

THE STATUS AND ECOLOGY OF THE SHORT-EARED OWL (*Asio flammeus*) IN NEW YORK STATE

Kathryn J. Schneider

16 Frisbee Lane, Stuyvesant, New York 12173

fallline@berk.com

Abstract

New York's salt marshes, hayfields, and pastures are important to Short-eared Owls as wintering areas, migratory stopover sites and peripheral breeding grounds for a North American population that extends well into Canada. Some years hundreds and possibly thousands of Short-eared Owls are found in the state. They winter in significant numbers in the Finger Lakes and the Lake Ontario lake plain, especially in Jefferson County, a few scattered sites in the Hudson Valley, and on the South Shore of Long Island. They are most numerous at sites where meadow voles, their favored prey, are abundant, and during winter they roost communally in sheltered sites close to their feeding grounds. The data available for New York show that 32 wintering sites have supported at least five birds for at least five years, but nearly half of these reached their maximum occupancy before 1980. Fifty percent of these sites have had birds present since the winter of 2000.

As breeders Short-eared Owls are very rare in New York. This study identified 48 breeding season records since 1980 that reached the level of "Probable" (28) or "Confirmed" breeding (20). Today nesting in New York is limited to the St. Lawrence and Lake Champlain valleys, the Great Lakes plains and the marshes of Long Island's South Shore, but historically it also included eastern Suffolk County and the upper Hudson Valley.

In the Northeast region, five of thirteen states list Short-eared Owls as "Endangered" while two others include them on their state lists at lower levels of conservation concern. Historically these owls bred in at least eight states in the Northeast but today they nest only in Massachusetts, New York, Vermont, and Pennsylvania. The species is listed as "Endangered" in New York. More research is needed to clarify what management strategies will have the greatest impact on the conservation of Short-eared Owls. This report includes recommendations to fill important information gaps.

Introduction

Short-eared Owls are birds of open landscapes inhabiting marshlands, meadows, prairies and tundra throughout their extensive global range. Although they hunt at night like most owls, they are also active at dawn and dusk so they are seen more than other nocturnal birds of prey. In New York these owls are most often observed in winter and during migration, but on rare occasions they also breed in the state. Their presence at any site in any season is tied to the abundance of meadow voles, their primary prey. In 1999, based on the results of the state's first Breeding Bird Atlas and declines in neighboring states, the New York State

Department of Environmental Conservation elevated this species from "Special Concern" to "Endangered" status. This report compiles and reviews information on the ecology, distribution and status of the Short-eared Owl in New York State.

Habitat

Short-eared Owls inhabit a variety of open landscapes such as fresh and saltwater marshes, tundra, prairies, coastal heathlands, old fields, grasslands, shrublands, and agricultural settings (Clark 1975, Holt and Leasure 1993). Open land with an abundance of meadow voles or other small mammals is needed to support nesting. Similar habitats are used in winter but sheltered roost sites may also be important environmental features (Banfield 1947, Bosakowski 1986).

In New York Short-eared Owls are most often reported in salt marshes, hayfields, fallow farm fields, and pastures. Territories are frequently located on grasslands among ridges and valleys with low wet areas; some border wetlands and rivers. The Short-eared Owl's preference for habitats containing water is probably related to the fact that meadow voles typically occur in mesic habitats. These birds use perches for hunting, and fence posts, hay bales, small trees and shrubs, are common features of the landscapes used by Short-eared Owls.

Range and Distribution

Short-eared Owls have an extensive global range being found on every continent except Australia and on many islands, including the Greater Antilles, Cuba, Hawaii and Puerto Rico (Vickery 1983). In North America, Short-eared Owls breed from the Alaskan tundra east across Canada to Newfoundland, south to central California, northern Nevada, Utah, northeastern Colorado, Kansas, Montana, southern Illinois, northern Indiana, northern Ohio, Pennsylvania, New Jersey and northern Virginia. They winter mostly from southern Canada south throughout the United States to Baja California, central Mexico, and the Gulf Coast to Florida (The A.O.U. 1998).

Very little is known about Short-eared Owl migration patterns. It is generally accepted that these birds leave the northern parts of their North American range in the fall and move south in search of food (Craighead and Craighead 1956, Clark 1975). In Europe, birds above 50° N latitude usually migrate, while those south of this line are resident (Mikkola 1983). Holt and Leasure (1993) reported that as of November 1992 there were 47 North American band recoveries that indicated seasonal north/south migration and west/southwest movements. Clark (1975) suggested, based on banding recoveries, that there is a southward movement of the entire population in the fall. According to his hypothesis, in areas where Short-eared Owls are present year-round the local populations are actually made up of two different sets of birds. The summer breeders migrate south and are replaced by different individuals that migrate in from more northern latitudes in the fall and spend the winter. Other authors suggest that Short-eared Owls migrate only in search of food and may be resident at sites with sufficient resources. Even Clark concluded that this species possesses all the characteristics typical of "irregular migrants" (Tate 1992).

In New York State Short-eared Owls are reported in all seasons but they are much rarer during the breeding season than at any other time of year (Cooper 1998, Reilly and Parkes 1959, Bull 1974). The origins of the birds that move into New York in the fall are unknown beyond the fact that they are from farther north. They are seen in small numbers at most major hawkwatches including Derby Hill in Mexico, New York, but they usually appear as single birds (G. Smith pers. comm.). It is also assumed, but not supported by empirical data, that many of the birds that spend the winter in the state are juveniles. With a few notable exceptions, the small number of Short-eared Owls that breed in New York each year typically appear sporadically at sites that have not been reported as breeding areas in the past. It is not known if these breeders are birds that spent the previous interim in New York State. Appropriate studies to clarify the demographics and origins of New York's Short-eared Owls are sorely needed.

