BOBOLINK PROTECTION AND MORTALITY ON SUBURBAN CONSERVATION LANDS

by Stephen F. Ells

In 1993 and 1994 I studied the role of conservation lands in Lincoln, Massachusetts, in the protection of the Bobolink *(Dolichonyx oryzivorus)*, a grassland species in regional decline (Bollinger and Gavin 1989; Veit and Petersen 1993). In Massachusetts public and private conservation organizations own hundreds of thousands of acres, some of which are grassland. Municipal conservation commissions, for example, control more than eighty-five thousand acres. Twenty-eight commissions (including Lincoln's) each control at least a thousand acres of land. Also, private conservation owners, such as the Massachusetts Audubon Society's (MAS) Drumlin Farm in Lincoln, control additional grasslands. Wildlife protection, however, is but one of many issues clamoring for their attention.

I studied the Bobolink because it is a declining, although much loved, bird. Its spirited song is a welcomed part of springtime for many townspeople. They would agree with Thoreau's Truro child who asked, "What makes he sing so sweet, Mother? Do he eat flowers?" If even the remnant population of this popular species were not being protected on conservation lands, it would warn of dangers facing less noticeable grassland plants and animals. Also, the Bobolinks are the longest distance migrants of all North American songbirds, flying fourteen thousand miles round-trip and yet often returning to within yards of their previous year's nests.

I wanted to learn what strategies existed to protect the Bobolink on its Lincoln breeding grounds and whether this stewardship would benefit other grassland birds. I was worried about the effect of haycropping and the choice of an appropriate "safe" cutting date. Finally, I wanted to learn whether simple monitoring techniques were feasible for other conservation observers to use to protect Bobolinks on their lands.

Recent writers have pointed out that wildlife-hostile agribusiness practices are transforming farmland throughout the country (Rodenhouse et al. 1992; Butcher 1993; Line 1994). They suggest that soon the only breeding reservoirs for many grassland species may be either less-intensive farms on the metropolitan fringe or public lands, such as airports. Although agribusiness is not as prevalent in Massachusetts, our conservation problems may be comparable. Grasslands continue to be abandoned or developed. For example, our dairy farms, with their hayfields and their pastoral beauty, are leaving the landscape more than half have gone in the last seven years. Some of these farms will remain in some agricultural use, but many will be developed. As I write, a 150-acre grassland farm just outside Boston's outer circumferential highway,

Interstate 495, is now 110 house lots and is on the market for thirty million dollars. Thus, local conservation lands may become even more important, by default, as regional breeding islands for certain grassland species.

Both the Lincoln Conservation Commission (LCC) and the MAS are known as good land managers and have chosen to manage or lease some of their holdings as agricultural land, including 220 acres of hayfields. This beneficial policy attracts open land wildlife (including Bobolinks) and supports the goals of open space and traditional landscape preservation, recreation, education, and community and family farming. Moreover, hay can make money for the conservation owner or can be swapped for free mowing. To produce top-dollar hay for the dairy and beef market, however, the farmer wants to cut the hay at its peak in May or June and again later in the summer. A problem arises when these intensive activities interfere with the conservation owner s mission.

Methods

In May and June of 1993 and 1994 I surveyed all public and private grasslands in Lincoln (more than fifty parcels) for Bobolink breeding activity. I identified the presence of stable male breeding territories (i.e., those on which one or more females were established) by repeated observation. Although each male's territory may contain more than one nesting female, for the purposes of this study I did not attempt to identify the number of nests per male territory. (Bobolinks are polygynous, i.e., one male mates with more than one female, while each female presumably mates with only one male.) I then noted the start of the hatch by observing a pattern of repeated male and female feeding trips and the carrying of fecal sacs and egg shells. I recorded the date of the haycropping of each of the breeding fields and, using available information in the literature on the Bobolink breeding cycle, estimated the percentage of stable male territories destroyed before any reasonable chance of nestling or fledgling survival. I used that percentage as an estimate of the loss of the year's breeding potential.

In addition, I intensively monitored four breeding fields that contained "cut-later" Bobolink sanctuaries. Three of these fields were active hayfields owned by the town of Lincoln or the MAS. The other was an old hayfield owned by the town of Carlisle. I monitored these four fields until the owner cut or the birds left, or a total of 288 times during the two-year period.

