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PERSISTENCE OF THE BOREAL OWL IN NEW MEXICO: 1987–2012

DALE W. STAHLCKER, Eagle Environmental, Inc., 30 Fonda Road, Santa Fe, New Mexico 87508; dale@eagleenvironmental.net

EDWARD P. MACKERROW, New Mexico Consortium, 4200 West Jemez Road, Suite 301, Los Alamos, New Mexico 87544

HIRA A. WALKER, New Mexico Department of Game and Fish, P. O. Box 25112, Santa Fe, New Mexico 87104 (current address: 316 Amherst Drive SE, Albuquerque, New Mexico 87106)

JONATHAN P. BATKIN, 129 West Zia Road, Santa Fe, New Mexico 87505

BERNARD R. FOY, 214 Spruce Street, Santa Fe, New Mexico 87501

ABSTRACT: To better understand the status of the Boreal Owl (*Aegolius funereus*) at the southern extremity of its North American range, we conducted audio playback surveys between late July and mid-October 2012 at seven of the nine northern New Mexico locations where the species had been documented between 1987 and 1993, as well as four additional locations 10–15 km from sites of previous detections. All survey locations were in subalpine conifer forest at elevations >3000 m above sea level. In total, we called in at least 12 individuals (6 adults and 6 juveniles) at or near six of the seven historical locations and at least three adults at two new locations. Of the eight locations with confirmed Boreal Owl detections, two were in the San Juan Mountains, two were in the Jemez Mountains, and four were in the Sangre de Cristo Mountains. Recently fledged owls were seen at both San Juan Mountain sites and photo-documented at one site. Adult owls were photo-documented at the other six locations. Detection of Boreal Owls at six of seven historical locations confirmed the species' long-term residency in New Mexico's three northern mountain ranges. While Boreal Owls have likely been present in New Mexico since the Pleistocene, climate change appears likely to threaten their high-elevation habitat, particularly since more frequent and larger fires are predicted in the future as the forest dries.

INTRODUCTION

Twenty-five years after the Boreal Owl (*Aegolius funereus*) was first photo-documented in New Mexico on 15 April 1987 (Stahlecker and Rawinski 1990), its status in the state remains an enigma. This is not surprising given that there has been no systematic effort to survey the owl's distribution since

1993 (Stahlecker and Duncan 1996). The species has been reported only occasionally since 1993 (Stahlecker 2010), except in one small area near the Colorado border where birders seek it out by broadcasting recordings. Lack of information on its status over the intervening two decades led the New Mexico Department of Game and Fish (NMDGF) to pursue efforts to remedy this data vacuum and better analyze the species' status in New Mexico. In autumns of 2009 and 2010, NMDGF biologists surveyed for it by playback at four locations (three historical) and heard *Aegolius* calls within two of the historical locations (NMDGF 2012). Since the Northern Saw-whet Owl (*A. acadicus*) is sympatric with the Boreal in northern New Mexico and these observers were inexperienced in distinguishing the vocalizations of the two species, persistence of the Boreal was not confirmed. To augment and expand these survey efforts, in the summer and autumn 2012 we resurveyed seven of the nine historical locations where the Boreal Owl was originally documented between 1987 and 1993 (Stahlecker and Duncan 1996, Stahlecker 2010). This paper summarizes the results of these efforts.

METHODS

Our primary objective was to revisit and resurvey seven of the nine locations where Boreal Owls were detected by Stahlecker and Duncan (1996). A full description of criteria for location selection, localities, and occupancy by Boreal Owls is provided in Stahlecker and Duncan (1996) and will not be revisited here. Of the nine historical sites, we did not revisit lower-elevation locations D and I (Figure 1) in 2012 as they were not likely to be breeding locales (Stahlecker and Duncan 1996). Neither did we visit locations G (Emslie 1981) and K (Howard 1931), sites of archaeological and paleontological records, respectively. In addition to revisiting historical locations for Boreal Owls, we surveyed four new locations, though only the two where we encountered Boreal Owls are plotted in Figure 1. The presence of subalpine conifer forest (Brown et al. 1979), dominated by Engelmann spruce (*Picea engelmanni*) and subalpine fir (*Abies lasiocarpa*), was the most important factor in choosing these new survey locations, as the species shows a strong link to spruce and fir throughout its range (Hayward and Hayward 1993). We also purposely chose new survey locations that were at least 5 km distant from historical locations, to provide reasonable certainty that we were outside the home range of owls occupying historical locations.