Food Habits

Short-eared Owls eat primarily small mammals but they occasionally take small birds, and the young sometimes eat insects (Tate 1992). For the most part their diet varies little throughout their range or seasonally; Short-eared Owls are small mammal specialists. In more than a dozen North American studies of their food habits, voles (*Microtus* spp.) have dominated the diet (Holt 1993, Holt and Leasure 1993, and references therein). Small mammal populations undergo well-documented population cycles that exhibit years of dramatic abundance and periods of extreme scarcity. These owls opportunistically inhabit areas where small mammals are abundant and their breeding sites, the number of wintering birds, the number of nesting pairs, and the numbers of eggs or young produced may change dramatically from year to year based on the food supply (Village 1987, Korpimäki and Norrdahl 1991, Mikkola 1983, Pitelka et al. 1955, Clark 1975). In New York and California they have been reported wintering in large numbers near rodent-infested dumps (Elliott 1953, Johnston 1956, Bull 1974, Fisler 1960).

In winter, changing weather conditions can affect prey availability. Unless voles are extremely abundant, deep snow and ice may reduce the availability of prey locally and cause the owls to abandon wintering areas occupied earlier in the season (Borko 1977, Clark 1975, Scheider 1958, Smith 1989). The changes observed in the numbers of birds at wintering areas and roost sites are probably a local response to changes in the availability of prey during the course of winter.

Young birds are less successful hunters than their parents, capturing prey only about 15% of the time compared to a 58% success rate for the adults (Marr and McWhirter 1982). After capturing a rodent the birds typically carry their prey in their feet to a nearby perch. However, courting or breeding birds almost always transfer the food item to their mouths before landing (Clark 1975). Short-eared Owls occasionally cache prey under small shrubs for later consumption (Holt and Leasure 1993, Young et al. 1988, Ingram 1962), but more often they bite off and swallow the head, eviscerate the body and consume it from front to back either in pieces or whole (Clark 1975).

The birds regurgitate pellets as means of eliminating the indigestible parts of their prey. They disgorge one pellet per meal, and while pellets are often found at feeding sites, they accumulate in great numbers at winter roosts (Holt and Leasure 1993). Pellet analysis is a fairly reliable way of characterizing the diet of Short-eared Owls if precautions are taken to obtain pellets from both roosts and feeding sites (Clark 1975) and care is taken to distinguish owl pellets from those of sympatric Northern Harriers (Clark 1972, Holt et al. 1987).

Winter Biology

In winter Short-eared Owls congregate in areas where prey is abundant and they often roost communally in sheltered sites close to their feeding grounds. Roosts of up to 200 birds have been reported (Bent 1938) but the number of birds using a roost probably depends on prey abundance. The number of birds roosting together varies over the course of the winter, generally increasing as the winter progresses until a maximum is reached between mid-January and mid-February (Clark 1975). Roost sites reported in the literature include a Scotch pine grove, junipers, a quarry, stump piles, gravel pits, junk yards with wrecked autos, Australian pines, yews, *Phragmites*, white pine groves, hedgerows, and second growth thickets. Most sites seem to provide shelter from the weather, especially wind. There is disagreement about the owls' ability to tolerate human disturbance near their roost sites. Hoyt (1962) reported owls roosting in junipers in a suburban housing development, and Clark (1975) wrote of a roost in an active junkyard, but at the same time he noted that the majority of his roost sites were free from human activities.

Short-eared Owls usually roost on the ground, but at least two studies have shown that they move to conifers when there is snow cover (Banfield 1947, Bosakowski 1986). Banfield (1947) suggested that the birds were less cryptic in the snow. The idea that the birds move to conifer roosts to avoid detection gains support from the observations of Craighead and Craighead (1956), who noted that Short-eared Owls select nest sites and ground roosts in fields with light-colored grasses that match their plumage. Even in conifer roosts the birds typically roost at heights of less than 8 ft, and they sometime perch very close to each other or to Long-eared Owls, with whom they often share their roost sites (Bosakowski 1986, Hendrickson and Swan 1938).

In New York winter mortality is reported from shooting, collisions with cars, fences, and guy wires, starvation, and roost predation by Great Horned Owls (VanBeurden 1955, Scheider 1959, Hoyt 1960, Spofford 1966, 1968a, Able 1990).

Breeding Biology

Data from New York show that breeding usually begins in late March and early April when winter roosts break up and the birds begin defending territories with elaborate flight displays. However, Short-eared Owls can and do breed opportunistically whenever prey are abundant. Short-eared Owls have bred in the late fall and even winter in Europe when food was abundant and temperatures were unusually warm (Brauner 1908, Bakker 1957, Eriks 1952, Grote 1930).

Similar displays are used in both territorial defense and courtship making it difficult to distinguish between the two behaviors unless one can clearly detect the presence of both the lighter male and the rustier female. During the two Breeding Bird Atlas Projects observers sometimes reported "Probable" breeding based on courtship or territorial displays, but they were unable to confirm nesting as the season progressed. Some of these observers might have been witnessing the break up of winter assemblages rather than the beginning of breeding.

Short-eared Owl home range size varies greatly and increases with decreasing prey densities (Clark 1975). Tate (1992) reported an average home range size of 51 ha in maritime heath on Nantucket, while Clark (1975) recorded a mean of 82 ha in freshwater marshes in Manitoba. The birds need good cover, and typically dense, tall herbs, for nesting.

Nests have been found on bare sand in beach grass, on flattened cattails in a wetland, in a field of goldenrod, and in uncultivated fields among alfalfa and wheat stubble (Bull 1974). Short-eared Owls build their nests on the ground, usually on dry sites that are slightly elevated, such as small knolls, hummocks and ridges. When they nest in agricultural settings their nests are sometimes plowed (Griffith 1987). Because Short-eared Owls nest on the ground their eggs and young are vulnerable to mammalian predators such as foxes, raccoons, feral cats, and skunks (Tate 1992).