Almost all my observations were made from the field margins or along customary paths. I did not search for, mark, or visit active nests or force-flush new fledglings. Despite the imprecision this introduced, I preferred to substitute patience for intrusion. Field-edge walking is the custom in town, is appreciated by the farmers, and does not attract other users into the fields (e.g., mountain bikes, joggers, and dog walkers). It was also consistent with the objective to use simple monitoring techniques. I did, however, make use of intensive research

done in Oregon and New York on the breeding cycle. Although learning about grassland birds by observing them from the hayfield edge is like learning marine biology by sitting on the beach there is a lot going on that one does not see I learned enough to estimate the loss of Bobolink breeding potential and to record unexpected late-summer activity.

Results and Discussion

Bobolink Breeding Territories in Lincoln. Ninety percent of the fifty-seven Bobolink breeding territories in Lincoln were on conservation lands. This is a much higher percentage than would be expected based on relative acreage, for conservation organizations own or manage only about sixty-three percent of the hayfield acreage in town (or one hundred forty acres). The bird s affinity for conservation hayfields is perhaps caused by two factors: the average size of these hayfields (thirteen acres) is almost twice that of nonconservation hayfields (seven acres); and the past pattern of early haycropping on the latter, with the likely low rate of breeding success, may discourage renesting there.

Furthermore, ninety-five percent of the breeding territories in Lincoln were in hayfields. This also is a much higher percentage than would be expected based on relative acreage, for hayfields amounted to only fifty-two percent of the grasslands in Lincoln. (The other grasslands of comparable size included pastures, passive-use recreational grasslands, athletic field margins, abandoned or rotary-mowed fields, alfalfa or clover patches, grain fields, and recently reseeded hay or cover crops.) Lincoln's breeding hayfields contained a typical mix of grasses (e.g., orchard grass with timothy and Kentucky blue grass) with some patchy alfalfa and clover, and scattered goldenrod, dock, or loosestrife. The fields were periodically fertilized and limed but have not been tilled and reseeded for more than four years. (By way of contrast, in Carlisle, Bobolinks for at least twenty years have bred in an old, sparse, seventeen-acre field, with many weeds and much buckthorn, which a farmer mows gratis in late summer for low-quality hay.) Thus, the attractiveness and importance of these older conservation hayfields in attracting breeding Bobolinks in Lincoln are clear.

Size of Breeding Fields in Lincoln. The breeding hayfields in Lincoln are smaller than those usually suggested for the Bobolink. Larger fields (at least twenty-five to seventy-five acres) are said to be needed for Bobolink breeding (Herkert 1991). The Lincoln Bobolinks, however, used smaller, scattered fields for they were the only ones available in this predominantly wooded suburban town. These breeding hayfields ranged from four and one-half acres to twenty acres. At this small scale, arraying these fields by fence line acreage is not a useful way of displaying the openness preferred by these Bobolinks. Instead, I found it helpful to cluster adjacent hayfields, which were often separated only by a row of brush, and to sort both the clusters and the isolated fields into a five-acre distribution pattern, as follows: there were two isolated breeding fields of

Bobolinks *Reproduced with permission from E. W. Friedmann*

less than five hayfield acres; five fields or clusters of fields of five to ten acres; two fields or clusters of eleven to fifteen acres; two fields or clusters of sixteen to twenty acres; and two fields or clusters above twenty-one acres. Thus, recognizing the potential of and being careful with small breeding fields is the vest-pocket conservation that is typical of the metropolitan environment.

Start of Hatching in Lincoln Bobolinks. Based on parental behavior, I inferred that the hatch in Lincoln started about June 8-9 in 1993 and by June 6 in 1994. As confirmation, on June 10, 1993, I found an early nest with five recent nestlings by observing anxious adults searching under freshly cut hay at Drumlin Farm. (One nestling had been freshly killed and the nest was destroyed the next day by raking equipment.) Other observers in Massachusetts have reported similar hatch starting dates: June 7-10 in 1987, 1988, and 1994 at the MAS Daniel Webster Sanctuary and June 9-14 in 1988, 1989, 1990, and 1994 at the higher elevation of the MAS Wachusett Meadow Sanctuary (Drinkwater 1988; Birch 1994; Choiniere 1993, 1994).