During late summer/autumn of 2012, we surveyed for Boreal Owls by using the technique described by Palmer and Rawinski (1986), which involves playback of the species' primary "staccato" song (Bondrup-Nielson 1984) for ~5-min intervals from stations spaced 200–800 m apart. To confirm locations of breeding in New Mexico, we chose to survey during the post-fledging period (July–September) with the intent of encountering identifiable juveniles (Stahlecker 1997). Equally important, the timing of the surveys allowed vehicular access to locations that are covered in snow and impassible in late winter/spring. In the nonbreeding season (July to December), Boreal Owls do not respond to playback with their primary "staccato" song given in the breeding season (Palmer and Rawinski 1987, Macaulay Library 2006), nor did they in New Mexico in 2012. Instead, adult Boreal Owls sometimes



Figure 1. Locations of 2012 detections (see Table 1 for codes) and historical records (Stahlecker and Duncan 1996) of the Boreal Owl in New Mexico. Stahlecker and Duncan (1996) had found the species at nine locations. In 2012, Boreal Owls were relocated at six of these and at two additional locations.

flew in silently (Stahlecker 1997) or responded with “*skiew*” or “*moo-a*” calls (Bondrup-Nielson 1984, Hayward and Hayward 1993, Macaulay Library 2006). When Boreal Owls were heard but not seen, we tried playback of both song and calls to entice the owls to remain in close proximity and come into view to facilitate photo-documentation. We conducted a single survey in each area except locations C and H. We completed most surveys during the five nights preceding and including the full moon because moonlight allowed observers to better see silent owls in flight (Palmer and Rawinski 1986). However, we found that surveys at several historical locations were equally successful during nights with little or no moonlight.

RESULTS

We conducted surveys on 18 nights between 28 July and 20 October 2012. In 26.4 hours on 11 nights, we called in at least 12 Boreal Owls (6 adults and 6 juveniles) at or near six historical locations, for a response rate of 0.45 owl/survey-hour. We also searched an additional 34.6 hours on seven nights at four new locations and encountered at least three adult owls at two locations where the species was previously undocumented, for a response rate of 0.09 owl/survey-hour. The combined response rate for 61 hours of surveys was 0.25 owl/survey-hour. Thus we were five times more likely to detect an owl when surveying historical locations (0.45 owl/survey-hour) than when surveying new locations (0.09 owl/survey-hour). Furthermore, in 2012 the response rate at historical locations was ~2.5 times greater than the response rate (0.17 owl/survey-hour) during the original “discovery” surveys from 1987 to 1993 (Stahlecker and Duncan 1996). We attribute higher encounter rates at historical locations to our ability to go directly to these sites rather than have to search new areas, either 25 years ago or in 2012.

Because this study was primarily a resurvey effort, the locations we found owls in 2012 were generally consistent with those from 1987 to 1993, as reported by Stahlecker and Duncan (1996). In 2012, Boreal Owls were again confirmed in the northern and southern portions of the San Juan Mountains (Figure 1, Table 1: locations A and B), the northern and southern portions of the Sangre de Cristo Mountains (locations C, H, and I), and the northeast Jemez Mountains (location F). A single survey in the northwest Jemez Mountains (location E) was unsuccessful. We obtained photographs at all sites where owls were detected except location B. A second survey was needed to call in and photograph an adult owl at location C, and a third visit was necessary to photo-document an owl near location H, though we considered it highly probable that previous vocal responses were of Boreal Owls.