The female, who may be only a year old when she first breeds, creates a cup and lines it with grasses and down (Tate 1992). A typical clutch is four to nine eggs, but clutches as large as 14 have been reported in years of peak small mammal abundance (Mikkola and Sulkara 1969). In New York clutch sizes range from one (Spofford 1968b) to nine (Chamberlaine 1997) and eggs have been reported as early as 2 Apr (Bull 1974) and as late as 27 May (Novak 1987). No more than one nest per breeding season has ever been observed in New York, although two broods have occasionally been reported in some parts of their range.

Incubation is by the female alone beginning with the first egg, and lasts a little less than a month. The eggs hatch asynchronously and although the young disperse from the nest after two weeks, fledging does not occur until about two weeks later (Tate 1992, Clark 1975). Young birds about two weeks old have been reported as early as 7 May in New York State (Worthington 1893). While both parents hunt for food for the young, only the female actually feeds and broods them (Holt and Leasure 1993). Once fledged, the young birds remain on the parents' territory for at least a week or two, where they roost with the family during the day and are fed by the parents until they become independent (Holt and Leasure 1993).

Status and Trends in the Northeast

Breeding Bird Survey trend analyses for the Northeast are not statistically meaningful for Short-eared Owls because of variable counts and small sample sizes. Survey-wide a slight decline is indicated in the 1960s but very few were observed in the eastern portion of their range and only small numbers were reported in central and western North America (Sauer, et al. 2001).

Table 1. Legal Status and Current Breeding Status of Short-eared Owl in the Northeast.

<u>State</u>	<u>Legal Status</u> ¹	<u>Breeding Status</u> ²
Maine		historical
New Hampshire		
Vermont		extant
Massachusetts	endangered	extant
Rhode Island		
Connecticut	threatened	historical
New York	endangered	extant
New Jersey	endangered	historical
Pennsylvania	endangered	extant
Delaware	endangered	
Maryland	special concern	historical

¹ Northeast Endangered Species and Wildlife Diversity Technical Committee 2001

² Melvin et al. 1989

Because of declining populations and a lack of data, the Short-eared Owl has been listed as a species of regional conservation concern in the northeastern United States since 1999 (Northeast Endangered Species and Wildlife Diversity Technical Committee 1999). As of 2001 five of the 13 states in this region listed Short-eared Owl as "Endangered" while two other states included it on their state lists at lower levels of conservation concern (Table 1, Northeast Endangered Species and Wildlife Diversity Technical Committee 2001). Melvin et al. (1989) reported that the Short-eared Owl is the rarest and most threatened species of owl nesting in the Northeast. Historically it bred in at least eight of the thirteen northeastern states, but today it nests only in Massachusetts, New York, Vermont, and Pennsylvania, having been lost from Maine, Connecticut, New Jersey, and Maryland.

Melvin et al. (1989) also looked at the regional status of Short-eared Owl using winter data from Christmas Counts. The data showed no clear trends for the 13 northeastern states between 1963 and 1983.

Status and Trends in New York State

Early in the twentieth century Eaton (1914) wrote in *Birds of New York State* that the Short-eared Owl is “one of our commonest owls” outnumbering all other owls in lowlands and marshy areas. In cultivated landscapes he reported that only screech-owls were more common, and he commented on marked increases observed in the state in October/November and March/April. Eaton mentioned four breeding areas specifically: Plum Island off eastern Long Island, several sites in the western part of the state, the marshes along the Seneca River above and below Montezuma, and the wetlands near the eastern end of Lake Ontario. Working from published local lists he compiled a table that included breeding records from 14 counties (Eaton 1910). His text mentions breeding in two more counties for a total of 16 county records as of the early twentieth century.

Sixty years later Bull (1974) noted a change in status calling the Short-eared Owl a “local breeder, greatly decreased in recent years.” Even outside the breeding season he found it “generally uncommon” as both a migrant and winter visitant, although he commented on their irregular occurrence in the state. Like Eaton, he showed breeding in the western part of the state and throughout Long Island, but he was “unable to find a single instance of nesting” on the wetlands near the eastern end of Lake Ontario. As a result, Bull’s (1974) distribution map includes a question mark in this part of the state (Figure 1). He lists 29 breeding records from 12 counties, including 15 from Long Island and New York City and another 14 from central and western New York.

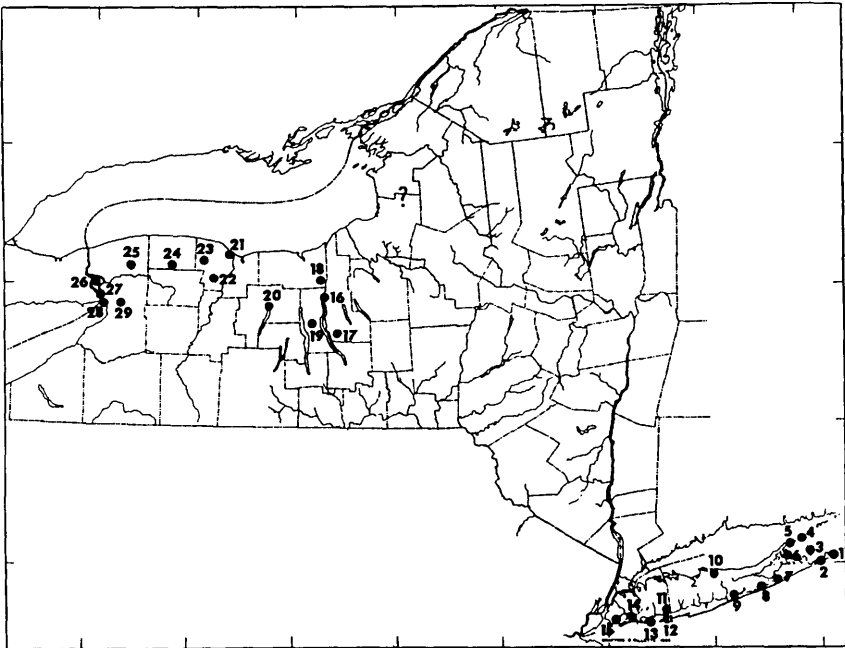


Figure 1. Short-eared Owl breeding sites from Bull 1974.