I found the start of the hatch to be the most useful and reliable index date from which other events in the breeding cycle can be measured. It is an event that a conservation observer can infer from field-side by sightings of the carrying of egg shells and fecal sacs, and of repeated parental feeding.

One puzzling historical discrepancy emerged. Based on the observed

hatching dates and an incubation period of about twelve days from the penultimate egg, I estimated the dates for earliest-egg laying in Lincoln as May 21-24, 1993-1994. I found only one other Massachusetts nest record as early as this—a nest with three eggs found at Alford, Massachusetts on May 25, 1932 (Kingsbury 1933). These dates are earlier, however, than dates of June 1 or later recorded for one or more eggs, or a full clutch, or for nesting, by Brewster (1906), Townsend (1920), Samuels (1870, reported in Forbush 1927), Bagg and Eliot (1937), Wetherbee (1945), Bailey (1955), Bent (1958), the Massachusetts Breeding Bird Atlas (unpublished), and the North American Nest Record Program at Cornell (Lowe 1994, pers. comm.). It is possible, although unlikely, that avid "eggers" of those times missed earlier eggs. An alternative inference is that earlier nesting is occurring, perhaps allowed by a warmer climate, changes in hayfield management (Bollinger and Gavin 1989), or the natural selection of earlier breeders under the pressure of a century of ever-earlier haycropping.

Fledging Dates. Estimating from the field edge the date of initial fledging (i.e., crawling from the nest) or first-flight was less reliable than estimating hatch dates. Stokes and Stokes (1989) suggest that early flight occurs about two days after fledging, with three more days required to fly well enough to follow the parents and beg for food. In Lincoln, however, early flights were brief and rare, some flights were premature panic flushes, and quick-glance identification clues could be misleading (e.g., some parenting females had lost their tails). The grass, not the sky, is the fledgling's world, and they leave it reluctantly. Thus, the start of fledging could not be easily inferred but probably occurred in Lincoln between June 17-19 in both 1993 and 1994, although fledglings were not conspicuous until the last week of June. This is consistent with the customary hatch-to-fledge time of approximately ten to eleven days (Stokes and Stokes 1989). At other locations, flightless fledglings were monitored at MAS Daniel Webster crawling on grass stems on June 17, 1994, and were flying two days later. Monitors also saw fledglings flying on June 23-24, 1993, at MAS Wachusett Meadow, and on June 25, 1994 (weakly) at Wayland's Heard Farm (Patterson 1994 pers. comm.).

Estimated Nestling and Fledgling Mortality. Based on my observations of nesting activity and on published data on the Bobolink breeding cycle, I estimated that haycropping in Lincoln killed about eighty percent or more of the young Bobolinks in fields where haycropping went on normally. This probable severe result occurred on all normally cut hayfields, whether they were owned by the LCC, the MAS, the private land trust, small farmers, a neighborhood association, the airport, or others. In 1993 and 1994, out of a total of fifty-seven established male breeding territories, forty were in unprotected fields. Although in both 1993 and 1994 the weather and other reasons delayed haying, seventy percent of the unprotected hayfields were cut before mid-June, and all fields were cut by June 28 in 1993 and July 10 in 1994. Because haycropping kills

essentially all nestlings and at least fifty percent of recently fledged young (Bollinger and Gavin 1989), a comparison of the timing of the hatch or observations of fledglings with the date of the cut made it clear that in only eight territories could some of the young birds have survived.

Bollinger et al. (1990) have also measured the effect of haycropping on Bobolink mortality. Their widely cited report of sixteen to forty percent mortality of Bobolink young in hayfields in upstate New York, however, may reflect the fact that many fields (particularly the older ones, which produce the most Bobolinks) were not cut until mid-July. The authors acknowledged that earlier cutting would have produced higher mortality in their study area. Lincoln's earlier completion of cutting, presumably resulting in higher Bobolink mortality, may be much closer to the norm in eastern Massachusetts.

