Abstract

Nocturnal, listening surveys were conducted in 2001 to document the presence and distribution of boreal owls in northeast Minnesota. Five survey routes were surveyed once during three time blocks: 15-31 March, 1-14 April, and 15 April-30 April. Boreal owls were detected on 24 occasions during 568.6 km of surveys, representing an overall detection rate of 0.042 owls/km and an abundance index of 0.087 owls per route length (km). Sixteen of the 24 (66.7%) detections occurred in the western portion of my study area, and specifically, along the Crooked Lake and Sawbill Routes. The detection rates increased markedly during April, with 23 of 24 (98.8%) of the total detections occurring after 1 April. Male boreal owls were observed in cavities at four locations, and females observed at three of those sites. One nest was documented and was still active when I left the study area at the end of April.

Introduction

The boreal owl (*Aegolius funereus*) is considered to be a regular breeding species that exists at low densities throughout northeast Minnesota (Lane 1997). The owl is found throughout extant portions of boreal forest and is associated with older trembling aspen (*Populus tremuloides*) for nesting and lowland black spruce (*Picea mariana*) for roosting and foraging activities (Lane and Andersen 1995). Habitat depletion is implicated in a projected long-term population declines of the species throughout North America (Hayward 1994), and specifically, in portions of northern Minnesota (Jaako Pöyry 1992).

This study continues my long-term effort to assess the distribution, status, and ecology of boreal owls in northeast Minnesota. Herein, I report the results of 2001 survey efforts.

Study Area

This study was conducted in northeast Minnesota, within Cook County and along the eastern quarter of Lake County (*see:* Lane 1997 for a detailed study area description). Approximately 80% of the surface area is forested, while 18% is covered by water bodies. Urban or developed land is minimally represented (Spadaccini and Whiting 1985). Climate in the region is characterized by cold winters and short summers. The mean temperature ranges from -17° C in January to 17° C in July. Annual snowfall averages 152 cm, and rainfall averages 45 cm (Ahlgren 1969).

Vegetation in the study area is characterized by forest-types representative of three biotic communities: the southern-most portion of the boreal forest life zone (Rowe 1972), the broadleaf

deciduous forest (Larsen 1980) and the Great Lakes-St. Lawrence forest biome (Rowe 1972) (for more detailed descriptions, see Lane 1997). Pockets of boreal, hardwood, and softwood forests persist regionally, although fire, fire suppression, and timber harvests have had considerable impacts in shaping the present-day forest mosaic (Heinselman 1973).

Methods

Nocturnal listening surveys were conducted during 2001, along five established survey routes in northeast Minnesota (Lane 1997). Three time blocks (15-31 March, 1-14 April, and 15 April-30 April) were utilized, with each of the five survey routes surveyed once during each of the three time blocks, resulting in a total of 15 surveys between 15 March to 30 April.

Three min listening stations, separated by 0.8 km, were used to detect the broadcast staccato song of the male boreal owl (Bondrup-Nielsen 1984). Surveys were initiated at least 0.5 h after sunset and continued until the route was completed. Surveys were not conducted in winds exceeding 18 kph or during moderate to heavy precipitation. If a route was not completed due to deteriorating weather, it was completed when conditions allowed, ideally within the same survey time block. However, once outside the time block, surveys were not conducted.

Two encounter indices were derived for boreal owls. The *detection rate* is the number of owls detected per total km surveyed (owls/effort) and the *abundance index* is the number of individual owls detected per linear route length (km) and provides a rough density estimate of boreal owls.

Results

Surveys were initiated on 16 March and completed on 26 April. Unfavorable weather conditions prevented the completion of surveys along the Gunflint and Arrowhead routes during the 1-14 April time block and resulted in only partial coverage of those routes. Boreal owls were detected on 24 occasions during 568.6 km of surveys (Table 1). Of the 24 detections, two owls

were heard on more than one survey replication, resulting in an *abundance index* (based on 22 individual owls) of 0.087 owls/km (Fig.1). The Crooked Lake route accounted for 10 of 24 (41.7%), the Sawbill route 6 of 24 (25.0%), and the Gunflint route 5 of 24 (20.8%), of total owl detections. (Fig. 2). Only one owl was detected during the 15-31 March survey period, with the remaining 23 detections occurring after 1 April (Fig. 3). Female owls were observed on three territories, and one nest was documented and still active at the time of my departure from the study area.