In addition to reconfirming Boreal Owls at six of the seven historical locations, we documented them at two locations distinct enough to be considered new for the species (Figure 1, Table 1). One new location (L) was 4.5 km from location H in the Sangre de Cristo Mountains but in a different drainage. The second location (M) was the first for Sandoval County and was 21 km southwest of location F, in the largest stand of spruce–fir (770 ha) forest within the Valles Caldera National Preserve (Muldavin et al. 2006), and 12 km south of more extensive spruce–fir habitat in the northern Jemez Mountains. The presence of two adults at location M on 28 September 2012 suggests an occupied territory on this isolated mountain (Figure 2).

We saw three juvenile owls (hatched in 2012) on 28 and 29 July at both San Juan Mountain locations, photo-documenting them at location A. The juveniles approached us while giving the “chirp” call that is a shortened staccato song generally given by nestlings and fledglings in response to the adult male’s “food” call (Bondrup-Nielson 1984). In addition, we initially heard three juvenile owls at location B “chirping” at a distance of 800 m. These birds did not approach upon playback: they instead stayed high in the trees but offered enough glimpses to be identified as juveniles. All juveniles observed were undergoing prebasic molt but retained the “chocolate” breast characteristic of juvenal plumage. While juvenile owls have been seen

Table 1 Results of Surveys for the Boreal Owl (*Aegolius funereus*) in New Mexico, 2012

Location		Mountain range	Coordinates ^a		Elevation (m)	Date	No. of owls seen/heard
Code	Name		Latitude (N)	Longitude (W)			
Historical							
A ^b	Apache Creek	San Juan	36° 58'	106° 26'	3300 3100	29 July 4 Aug	3 juveniles seen/heard 1 adult seen/heard,
B	Canjilon Mountain	San Juan	36° 36'	106° 20'	3100	8 Aug	1 unknown age heard ^c 1 adult seen/heard ^c
C ^b	Wheeler Peak	Sangre de Cristo	36° 34'	105° 21'	3200	30 Jul	3 juveniles heard (1 seen) ^d
E	San Pedro Parks	Jemez	36° 07'	106° 45'	3300	27 Sep	1 adult seen/heard
F	Chicoma Mountain	Jemez	36° 01'	106° 23'	3000	4 Oct	No owls seen or heard
H	Lake Peak	Sangre de Cristo	35° 47'	105° 46'	3300	30 Jul	2–3 adults seen
I	Jack's Creek	Sangre de Cristo	35° 54'	105° 38'	3650	1 Aug	1 unknown age heard
New					3650	26 Sep	1 unknown age heard
L	Tesuque Creek	Sangre de Cristo	35° 46'	105° 48'	3650	9 Oct	1 adult seen
M	Redondo Peak	Jemez	35° 52'	106° 33'	3300	4 Aug	2 adults seen/heard
					3050	14 Oct	1–2 adult seen/heard
					3400	29 Sep	2 adults seen/heard

^aRounded to the nearest minute.

^bNew Mexico Department of Game and Fish personnel, led by Walker, also recorded *Aegolius* here in 2009 or 2010.

^cData provided by C. Adams, N. Hetrick, M. O'Donnell on 4 Aug, and J. Kitting, K. McCormick, W. Talbot, and C. Wolf on 8 Aug. Adult photo-documented.

^dOnly detection in 2012 that was not photo-documented.



Figure 2. Adult Boreal Owl, Redondo Peak, Jemez Mountains, New Mexico, 29 September 2012. This photo documents the first record of the species in Sandoval County.

Photo by Ed MacKerrow, Mountain Horizon Photographs

previously at locations A and I (Stahlecker and Duncan 1996, Stahlecker 1997), the photo on this issue's front cover is the first published of a juvenile Boreal Owl in New Mexico.