Nesting Success on Small Cut-later Sanctuaries. Even small cut-later sanctuaries, despite their disadvantages, were very important in an otherwise hostile landscape. By 1994 the LCC and the MAS had created three small areas within larger hayfields and delayed the first cut until at least July 15. These cut-later sanctuaries contained, in total, only nine acres and represented only four percent of the total hayfield acreage in town. These small sanctuaries, however, accounted for about seventy percent of the Bobolink breeding territories that likely produced at least some young. That is, the nine acres of Bobolink sanctuaries contained seventeen territories that were not destroyed by haycropping. But the other 210 acres of unprotected public and private hayfields in town produced young from only eight male territories or parts of territories.

Relying on such small cut-later areas, however, imposes a variety of survival penalties. For example, per-acre density of breeding territories is said to be greater on much larger fields (Bollinger 1988). Small cut-later areas concentrate predators. Some bachelor birds and refugee Bobolinks from mowed fields probably come to the small cut-later areas and compete for limited resources. And small areas may not include the variety of mini- habitats that may be needed within a breeding field to meet a variety of food, shelter, and weather conditions. Finally, since the cut-later area is often at the edge of a larger field, it is disproportionately more accessible to field-edge predators. In these ways, their smallness could make successful breeding harder.

Thus, the small cut-later areas, though important, are a compromise. For a declining species, conservation owners should not conclude that such postage-stamp-size sanctuaries are equivalent to adequate protection. (In Lincoln, for example, cuts were delayed on only six percent of LCC hayfields and on only nine percent of MAS hayfields.) The combination of the Bobolink's fatal attraction to active hayfields and the resulting high mortality of its young due to haycropping creates a situation in which the preferred habitat may be a reproductive sink. Even with the comparative success of the above sanctuaries, the overall townwide loss of young due to haycropping was about fifty-seven

percent (based on the loss of young from about thirty-two of fifty-seven breeding territories). And of course this is from a population of parents depleted by loss of habitat and persistent early cutting. Additional strategies to manage hayfields for conservation could include more and larger cut-later areas (e.g., Amherst's one hundred twenty acres) (Westover 1994), choice of later-maturing hay species, choice of appropriate markets (e.g., fodder for horses and sheep), use of no- till reseeding drills, scheduling of fertilizing to avoid crushing nests (and affecting the brooding female?), reclamation of nonagricultural fields, and wildlife protection plans. The conservation ideal for me would be a mosaic of fields, cut or burned on different rotations to provide habitats for a variety of animals and plants.

Extensive Late Summer Use of Protected Fields. During the late summer I continued to monitor three cut-later areas in 1993 and four in 1994, for a total of seven "field seasons." (A field season represents the experience of one field during one breeding season.) At one field in both years and at another field in 1993, activity appeared to drop sharply in mid-July, and the Bobolinks probably left. The former field was the smallest of the cut-later areas, less than two acres, and the latter was the three-acre area at the MAS Drumlin Farm, which had been the most parched by the 1993 drought.

On the other hand, Bobolinks made extensive use of the majority of the cut-later areas (Drumlin Farm in 1994, Carlisle in both years, and Farm Meadow, studied only in 1994) until early August, with one area active until September. Although the Bobolinks could be stubbornly inconspicuous, these July and August breeding areas had a changing mix of incubating and feeding birds, nestlings, fledglings, protective and tutoring parents, bachelor or refugee adults, and molting birds of all genders and ages.

In 1994 the three-acre cut-later area at Drumlin Farm had an average of thirty Bobolinks daily throughout the last two weeks of July and into the first week of August. During the month of July I observed parental insect-carrying on ten days, with the latest date July 24. Fecal sac carrying was observed on July 10. Bold and protective behavior, generally by adults protecting a consistent area, was seen as late as July 29. Recently fledged birds were seen as late as July 27. Protective behavior by adult male(s) still in full breeding plumage was noted as late as July 27 and 29. The most vivid example of this protective behavior occurred at dusk on July 27, 1994, when I flushed thirty-six Bobolinks from an apparently empty field. A male in breeding plumage interposed himself (with agitated behavior and "chucking") between me and a probable family group, consisting of a female (with insect) and three begging young birds and evidence of more in the grass. The goldenrod clump ten feet behind this family group was festooned with a dozen older fledglings molting into first winter plumage.