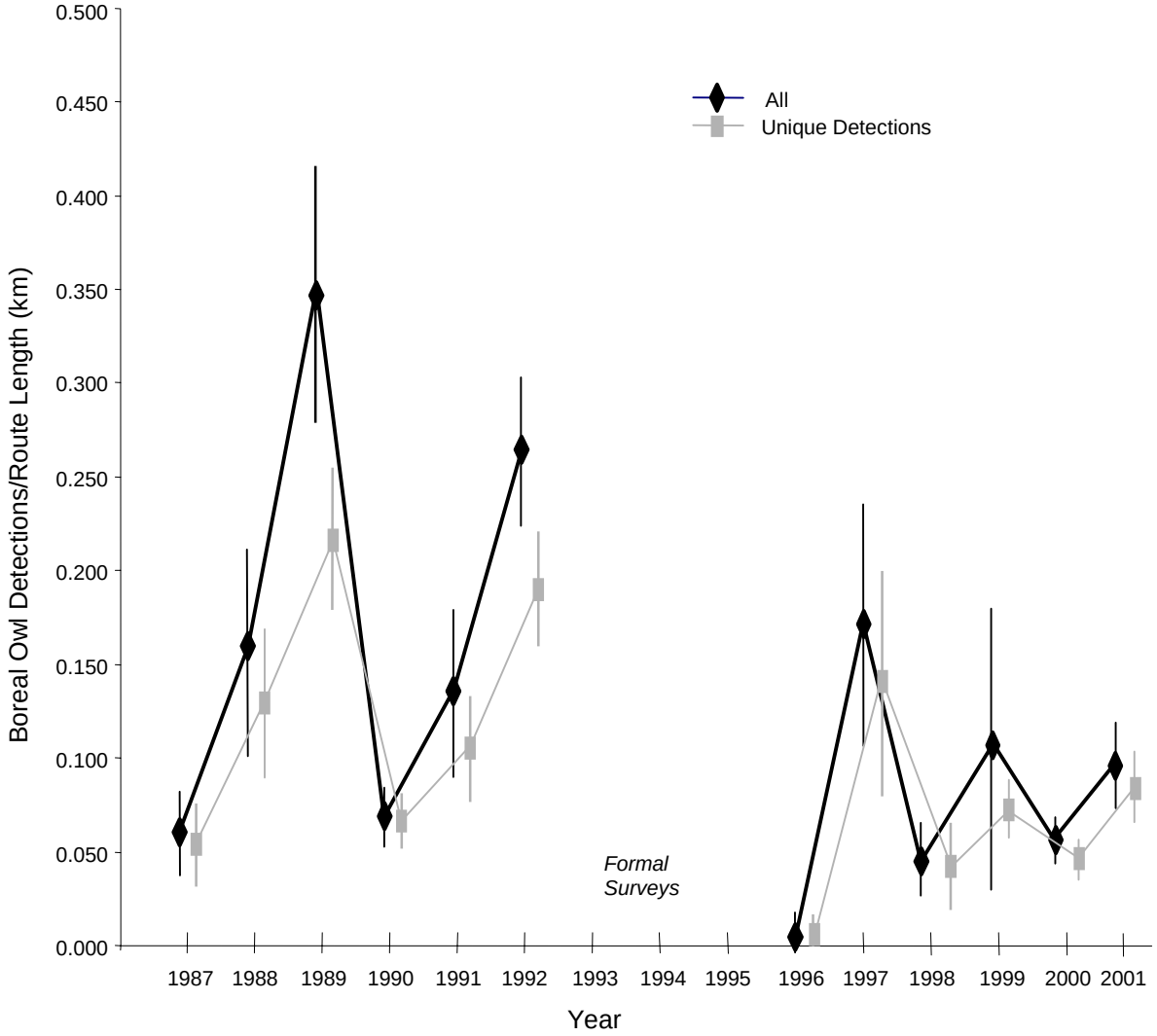

Figure 1. Annual abundance indices from 1987 through 2001 for territorial male boreal owls in northeast Minnesota. Individual owls detected per route length (km) is represented by a gray line, and the total detections per route length by a black line. Error bars represent SD of abundance index, using survey routes as replicates.