DISCUSSION

The Boreal Owl was added as “threatened” to New Mexico’s list of threatened and endangered species in 1990 because the limited data available at that time suggested a small, sparse, and vulnerable population (NMDGF 2012). However, we believe that the Boreal Owl might not be so much rare in New Mexico as it is difficult to encounter incidentally. In this study, we had little difficulty in refinding this species at historical locations

by broadcasting its song, even though this was the first systematic survey for the Boreal Owl in New Mexico in two decades. To find Boreal Owls at six of the same locations 20–25 years later suggests that there have been Boreal Owls resident at each site throughout the intervening years. However, such persistence data alone do not clarify the species' population status and distribution in New Mexico. We recommend long-term systematic surveys, as well as reproductive studies, across the species' range in New Mexico. Genetic studies showed little variation within the patchily distributed Rocky Mountain subpopulations of the Boreal Owl or between them and the broadly distributed contiguous subpopulations of the boreal forest of northern North America (Koopman et al. 2007); otherwise, population-level monitoring for North America is limited and unpublished. We publish our results in part to stimulate discussion, review, and study of the status and distribution of the Boreal Owl in North America.

The need for such work is particularly relevant as evidence mounts that climate change, at least in the U.S. Southwest, could erode the ranges of alpine and subalpine species such as the Boreal Owl significantly. Williams et al. (2012) combined data on tree-ring growth, climate records, and computer-model projections of future climate trends and predicted that warmer summer temperatures and lower winter precipitation in the 21st century will result in greater evaporation rates and so drying out of the region's forests. Consequently, these forests will become more susceptible to diseases, infestations such as outbreaks of bark beetles (family Scolytidae), and catastrophic wildfires. Already, we are seeing some evidence of such effects on Boreal Owl habitat in New Mexico. From 2011 to 2013, two wildfires in the Jemez Mountains totaling >700 km² decreased the extent of spruce–fir forest around the southern and eastern portions of the Valles Caldera National Preserve by 34 km². In the same three years, three fires in the southern Sangre de Cristo Mountains burned through 54 km² of spruce–fir habitat. In 2013, one of these fires burned through the Boreal Owl's historical location at Jack's Creek. More large fires could decimate Boreal Owl habitat in the three New Mexico mountain ranges the species is known to inhabit.

There is some evidence that climatic and ecological changes are affecting the Boreal Owl already. The species' use of nest boxes in Scandinavia has been declining in the last few decades, but Hipkiss et al. (2013) found that in Sweden the owls were likely not avoiding old nest boxes. They concluded that the decline in Boreal Owl populations was real and more explainable by concurrent documented declines in prey populations. Field work for Colorado's second breeding bird atlas from 2007 to 2012 recorded slightly fewer priority (23) and non-priority (24) blocks with Boreal Owls (L. Wick-ersham in litt.) than did the 1987–95 effort (27 priority and 26 non-priority blocks; Ryder 1998), though this dataset, like ours, is largely distributional rather than numerical.

Meanwhile, a more imminent threat to New Mexico's Boreal Owl habitat is rapidly approaching from the north. Large outbreaks of spruce bark beetles (*Dendroctonus rufipennis*) have been documented in Colorado for over a century (Schmid and Frye 1977), but they have accelerated in

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the dry years of the early part of the 21st century. From 2010 to 2014 the Rio Grande National Forest of southern Colorado lost 90% of its mature spruce trees, or approximately 200,000 of 240,000 ha (R. Ghormley in litt; Figure 3a). Three fires ignited by lightning in June 2013 intensified as they burned through dead spruce forests; nearly 45,000 ha burned. In August 2014, 25–50% of the spruce trees in the spruce–fir forest at Cumbres Pass on the Colorado/New Mexico border near Apache Creek were dead or dying (Figure 3b). Thus the historical sites for the Boreal Owl in the Rio Grande National Forest and elsewhere in Colorado should be revisited to determine whether the species is still present, and the same will be true of the New Mexico sites if the devastation of mature spruce forests extends into northern New Mexico.

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Figure 3. (a) Nearly complete mortality of mature Engelmann spruce at Wolf Creek Pass, Colorado, 50 km from New Mexico, June 2014. (b) Approximately 50% mortality in a stand of spruce at Cumbres Pass, Colorado, 5 km from New Mexico, August 2014.

Photos by Dale Stahlecker (a) and Mark Blakemore (b)

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