The ragged, late-cut old field in Carlisle, which was about seventeen acres,

was active throughout July and into August in both 1993 and 1994. For example, about July 6, I observed a female's behavior that indicated that a late nest had hatched and, because she was distinctively marked, I could follow her energetic parenting (without assistance, by the way, from her likely mate, which gave his allegiance to another active nest site). On July 16, at least some of her young appeared to have fledged as she was also protecting and feeding birds in the grass a short distance away from the nest site. On July 18, she and her family were at the other end of the field, 300 yards from her nest site, although the youngest observed fledgling was very awkward and short-tailed. On July 21, four fledglings were staying close (i.e., often three to a weed) to the female. They retained an affinity for their nest area though they moved around the field in a loose group, the cautious female keeping them at least sixty yards from the observer's scope. Also in 1993, other first flight activities were observed at least as late as July 21, and another family group was apparently very dependent on the care of the female into the first week of August. In 1994 the field had more birds and later dates, but the situation was comparable. In July 1994 it held a flock of eleven to forty Bobolinks, often hidden away in an obscure corner or on a reverse slope. Two of the females were still "on station" and protective in the fourth week of July. The August field had a flock of twenty, including a begging bob-tail juvenile and family groups, in declining numbers through August 14.

Farm Meadow's cut-later area of five acres had a daily average of forty-nine Bobolinks throughout all of August. From observation and identification of known individuals, these birds, except for an occasional visiting flock, were generally the field's resident flock. I observed typical recent fledglings on eight days of August and as late as August 15. Also, I observed late males in full breeding plumage (or with minor changes) protecting young birds as late as August 3, or paired with fledglings as late as August 11. Such males may be a useful and conspicuous indicator of continuing fledgling dependence at the end of the season. Belated broods of young birds are known to delay the molt of their parents far beyond the usual limits (Dwight 1900). The Bobolink flock departed abruptly about September 1, leaving one to three birds, which were regularly in the field through September 28.

These home-field mixed flocks could be "glued to the ground," even when joggers, mountain bikes, or farm trucks passed close by. It could take forty minutes even to know there were Bobolinks in a field. These late-summer birds often tucked themselves onto a reverse slope or dribble-flushed into a field's far corner. And any time from late June to early September, some male Bobolinks (for example) were in molt some of these were flight-impaired and were particularly secretive.

The longer than expected breeding activity and home-field use posed both a conservation challenge and a research puzzle. Although the Massachusetts Breeding Bird Atlas (unpublished) notes fledglings as late as mid-July, I found

only two references to late-July fledging in Massachusetts Bagg and Eliot (1937) note a nest with eggs in mid-July, and Thoreau in his Journal of July 26, 1853, reports from Concord that "I see the young [Bobolinks], just able to get out of my way above the weeds and bushes of the low grounds, their tails not grown out to steady them." Outside Massachusetts, I found a report of an August 5, 1927, fledgling in Ohio (Trautman 1940). Because this late-season activity has implications for management strategies, I compared the Lincoln experience with research elsewhere.

Comparison of Lincoln Data with Other Data. Excellent data from Oregon and New York include a great deal of information on the Bobolink breeding cycle. The observed Lincoln dates can be compared with this research to suggest the rate and duration of local breeding, help explain the patterns of late July and August occupancy, and help develop appropriate "safe-cut" dates. I have chosen to plot these data using as the index the earliest date of hatch or fledge during the Oregon or New York study period, and to match that to the corresponding date of the earliest hatch or fledge in the Lincoln breeding cycle. This method of display is most consistent with this study's objectives of testing a monitoring system that is useable by local conservation observers elsewhere. The land manager usually will not have the resources to monitor the fields every year but can monitor for a few years and identify the earliest hatch to use as an index.

The data showed two patterns. The first pattern, which was similar to that found in the minority of Lincoln fields, was found on an Oregon National