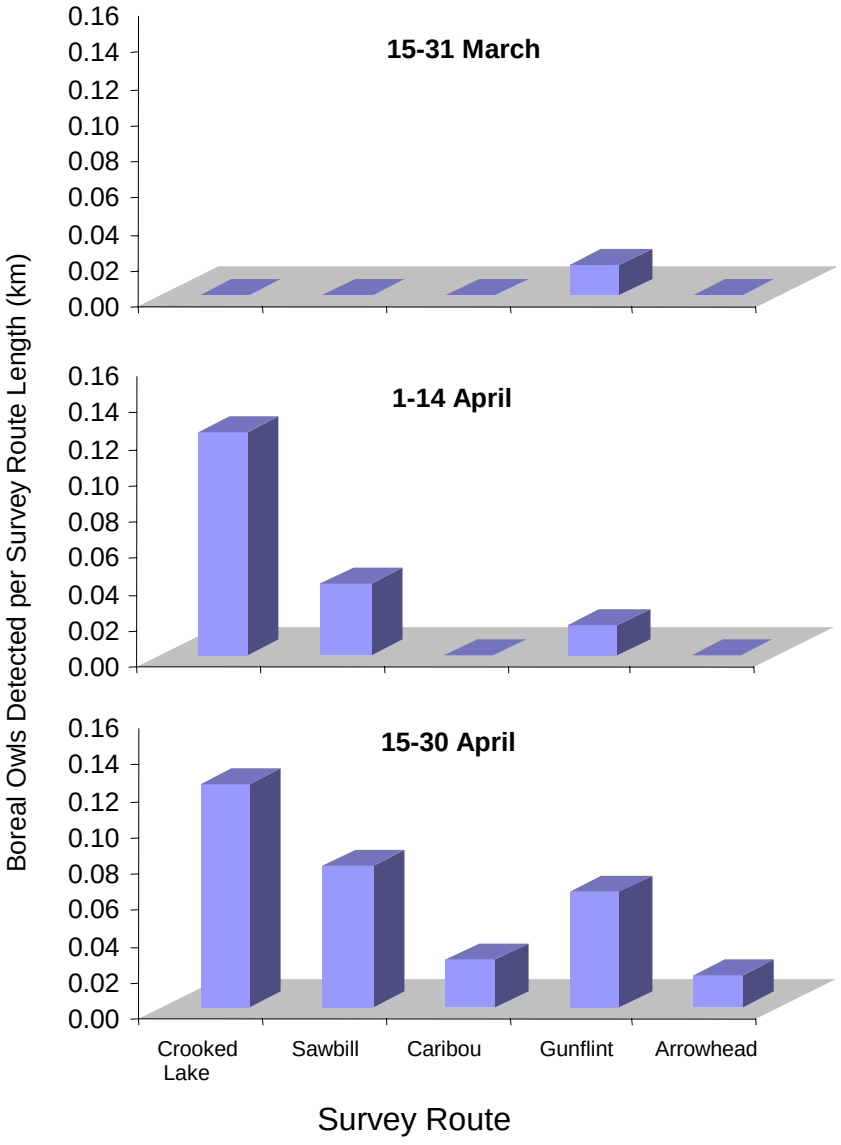

Figure 2. Detection rates of vocalizing male boreal owls in northeast Minnesota during 2001. Surveys along the Gunflint and Arrowhead Routes were limited during the 1-14 time block due to poor weather conditions.

Table 1. Summary of boreal owl surveys conducted in northeast Minnesota from 1987-2001. Standardized owl surveys were not conducted from 1993-1995.

Year	km Surveyed	Boreal Owl Detections	Detection Rate[1]
1987	524.9	16	0.030
1988	925.9	41	0.044
1989	993.7	88	0.089
1990	512.5	18	0.035
1991	1173.9	35	0.030
1992	867.3	36	0.042
1993			
1994		*Standardized Surveys Not Conducted*	
1995			
1996	741.3	2	0.003
1997	662.8	44	0.066
1998	620.3	13	0.021
1999	653.5	27	0.041
2000	660.4	16	0.024
2001	568.6	24	0.042

[1]The detection rate represents the number of owls detected per total km surveyed (owls per effort).