Methods

In order to document the current status and distribution of Short-eared Owl in New York, I compiled breeding records from all the readily available sources of avian records. These included *The Kingbird* Regional reports through spring 2002, the database from the first New York State Breeding Bird Atlas, the database records and notable species forms from *Atlas 2000* through September 2002, the archives of several local and regional listserves including Northern NY Birds from February 2000 to April 2002, Oneida Birds from June 1995 through September 2002, and Bird East from January 6, 1995 through April 14, 2002. Bird East distributes electronic postings from many Regional listserves, including Finger Lakes Bird Line, WNY Dial-a-Bird, Rochester RBA, Syracuse RBA, and the NYC RBA. I also collected information from the New York Natural Heritage Program databases and the manual files of DEC's Endangered Species Unit. To clarify and augment some of this data I contacted many individuals by telephone or e-mail. These conversations uncovered a number of private databases, some listing hundreds of Short-eared Owl records specific to certain parts of New York State. These included: the Buffalo Ornithological Society Database of Noteworthy Bird Records from the *Prothonotary* (1964-1997), William Ostrander's Kingbird Region 3 database (1998-2002), the Finger Lakes Region Short-eared Owl Census (1992), and Gerald Smith's birds of prey database (1977-2002). I reviewed these databases for important new information on probable or confirmed breeding records or large winter assemblages. Using information from all these sources I created two Access databases for Short-eared Owls, one containing information on breeding records (1 Mar through 30 Aug) and a second with data on wintering areas (1 Sep through 29 Feb).

While these Access databases probably represent the most comprehensive compilation of New York State data on Short-eared Owls since Bull (1974), several deficiencies should be mentioned. Specifically, the reporting of Short-eared Owls in *The Kingbird* varies from Region to Region, and some Regional editors do not publish all the information they receive on this species. In addition some records were difficult to interpret. For example, a report of 67 Short-eared Owls on eight Christmas Counts in Region 10 (NYC and Long Island) could not easily be tied to any specific location. Data collected from road tours, hawkwatches, and Christmas Counts were excluded from further analysis unless I could tie them to a well-documented wintering area or breeding site. In addition, some sites reported in *The Kingbird* had multiple names. By talking to the Regional editors and examining maps for road and town names, I was able to unravel many but not all of these synonyms. I excluded data whenever I could not be sure of the geographic location.

Results

Using these sources I was able to identify 48 breeding season records since 1980 that reached the level of "Probable" (28) or "Confirmed" breeding (20). These nesting attempts occurred at 36 different sites distributed over 19 counties. They included four of the sites identified in Bull (1974). Eight of the county records were not documented by either Eaton or Bull (Madison, Clinton, Jefferson, Livingston, Allegany, St. Lawrence, Chemung, Schuyler; Table 2).

Table 2. County Records for Breeding Short-eared Owls

<u>County</u>	<u>Eaton 1914</u>	<u>Bull 1974</u>	<u>Schneider 2002</u>
Allegany			X
Cayuga	X	X	
Chemung			X
Clinton			X
Erie	X	X	
Essex	X		X
Genesee	X		
Jefferson			X
Kings		X	X
Lewis	X		
Livingston		X	
Madison	X		X
Monroe	X	X	X
Nassau		X	X
Niagara	X	X	X
Onondaga	X		X
Ontario	X	X	X
Orleans	X	X	X
Oswego	X		
Queens		X	X
Rensselaer	X		
Saratoga	X		X
Schuyler			X
Seneca	X	x	
St. Lawrence			X
Suffolk	X	X	X
Wayne		X	
TOTAL	16	12	19

Based on these data it appears both Eaton and Bull had incomplete information about the breeding season distribution of Short-eared Owls in the northern part of the state. Records from the St. Lawrence Valley, the Champlain Valley and Jefferson County make up nearly half of the nesting records since 1980 and the two breeding birds atlas projects clearly helped fill in this gap. Although these data may be incomplete, the post 1980 distribution map also suggests that this species may have been lost as a breeder from eastern Suffolk County and the upper Hudson Valley (Figure 2).

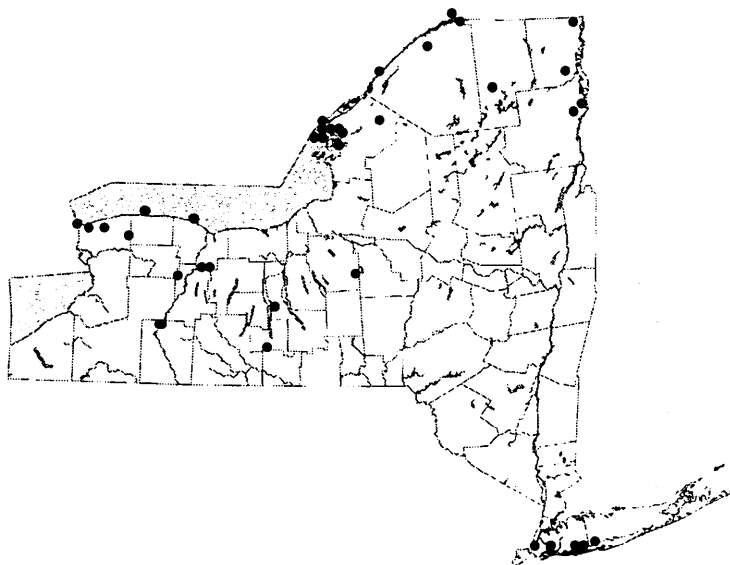


Figure 2. "Probable" and "Confirmed" Short-eared Owl breeding sites 1980–2002.

