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**Decline of the Long-eared Owl in New Jersey.**—Long-term observations of the Long-eared Owl (*Asio otus*) in New Jersey suggest that numbers are decreasing at traditional winter roosts (Kane pers. obs.). Nesting activity is rare within the state and also may be decreasing. In this paper, we review the previous wintering records of Long-eared Owls in New Jersey and analyze Christmas Bird Count (CBC) data from 1956 to 1986, published annually in *American Birds*.

*Methods.*—We have monitored Long-eared Owls for 10 or more years in New Jersey, New York, Connecticut, and Pennsylvania. Most of our field work has involved checking of known roost sites (Smith 1981, Bosakowski 1984), as well as frequent reconnaissance trips of new areas. During the breeding season, intensive ground searches for raptor nests have been made primarily in northern New Jersey, southeastern New York, western Connecticut (e.g., Bosakowski 1982; Speiser and Bosakowski 1984, 1987, 1988; Bosakowski et al. 1989), and northeastern Pennsylvania, but no active nests of the Long-eared Owl have been discovered during these surveys. In addition to field observations of winter roosts, we summarized all winter Long-eared Owl sightings reported in “Records of New Jersey Birds” since 1966. We also summarized all CBC data for New Jersey from 1956–86. Only CBC stations that recorded at least one Long-eared Owl in their history were included in this analysis. Due to the increasing number of counts and observers since 1956, the data were normalized relative to a measure of field effort. Raynor (1975) found that party-hours had the highest correlation with numbers of birds observed. Since wintering Long-eared Owls are faithful to their day roosts (Smith 1981, Bosakowski 1984), some observers make special trips in advance to find these roosts for the CBC day, thus somewhat biasing the data. This effect reduces the value of normalizing factors such as party-hours and therefore we have presented the data using several different indices of abundance or effort.

*Results.*—We have observed a decrease in Long-eared Owls at many traditional winter roosts. Of 58 known winter roost sites during 1967–1988, six have been eliminated, and three have been thinned or affected by land development. With 49 roost sites remaining, most of the owls should also remain, but many roosts have had noticeable decreases or abandonment during the past decade. Unfortunately, long-term coverage at these roosts was too inconsistent to lend numerical support to our inquiry, although Smith (1981) has documented a decline at a traditional winter roost in central Pennsylvania that was checked annually for nearly 20 years. Prompted by these preliminary observations, we decided to search the regional literature and CBC records for evidence of a decline.

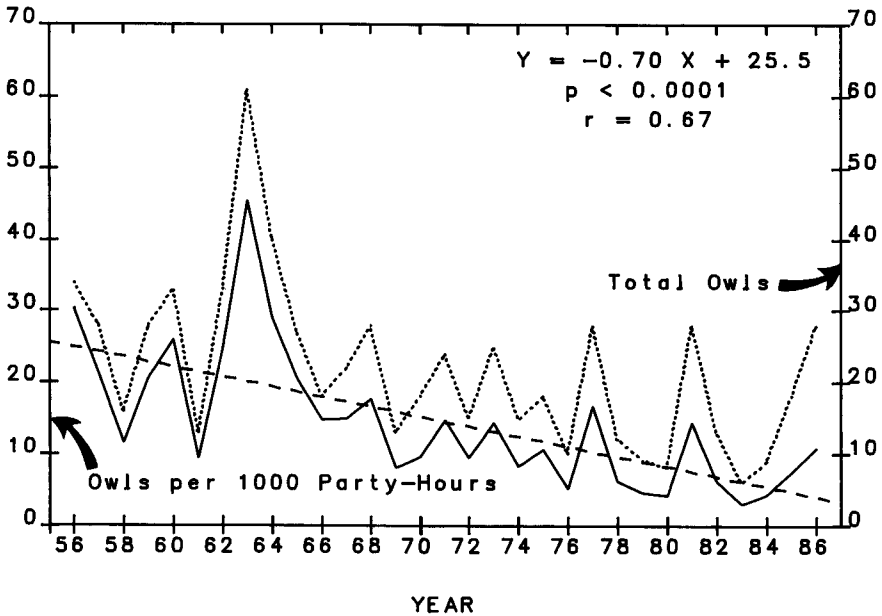


FIG. 1. Annual total number of Long-eared Owls found on all New Jersey Christmas Bird Counts (dotted line) and number of Long-eared Owls found per 1000 party-hours (solid line). Regression line (dashed line) for party-hours data shows a significant negative slope for the 31-year period (see graph for line formula and statistics). Regression line for total owls is ( $Y = -0.629X + 31.9$ ,  $P = 0.005$ ) and had a lower correlation coefficient ( $r = 0.50$ ).