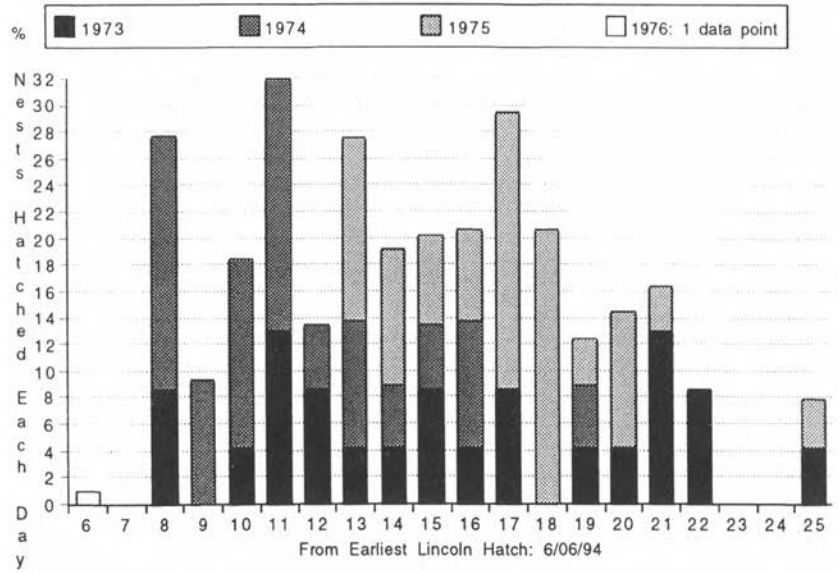

Figure 1. % Oregon Hatching '73-'76, by Day, using Lincoln Hatch

Wildlife Refuge on which hay was cropped in late summer (Wittenberger 1978). Although the entire refuge was censused each year, intensive work occurred on a seventy-three-acre portion, where individuals were identified by either leg-banding or physical or behavioral traits, all nests were found, and more than five hundred nestlings were monitored.

Figure 1 displays three years (and the start of a fourth year) of the Oregon hatches and adjusts the earliest hatch date to correspond to the date of the earliest Lincoln hatch. The data, displayed for each day, are expressed as a percentage of that year's hatches. In other words, Figure 1 shows what three years of the Oregon hatch would have looked like in rate and duration if it had occurred in Lincoln (given the caveats discussed earlier). Understanding both the rate and the duration of the breeding cycle is important because the danger in some customary "safe-cut" dates is that they may be based on the conspicuous first rush of birds and thus may save only the first of the year's young birds. Figure 1 shows an average annual hatch duration of fifteen days. In large part due to the delayed nesting of the secondary females (i.e., the second mates of polygynous males), an average of twenty-nine percent of the hatches occurred during the last week of the hatch. The hatch periods shown in Figure 1 would have ended, in Lincoln, between June 19 and 25, with about ninety-five percent of the hatch completed between June 16 and June 22. Thus, assuming approximately eleven days from hatch to fledge, we could predict that about ninety-five percent of the Lincoln birds would have fledged by about June 27, July 2, or July 3. This pattern of fledge was, in general, consistent with the behavior observed in the minority of cut-later Lincoln fields discussed earlier, i.e., those in which Bobolink activity appeared to drop sharply in mid-July.

An extended pattern of the breeding cycle, however, is seen in upstate New York data, which were collected in areas where there were both haycropping during the nesting season and renesting of those birds whose first nests had failed before fledging (Bollinger 1988; Bollinger and Gavin 1989). Besides gathering information on 300 hayfields, the researchers intensively monitored nine locations over three years, banded or color-marked ninety percent of the adults, and monitored all or nearly all nests, from which 752 birds fledged.

Figure 2 displays three years of the New York fledge and, like Figure 1, adjusts the earliest fledge to correspond to the date of earliest Lincoln fledge. The data, displayed for every two days, are expressed as a percentage of that year's fledges. In other words, Figure 2 shows what three years of the New York fledge would have looked like in rate and duration if it had occurred in Lincoln (given the caveats discussed earlier). The important conservation data in Figure 2 (and the difference from Figure 1) are in the prominent right slope of the data. They suggest that the birds that would fledge in Lincoln on or after June 30 represented a large portion (about thirty percent) of the year's fledglings. Furthermore, Bollinger et al. (1990) found renesters to be common in unmowed

sections of partially mowed fields, and based on the dates Bollinger and coworkers suggest, renesters in Figure 2 would be responsible for about fifteen percent of the year's fledglings. Using the New York data, the last predicted Lincoln fledge dates would be July 24-25.