Because neither Eaton nor Bull tried to give a statewide perspective on the status and distribution of Short-eared Owl in winter, it is much more difficult to draw conclusions about winter population trends. Eaton considered the bird a common winter visitant in 1914, but he did not discuss any specific roosts or wintering areas. Bull cites three "big years" inland, 1962, 1965 and 1969, and gives winter maxima at six large roosts during those years. Along the coast he documented only one large concentration in 1959 when 40 birds were reported at Canarsie Pol, Jamaica Bay.

I used the data compiled from the sources mentioned above to identify important wintering areas throughout New York State. Winter aggregations only form near good feeding areas, so to some extent large winter concentrations can

be used to identify sites with good numbers of *Microtus*. Unfortunately, because small rodents undergo population cycles, these habitats may not support large numbers of owls every year. Therefore I arbitrarily labeled sites important wintering areas if they supported at least five birds and had owls present in at least five years. These criteria allowed me to identify the 32 important wintering areas that are mapped in Figure 3. The data from these sites show that they may persist for many years. On average these 32 wintering areas were occupied off and on over 29 years with ranges running from 13 to 45 years. Forty-nine percent of them reached their maximum occupancy, which varied from 6 to 76 birds, before 1980. Fifty percent of the sites have had birds present since the winter of 2000.

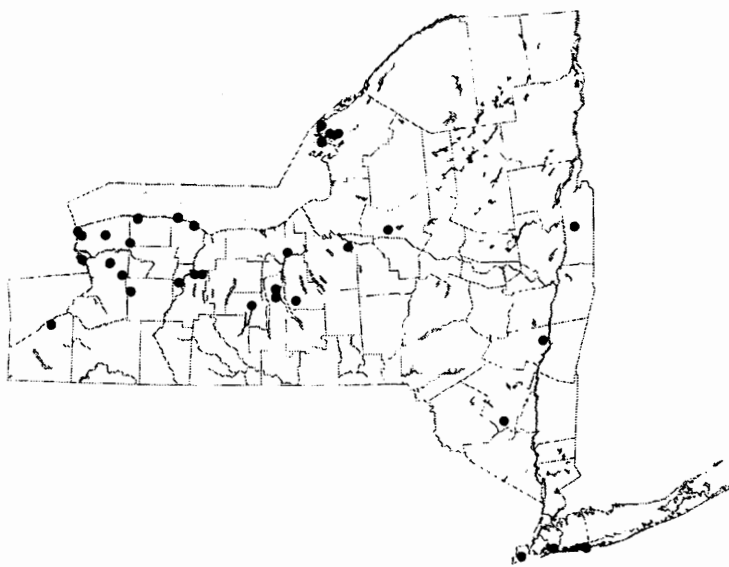


Figure 3. Important Short-eared Owl wintering areas. Each site at some time supported at least five birds and had owls present for at least five years.

Audubon Christmas Count data on Short-eared Owls are shown in Figure 4 (National Audubon Society 2002). While early counts covered only a limited area of the state and had relatively few participants, the New York State data since 1940 show clear peaks and valleys. The top five winter counts occurred 1945, 1961, 1962, 1969, and 1991. Like the Breeding Bird Survey data, the high variability from year to year makes it difficult to discern any clear population trends. I found no relationship between high Christmas Count years and the years when wintering areas had their peak numbers of owls.

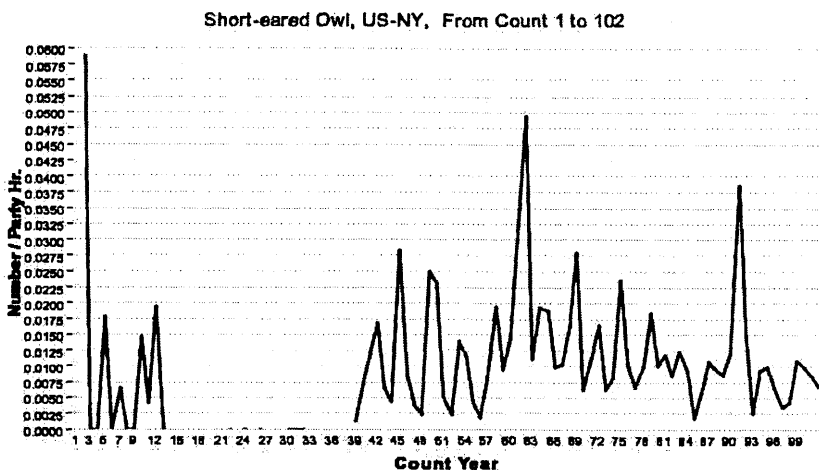


Figure 4. Number of Short-eared Owls/party hour on National Audubon Society Christmas Bird Counts in New York State 1901–2002 (National Audubon Society 2002).

Both Holt and Leasure (1993) and Clark (1975) reported that wintering areas often turn into breeding areas if food is plentiful, and Clark noted two specific examples in Manitoba. “Probable” or “Confirmed” breeding has occurred at or near 14 of the 32 important wintering areas. If it is wintering birds that stay and breed at these sites, one might expect more breeding in the years when many birds spend the winter in New York State. Figure 5 shows the number of “Probable” or “Confirmed” nesting records and the number of Short-eared Owls observed per party hour on Christmas Counts by year. While the relationship between these two variables is not statistically significant, the data are clearly suspect since observer coverage varies greatly by year and location. Alternatively, the number of breeders in New York in any one year may bear no relationship to the number of birds that winter in the state. Rather, breeding populations could be controlled by other factors such as vole populations in New York or even in Canada.