The number of Long-eared Owls reported each winter in "Records of New Jersey Birds" was tallied from 1966–85 (Table 1). On first inspection, the yearly totals appear to be somewhat stable, if not irregular, but one must consider that the number of observers has increased steadily and that rare species are often considered more desirable to report. Furthermore, Smith and McKay (1984) report that interest in 'owling' has increased in the past several decades, leading to increased efforts to locate and count this and other owl species. To reduce these biases and effects, we next examined New Jersey CBC data corrected for the number of party-hours which showed a highly significant negative trend in winter populations of Long-eared Owls (Fig. 1). Even without adjustment for search intensity (party-hours afield), the total number of owls still showed a significant negative trend although with a smaller slope. The graph also reveals irruptive years which may reflect the well known 3–4 year cycles of vole populations. Thus, the normal wintering population of Long-eared Owls in New Jersey may be greatly augmented by owls retreating from cyclic vole shortages to the north. We frequently observe owls arriving at roosts in late January which also may explain some of the irregularities in the cycles observed in the CBC data (collected mainly in mid- to late December).

Theoretically, the number of parties afield should correlate with the number of roost sites found, but this relation is complicated by the fact that observers often locate roost sites prior to the count day, so owls are sometimes found regardless of the number of parties or party-hours spent. Complimentary methods of analysis are to record the percentage of CBC

TABLE 1  
SUMMARY OF WINTERING LONG-EARED OWL NUMBERS<sup>a</sup> REPORTED IN  
RECORDS OF NEW JERSEY BIRDS<sup>b</sup>

	Region 1 NW	Region 2 NE	Region 3 Central	Region 4 SW	Region 5 SE	Annual totals
1966-67	0	2	1	10	0	13
1967-68	0	4	6	5	0	15
1968-69	0	8	10	0	0	18
1969-70	0	1	0	0	0	1
1970-71	1	45	5	14	1	66
1971-72	0	10	28	10	0	48
1972-73	2	5	1	0	0	8
1973-74	6	10	9	5	0	30
1974-75	0	20	2	2	1	25
1975-76	1	14	13	0	3	31
1976-77	0	26	12	5	0	43
1977-78	15	8	4	15	11	53
1978-79	3	2	16	6	1	28
1979-80	4	1	8	5	1	19
1980-81	0	6	14	3	1	24
1981-82	2	19	5	0	0	26
1982-83	2	2	4	2	0	10
1983-84	10	4	0	2	0	16
1984-85	20	8	0	4	0	33

<sup>a</sup> If exact numbers were not given, the following interpretation was assigned: 1 owl = "the species," "noted," "present," "reported." 2 = "owls," "small numbers," "others were at . . .," "a few," "several."

<sup>b</sup> Formerly a section of *New Jersey Audubon*.

stations that reported Long-eared Owls or to record the average number of owls per CBC station (Fig. 2). The first method is weak with regard to numerical abundance, but provides an indication of Long-eared Owl distribution in New Jersey each winter. Both the "percentage stations with owls" and "average number of owls per station" methods show peak years, but the decline in numbers is not apparent with the percentage of CBC stations method. This result indicates that the decline in Long-eared Owl numbers has not resulted in a diminution in distribution but rather from an overall reduction across all CBC stations.

*Discussion.*—Bent (1938) noted that the Long-eared Owl could hardly be classed as a bird of deep forests. This fact is borne out in the current literature in which most of the Long-eared Owl breeding studies have come from largely non-forested, open terrain (e.g., Craig and Trost 1979, Village 1981, Marks 1986). Likewise, nearly all studies of winter roosts have reported a close proximity of the roost grove to open habitats (see Bosakowski 1984).