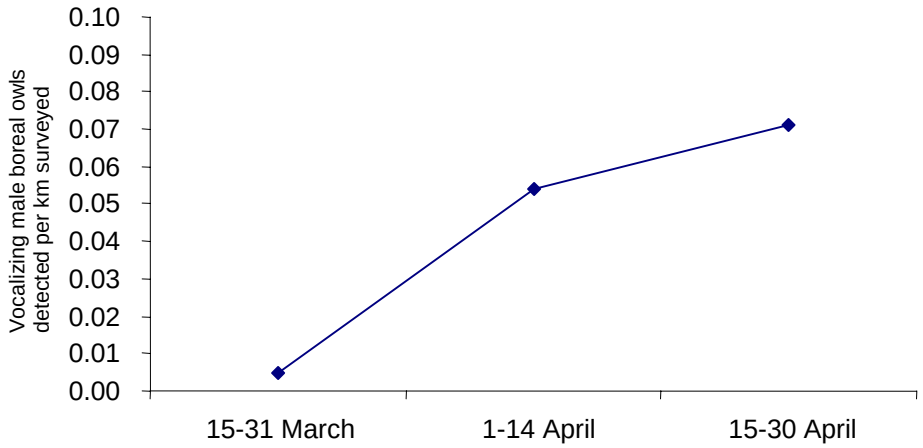

Figure 3. Detection rates of vocalizing male boreal owls in northeast Minnesota during 2001.

Discussion

Following a quiet start, owl activity increased markedly during the last 3 weeks of surveys. Twenty three of 24 (95.8%) boreal owl detections occurred after 1 April. The increase in vocalization activity coincided with a substantial winter irruption of northern forest owls, including boreal, great gray (*Strix nebulosa*), and northern hawk owls (*Surnia ulala*). Unlike past irruptions, however, an anticipated increase in vocalizing male boreal owls did not materialize.

My immediate concern is directed towards the apparent negative trend of owl detections recorded since 1987. This trend has been identified despite the fact that my detection protocol and survey routes have changed little since initiating my study, I am conducting surveys later into the spring, and my ability to identify call notes and subtle vocalizations of boreal owls has improved.

The decrease in owl numbers, especially when viewed in combination with both natural and anthropogenic disturbances to boreal owl habitat, is likely irreversible over the short term. As I have reported previously a substantial percentage of cavity trees have been lost within the landscape, either by pathological rotation or harvest. Conversely, those stands that have lost

cavity substrate trees have thus far, been unable to supplant the lost trees. In every stand that I have documented the loss of a cavity tree or trees, there have been no known instances where an owl has utilized a different cavity tree in the same stand, suggesting that cavity trees may be a limited resource in those forest patches selected by boreal owls. Furthermore, I have yet to observe boreal owls in "new" areas of my study area. Instead, they continue to utilize the same general stands and macro-scale habitat patches, supporting my oft-repeated suggestion that the owls' habitat requirements are rigid and should be incorporated into management plans as such.

So while I *again* raise the suggestion that there has been a pronounced decrease in boreal owl numbers in the managed forests of my study area, a logical questions is "what is the cause?" I suggest several possible factors. First, the reduction of suitable habitat available to both resident, and immigrant (or transient) owls during their movements into or within northeast Minnesota. Although local owls may reap the rewards of their residency through optimal habitat selection (i.e., *core areas*), resources peripheral to the resident birds, if degraded or diminished will not support substantial influxes of owls. It would follow that competition for "intact" resources would increase and reproduction success would decrease as one moved out from those core areas. Second, there is little documented evidence pertaining to the status of the Canadian, or source population of boreal owls, especially in light of highly publicized habitat depletions of the boreal forest there. It would be highly logical to assume that a reduction in the Canadian population will ultimately impact the Minnesota metapopulations, especially in those areas increasingly isolated from contiguous habitat patches. Finally, although the suggestion has been made that we are simply experiencing a downward, short-term trend in the boreal owl population, caution should be exercised in incorporating that philosophy into management prescriptions for the species, especially in light of forest change and its known effect on meta population models.

The question now is how do land managers address the apparent decline in the boreal owl population? I suggest that it is of critical importance to enact a comprehensive management plan designed to conserve habitat within and adjacent to lowland conifer tracts in the region, and especially stands capable of producing cavity or cavity-prone trees. As the catastrophic July 1999 windstorm has shown, the life span of cavity trees in northeast Minnesota and especially aspen, is

limited. Nest boxes should be utilized to provide some measure of resource continuity for the breeding population of boreal owls, especially until age classes of substrate trees conducive to cavity formation and/or excavation become available.

Acknowledgments

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