Management and Research Recommendations

The data presented here suggest that New York’s open habitats are important to Short-eared Owls as wintering areas and peripheral breeding sites for a North American population that extends well into Canada. Even the limited information currently available confirms that in some years there are certainly hundreds and possibly thousands of Short-eared Owls in New York in winter. Breeding birds are more scarce, but New York’s nesting owls are birds at the southern edge of their range. Biologists have shown that these rare peripheral breeders may be evolutionarily important because they harbor interesting and

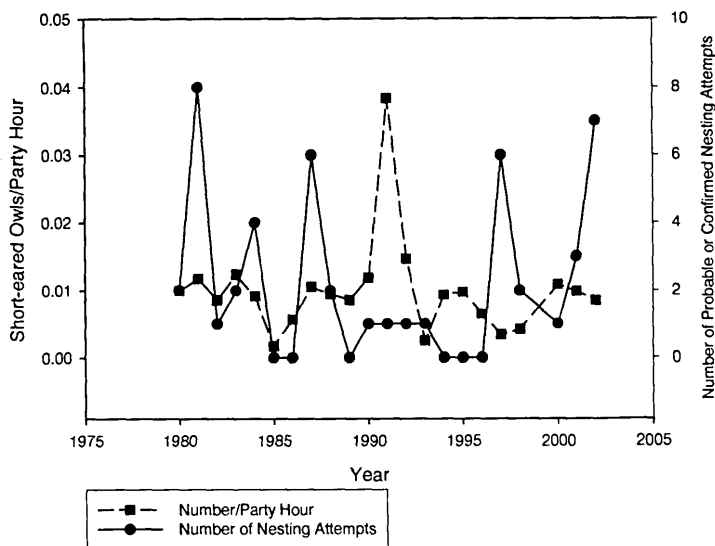


Figure 5. Number of Short-eared Owls/party hour on National Audubon Society Christmas Bird Counts and “Probable” or “Confirmed” nesting attempts 1980–2002..

unusual genetic information (Millar and Libby 1991). However, more research is needed to clarify what management strategies will have the greatest impact on the conservation of Short-eared Owls. The projects listed below will help fill some important information gaps.

1. Map traditional wintering areas and roost sites. New York almost certainly provides important wintering habitat for Short-eared Owls. Wintering areas that traditionally support more than single birds need to be mapped to identify foraging habitat and roost sites. Much of the information needed to map important wintering areas is available at the local level and more could be learned by interviewing local birders.
2. Monitor wintering areas and roost sites each winter. At least some wintering areas and roost sites should be systematically monitored using standardized methodology. Village (1987) and Craighead and Craighead (1956) described roadside surveys that can be used in open habitats to monitor raptor populations. If roost sites are known it is also possible to count owls as they emerge in the late afternoon. These kinds of data, consistently collected throughout the winter over a period of several years, would let us know if the Christmas Bird Counts are an accurate way to monitor the number of Short-eared Owls in New York in winter. It might also provide information on how these numbers change over the course of the winter.

3. Monitor wintering areas and recently occupied breeding sites for breeding birds. Since many wintering areas eventually become breeding sites, wintering areas and recently occupied breeding sites should be systematically surveyed for breeding birds. In New York courtship is usually observed in April and May, eggs are typically laid from mid-April to mid-May, and young are present in June and July. Combs and Griffin (1990) reported that birds on Nantucket are most visible in June at dawn and 2-3 hr before sunset. Field surveys for breeding birds should be designed to take these factors into account.
4. Learn the age, sex, origins, and migration routes of New York's Short-eared Owls. A holistic approach to the conservation of Short-eared Owls in New York State requires that we know something about every stage of their life cycle, including where they breed, where they migrate, and where they spend the winter. Since owls can be easily aged and sexed, we might learn more about the demographics of New York birds by compiling data from museum specimens. However, this sample could be biased if young birds are more likely to be killed. Better and more detailed information will require trapping some birds and fitting them with radio or satellite transmitters to follow them over a period of many months.
5. Quantify the habitat characteristics of sites used by New York's Short-eared Owls. Although the basic habitat requirements of Short-eared Owls are known, but it would be useful to gather quantitative habitat data on occupied sites in New York State. Herkert et al. (1999) reported that Short-eared Owls in Illinois required relatively short grass (< 50 cm), and that in the Midwest most idle grasslands are too tall for Short-eared Owls so that their grasslands need to be mowed or burned to reduce overall grass height. While Short-eared Owls usually prefer large grasslands (Herkert 1991, Herkert 1992, Robinson 1991), their data suggested that the birds might respond equally well to the total amount of grassland within the landscape. We need to identify the kinds of grasslands in New York State that can support large populations of meadow voles and that are structurally suitable for Short-eared Owls both in winter and during the breeding season. By gathering data from occupied sites and developing a habitat model, it might be possible to use a combination of aerial photos, geographic information systems and field surveys to identify new habitats. These sites could be targeted for field surveys by breeding bird atlas observers and Christmas Count participants.
6. Manage and protect consistently occupied sites. Finally it is important the few remaining sites that are consistently occupied by Short-eared Owls either in summer or winter be protected and managed in a way that takes into consideration their known habitat requirements. Many of the naturally open habitats that were historically used by Short-eared Owls, such as heathlands, maritime grasslands, wetlands, and barrens have probably been lost. Outside Long Island the only naturally open habitats of adequate size are probably wetlands and alvar grasslands. Fortunately many of these sites are already in

public or conservation ownership and many of them are already known to support other state-rare grassland birds such as Northern Harrier, Upland Sandpiper, Grasshopper Sparrow, and Henslow's Sparrow. Targeted surveys are needed to determine if they are also used by Short-eared Owls.