The principal difference between the New York pattern (with renesters) and the Oregon pattern (without renesters) is that the New York fledge lasted almost forty days in each of the three years. It was thus more than twice as long as Oregon's hatch and ended in late July. This New York pattern of Figure 2 is consistent with my observations of the majority of Lincoln's cut-later fields, i.e., those that were active throughout July and into early or mid- August. This suggests that renesting birds can be a cause of late summer activity in Lincoln s fields, an activity that might keep the remainder of the flock longer in its home field. Such renesting could be due not only to nearby haycropping but also to other pre- fledging nest destruction, such as recreational activities or predation on these small suburban fields. One Lincoln five-acre sanctuary was active later than the New York data would directly support, but fourteen acres of that field (Farm Meadow) were cut on July 3. This may have been not only early enough to destroy some nests before the young birds fledged (thereby inducing the adults to renest) but also late enough so that those renesters fledged young in August, thus keeping the field active throughout the month.

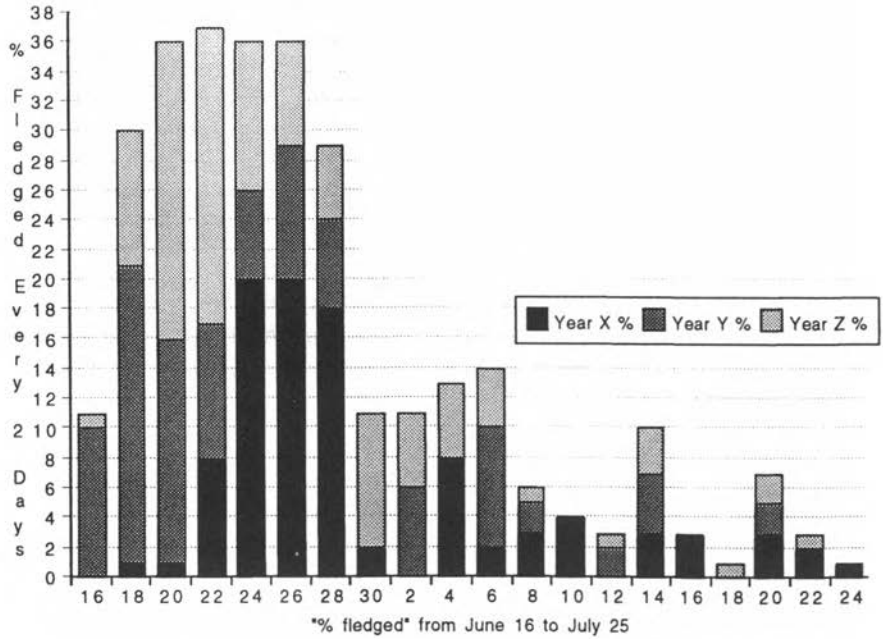

Figure 2. New York Fledge Curve with Lincoln Fledge-date

The Safe-cut Date. On active hayfields, an appropriate safe-cut date is the most important strategy for Bobolink protection, but what is that date? Unfortunately, the literature does not tell when a young bird s survival is no longer endangered by cutting its breeding field. Research is little help on this issue—papers simply note that many fledglings die, and do so invisibly and unrecorded. In one group of fledglings in Oregon, half died during the first week after leaving the nest (Wittenberger 1978), and others note the hazard the young fledgling faces (Bollinger et al. 1990). Bollinger and Gavin (1989) recommend "Cutting should occur after mid-July (and preferably in August) to avoid nest mortality." But this recommendation protects only against nest mortality the direct killing of the birds in the nest.

In practice, it has often come down to a pseudo-standard of "Well, they seem to be flying, so it's probably OK." Even if one assumes that the observers have not missed the later nesters, this approach does not fully appreciate the complex development that is underway. Alexander Skutch (1976) notes that the life of a young bird during the short weeks after the fledge is a continuous lesson—the parents must teach them what to eat, when to hide, what to fear, and even what not to fear. It is then, he says, that the young get the "training that will help them confront the complexities and perils of the wider world they will soon enter." Thus, such a plausible clue as whether some young can fly represents only the start of a phase of intensive education it is not an assurance that the young can readily survive without their home field advantage.

