thesis.

Toland, B. R., and W. H. Elder. 1987. Influence of nest-box placement and density on abundance and productivity of American Kestrels in central Missouri. Wilson's Bulletin 99:712–717.

Vierling, K. T. 1997. Habitat selection of Lewis' Woodpeckers in Southeastern Colorado. Wilson's Bulletin 109:121–130.

Winkler, H., D. A. Christie, and D. Nurney. 1995. Woodpeckers: a guide to the woodpeckers, piculets and wrynecks of the world. Pica Press, Tonbridge, UK.