To compensate for the loss of naturally open habitats to development, reforestation and incompatible agricultural practices, it will be necessary to manage man-made grasslands for Short-eared Owls and other grassland birds. Fort Drum and Shawangunk Grasslands National Wildlife Refuge are examples of man-made grasslands in public ownership and that are being successfully managed for grassland birds, including Short-eared Owls. However, many of the sites that are currently occupied by Short-eared Owls are used for agriculture. They include hayfields, fallow fields and unoccupied pastures that, for a short time before the invasion of woody species, are suitable for Short-eared Owls. The long-term maintenance of these sites for grassland birds will require active management through mowing or burning. Public-private partnership programs like the USDA NRCS Wildlife Habitat Incentive Program or Conservation Reserve Program may be the key to promoting habitat protection and slowing the conversion of grasslands to row crops and development.

Acknowledgements

Portions of this report were funded by the New York State Department of Environmental Conservation through a contract with Stuyvesant Environmental Consulting, LLC. Thanks are also due to dozens of New York State ornithologists and birders, who generously shared their data and observations and responded to my e-mails and phone calls. This project would not have been possible without their information and support.

The views expressed in this report are mine and not necessarily those of the New York State Department of Environmental Conservation.

Literature Cited

- Able, K. 1990. Regional reports, Region 8-Hudson-Mohawk. *Kingbird* 40(2): 117-120.
- American Ornithologists' Union. 1998. Checklist of North American Birds, 7th ed.. American Ornithologists' Union, Washington, DC.
- Bakker, D. 1957. De Velduil in de Noordoost-polder. *Levende Natuur*. 60: 104-105
- Banfield, A.W.F. 1947. A study of the winter feeding habitats of the Short-eared Owls (*Asio flammeus*) in the Toronto region. *Canadian Journal of Research* 25: 45-65.
- Bent, A. C. 1938. Life histories of North American birds of prey. Pt. 2. U.S. National Museum Bulletin No. 170.
- Borko, M. 1977. Short-eared Owl food items in winter. *Kingbird* 17(1): 80-81.

- Bosakowski, T. 1986. Short-eared Owl roosting strategies. *American Birds* 40: 237-240.
- Brauner, A. 1908. Von Winternisten der Sumpf-Ohruele. *Ornithol. Jahrb.* 19: 55.
- Bull, J. 1974. *Birds of New York State*. Doubleday/Natural History Press, Garden City, NY.
- Chamberlaine, L. B. 1997. Regional reports, Region 6-St. Lawrence. *Kingbird* 47(3): 224-230.
- Clark, R. J. 1972. Pellets of the Short-eared Owl and Marsh Hawk compared. *Journal of Wildlife Management* 36: 962-964.
- Clark, R. J. 1975. A field study of the Short-eared Owl (*Asio flammeus*) Ponoppidian in North America. *Wildlife Monographs* 47: 1-67.
- Combs, K. P. and C. R. Griffin. 1990. Population dynamics, habitat use and management of Short-eared Owls and Northern Harriers on Nantucket Island, Massachusetts. University of Massachusetts, Department of Forestry and Wildlife Management, unpublished progress report, Amherst, MA.
- Cooper, M. F. 1998. Short-eared Owl, *Asio flammeus*. Pages 337-338 in *Bull's Birds of New York State* (E. Levine, Ed.). Comstock, Ithaca, NY.
- Craighead, J. J. and F. C. Craighead, Jr. 1956. *Hawks, Owls and Wildlife*. Stackpole Co., Harrisburg, PA.
- Eaton, E. H. 1910. *Birds of New York State, part 1*. University of the State of New York, New York State Museum, Albany, NY.
- Eaton, E. H. 1914. *Birds of New York State, part 2*. University of the State of New York, New York State Museum, Albany, NY.
- Elliott, J. J. 1953. Regional reports, Region 8-Long Island. *Kingbird* 3(1): 18-19.
- Eriks, A. 1952. Winter-broedgevallen van de Velduil (*Asio flammeus*). *Limosa* 25: 86.
- Fisler, G.F. 1960. Changes in food habits of Short-eared Owls feeding in a salt marsh. *Condor* 62:486-487.
- Griffith, K. C. 1987. Regional reports, Region 2-Genesee. *Kingbird* 37(4): 220-223.
- Grote, H. 1930. Winterbruten von *Asio flammeus*. *Beitr. Fortpfl. Bio. Vog.* 6:93.
- Hendrickson, G.O. and C. Swan. 1938. Winter notes on the Short-eared Owl. *Ecology* 19: 584-588.
- Erkert, J. R. 1991. Prairie birds of Illinois: population response to two centuries of habitat change. *Illinois Natural History Survey Bulletin* 34: 393-399.
- Herkert, J. R. editor. 1992. Endangered and threatened species of Illinois: status and distribution. Part 2 –animals. Illinois Endangered Species Protection Board, Springfield, IL.
- Herkert, J.R., S.A. Simpson, R.L. Westemeier, T.L. Esker and J.W. Walk. 1999. Response of Northern Harriers and Short-eared Owls to grassland management in Illinois. *Journal of Wildlife Management* 63: 517-523.
- Holt, D. W. 1993. Trophic niche of nearctic Short-eared Owls. *Wilson Bulletin* 105: 497-503.
- Holt, D.W. and S.M. Leasure. 1993. Short-eared Owl *Asio flammeus*. In *The Birds of North America No. 62* (A. Poole and F. Gill, Eds.). The Academy of Natural Sciences, Philadelphia, PA; American Ornithologists' Union, Washington, D.C.