Some reasonable estimates, however, of the effect of the timing of haycropping on Bobolink populations can be made. As discussed earlier, haycropping in the first week of July would find many young birds still in the nest or within a week of fledging and would likely kill most of them. In the minority of Lincoln's cut- later fields, Bobolinks left by mid-July, which is consistent with the Oregon pattern. On the other hand, in the majority of Lincoln's cut-later areas, recently fledged young were evident in the last week of July or, in one case, as late as mid-August. The New York data also showed that although approximately seventy percent of the year's fledglings fledged in the first two weeks of the season, the remaining thirty percent fledged during the next three to four weeks of the season. Extrapolating the New York data to Lincoln, thirty percent of the year's fledglings in Lincoln would be predicted to fledge during the month of July. A cut date during the last week of July would probably result in the loss of a small percentage of these young, but a cut date of July 15 would likely result in the loss of about half of these later fledglings.

The best approach may be to let the Bobolinks set their own safe-cut date and protect the home field until Bobolinks have naturally dispersed. There may not be a single dispersal date, however, that holds true for all fields or even for a specific field in another year. The date on which the Bobolinks leave a field may vary depending on several factors—delays in nesting, the availability of food,

shelter and mini-habitats within the field, the extent and timing of nearby haycropping, the availability of alternative habitat, the size of the field or its Bobolink population, the level of disturbance or nest destruction, the presence of renesting birds, etc. Some of these variables may be weather-dependent and some may be field-specific. Although some fields may empty early, it is also likely that there are late years, late fields, and late nesters.

My experience in Lincoln and Carlisle suggests that the birds may often leave their home field, if it remains uncut, later than is assumed. Because it is unlikely that most fields can be practically or accurately monitored each year, this suggests the selection of a conservative safe-cut date of at least mid-August to protect all of the late fledglings. Although there may be compelling reasons that lead a conservation owner to decide to cut earlier than mid-August, the burden should be on that owner to monitor these fields, to minimize the cut, and to set aside additional cut-later acreage to replace the birds that may be sacrificed by an early cutting date.

Conclusion

The local conservation commission and others responded positively to this survey of Bobolink mortality, the MAS Grasslands Bird Project, and the fortuitous appearances of endangered grassland species. The LCC was alerted in 1993 by a territorial display, next to a cut-later hayfield, of a state-endangered Sedge Wren *(Cistothorus platensis)* and by a discouraging first-year report on Bobolink mortality. The local newspaper became interested. With the grudging acquiescence of its farmer-lessees, the LCC issued a new and thoughtful farming policy for its land, which called for wildlife inventories, the protection of biodiversity, and annual reviews of the farmer-lessees' plans. Of benefit to the Bobolink, it said that "[a] species of concern, or one which is not considered endangered but has experienced a reduction in population, should be given careful consideration to encourage its proliferation." Then, the LCC created a new five-acre cut-later sanctuary. This was a great success a pair of state-endangered Henslow's Sparrows *(Ammodramus henslowii)* hatched young there about August 11, their first known nesting in the state in twenty years. As described elsewhere in this issue, the LCC and MAS ran both an educational program and warden patrols for the 600-1000 visiting birders and townspeople. Competition remained high, however, from other public uses, such as a recreation complex, to use this conservation field.

Elsewhere in town, although Drumlin Farm's farming and educational activities in 1994 eroded its already-small Bobolink sanctuary, the MAS did buy more expensive open land nearby. Also, as if they sensed a welcome, the first pair of Eastern Meadowlarks *(Sturnella magna)* to nest in town in a decade showed up on a private hayfield under a LCC conservation restriction. The farmer (whose family has farmed the land since the 1600s) readily agreed to

protect the nest. And the Massachusetts Port Authority (Hanscom) agreed with the author to delay future cutting of an outside-the-fence hayfield, where Bobolinks and meadowlarks have regularly attempted to nest. Finally, statewide support was given by the Massachusetts Association of Conservation Commissions, which published a summary of this research for all 351 commissions across the state.

Thus, the commitment and good will of this conservation commission and others contributed to the protection of Bobolinks and other wildlife in this town. These actions alone, however, are probably not enough, in view of the pressures on the wildlife. Aldo Leopold (1945) described a similar dilemma when he contrasted two alternative futures for the farm. The first was "The farm is a food-factory and the criterion of its success is saleable products." The second was "The farm is a place to live. The criterion of success is a harmonious balance between plants, animals, and people." With technical help and encouragement, local conservation organizations could do more to protect wildlife.

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