Throughout much of New Jersey, open habitats have steadily dwindled in area this century due to changes in land use which include: (1) a shift in farming to the midwest allowing many fallow fields to undergo natural forest succession, (2) urbanization of fields for housing, industry, and high-impact recreation, and (3) decreased needs for wood as an energy source due to gas and oil efficiency. As a result of these major economic shifts, much of the former open lands of New Jersey are now urbanized or heavily wooded, thereby reducing Long-eared Owl nesting habitat. Currently, the only known regular breeding area in the state is southwestern Hunterdon County, one of the largest agricultural counties in New Jersey.

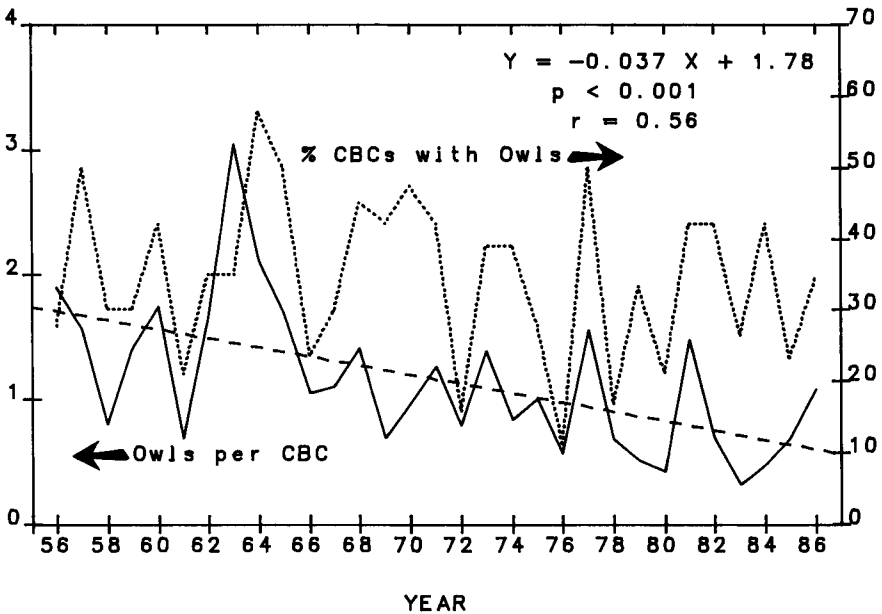


FIG. 2. Average annual number of Long-eared Owls found per Christmas Bird Count (CBC) station in New Jersey (solid line) and percentage of CBC stations reporting owls each winter (dotted line). Regression line (dashed line) for average numbers shows a significant negative slope for the 31-year period (see graph for line formula and statistics). Regression line for percentage of CBCs was not statistically significant.

Given the present amount of farmland, grassland, and marsh in the state, the number of owls is still comparatively small, suggesting that other factors may also limit Long-eared Owl numbers in New Jersey. In Michigan farm country (only 11% wooded), the Craigheads (1956) also found the Long-eared Owl to be a relatively scarce component of the total raptor population. Similarly, Smith and Murphy (1973) found only one Long-eared Owl nest in their intensive four-year study of a desert-scrub raptor community in Utah. We suggest that competition with other raptors could be limiting Long-eared Owl numbers in the remaining open lands of New Jersey, especially in light of widespread habitat alterations. In particular, Great Horned Owls (*Bubo virginianus*) will compete for small rodents and nest sites and appear to be increasing throughout New Jersey (Bosakowski and Kane pers. obs.). Great Horned Owls will also prey upon the Long-eared Owl (Bosakowski et al. 1989, F. and N. Lilly pers. comm.).

Throughout most of its range the Long-eared Owl feeds primarily on voles (*Microtus*) (Marti 1976). Declining vole habitat (grasslands, cropland) and predation pressure from other increasing sympatric raptor populations namely, Great Horned Owl, Common Barn-Owl (*Tyto alba*), and Red-tailed Hawk (*Buteo jamaicensis*) could account for the lack of suitable food resources in most open lands of New Jersey. In addition, changing agricultural practices and increased use of chemical rodenticides may be eliminating the niche of vole specialists such as the Long-eared Owl. The paucity of nests reported and our own surveys suggest that the Long-eared Owl should be considered a rare and local nesting species in

New Jersey. Thus, there is no evidence to suggest that the Long-eared Owl has been largely overlooked in recent times as was formerly postulated by Bent (1938) and Bull (1964, 1974).

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