- Holt, D. W., L. J. Lyon, and R. Hale. 1987. Techniques for differentiating the pellets of Short-eared Owls and Northern Harriers. *Condor* 89: 929-931.
- Hoyt, S. F. 1960. Regional reports, Region 3-Finger Lakes. *Kingbird* 10(1): 25-29.
- Hoyt, S. 1962. Short-eared Owls in a suburban housing development. *Kingbird* 12(1): 81.
- Ingram, C. 1962. Cannibalism by nestling Short-eared Owls. *Auk* 79: 715.
- Johnston, R. F. 1956. Predation of Short-eared Owls on a *Salicornia* salt marsh. *Wilson Bulletin* 68: 91-102.
- Korpimäki, E. and K. Norrdahl. 1991. Numerical and functional responses of Kestrels, Short-eared Owls, and Long-eared Owls to vole densities. *Ecology* 72:814-826.
- Marr, T.G. and D.W. McWhirter. 1982. Differential hunting success in a group of Short-eared Owls. *Wilson Bulletin* 94: 82-83.
- Melvin, S. M., D. G. Smith, D. W. Holt, and G. R. Tate. 1989. Small owls. Pages 88-96 in *Proceedings of the Western Raptor Management Symposium and Workshop* (B. G. Pendleton, Ed.) National Wildlife Federation Scientific and Technical Series No. 13.
- Millar, C. I. and W.J. Libby. 1991. Strategies for conserving clinal, ecotypic, and disjunct population diversity in widespread species. Pages 149-170 in *Genetics and Conservation of Rare Plants* (D. A. Falk and K. E. Holsinger, Eds.). Oxford University Press, Oxford, UK.
- Mikkola, H. 1983. Owls of Europe. Buteo Books, Vermillion, SD.
- Mikkola, H. and S. Sulkava. 1969. On occurrence and feeding habits of Short-eared Owls in Finland 1964-68. *Ornis fenn.* 46: 188-193.
- Morrow, I. 1979. Report of raptor observation form of July 11, 1979 on Short-eared Owl at Ocean Parkway on June 29, 1979.
- National Audubon Society. 2002. The Christmas Bird Count historical results [Online]. Available at . Accessed November 25, 2002.
- Northeast Endangered Species and Wildlife Diversity Technical Committee. 1999. Wildlife species of regional conservation concern in the northeastern United States. *Northeast Wildlife* 54: 93-100.
- Northeast Endangered Species and Wildlife Diversity Technical Committee. 2001. Endangered, threatened and special concern animal species in the northeastern states: a list of species recognized by state and federal laws. Unpublished report.
- Novak, P. G. 1987. Report of raptor observations at Factory Road on May 27, 1987.
- Pitelka, F. A., P. Q. Tomich, and G. W. Treichel. 1955. Ecological relations of jaegers and owls as lemming predators near Barrow, Alaska. *Ecological Monographs* 25: 85-117.
- Reilly, E. M. and K. C. Parkes. 1959. Preliminary Annotated Checklist of New York State Birds. New York State Museum and Science Service, State Education Department, Albany, NY.

- Robinson, S. K. 1991. Effects of habitat fragmentation on Midwestern raptors. Pages 195-202 in *Proceedings of the Midwest Raptor Management Symposium and Workshop* (B. A. Giuron Pendleton, E.L. Krahe, M. N LeFranc., Jr., K. Titus, J. C. Bednarz, D. E. Andersen, and B. A. Milsap, Eds.). National Wildlife Federation Scientific and Technical Series No. 15.
- Sauer, J. R., J. E. Hines, and J. Fallon. 2001. The North American Breeding Bird Survey, Results and Analysis 1966 - 2000. Version 2001.2., Laurel, MD.
- Scheider, F. 1958. Regional reports, Region 5-Oneida Lake Basin. *Kingbird* 8(1): 21-23.
- Scheider, F. 1959. Regional reports, Region 5-Oneida Lake Basin. *Kingbird* 8(4): 121-125.
- Smith, G. A. 1989. Point Peninsula, Jefferson County; mouse raptor mecca during the winter of 1987-1988.
- Spofford, S. H. 1966. Regional reports, Region 3-Finger Lakes. *Kingbird* 16(1): 33-36.
- Spofford, S. H. 1968a. Regional reports, Region 3-Finger Lakes. *Kingbird* 18(2): 96-99.
- Spofford, S. H. 1968b. Regional reports, Region 3-Finger Lakes. *Kingbird* 18(4): 204-207.
- Tate, G. R. 1992. Short-eared Owl, *Asio flammeus*. Pages 171-189 in *Migratory Nongame birds of Management Concern in the Northeast* (K. J. Schneider and D. M. Pence, Eds.). U. S. Department of Interior, Fish and Wildlife Service, Newton Corner, MA.
- VanBeurden, H. 1955. Regional reports, Region 3-Finger Lakes. *Kingbird* 4(4): 103-105.
- Vickery, P. D. 1983. Short-eared Owl. Pages 174-176 in *in .*). Audubon Society Master Guide to Birding, part 2 (J. Farrand, Jr., Ed.). Knopf, New York, NY.
- Village, A. 1987. Numbers, territory-size and turnover of Short-eared Owls *Asio flammeus* in relation to vole abundance. *Ornis Scandinavica* 18: 198-204.
- Worthington, W. W. 1893. Short-eared Owl nesting on Plum Island, New York. *Auk* 10: 301.
- Young, L. S., J. G. Crenshaw and L. L. Crenshaw. 1988. Food caching by a Short-eared Owl. *Murrelet* 69(1): 39.

