The Cooper’s Hawk in Wisconsin: A Review of Its Breeding Biology and Status

A 17-year study of the Cooper’s Hawk (Accipiter cooperii) in Wisconsin has documented healthy reproductive success as well as nesting densities that are among the highest reported for this raptor in North America. This work has also helped remove this bird from the state’s list of threatened species. Cooper’s Hawks breed statewide in a wide variety of tree species and upland wooded habitats, including pine plantations and urban woodlots. This hawk may be one of the commonest diurnal raptors in Wisconsin in the nesting season.

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Many of the results of our continuing studies of the Cooper’s Hawk (Accipiter cooperii) were not available to Robbins (1991) when he wrote his account of this species in Wisconsin Birdlife. Here we update and amend some of his interpretations about its status and breeding biology in the state on the basis of our 1980-1996 work at more than 500 nests in 30 counties (Figure 1).

BACKGROUND

The Cooper’s Hawk was widely described as a common breeding bird in Wisconsin and other midwestern states in the late 1800s and early 1900s (Robbins 1991, Rosenfield et al. 1991a). By the 1930s and 1940s, counts along autumn migration routes in eastern states had suggested that its numbers were falling, although the geographic origins of migrants—their birth and/or breeding sites—were and are unknown in almost all cases. Concurrent declines in reproductive success in the northeastern United States in the late 1940s through mid-1960s were associated, temporally at least, with evidence of eggshell thinning and other impacts of environmental contaminants, especially DDT.

Consequent concern about the eastern population of the Cooper’s Hawk depended mostly on information gath-
Figure 1. Wisconsin counties with active Cooper’s Hawk nests, 1980–1996 (Rosenfield and Anderson 1983; RNR, JB and WES unpubl. data).

and other aspects of Wisconsin status, including nesting phenology (SMV).

This overview of our work concentrates on nesting success, breeding densities, habitat use, and related aspects of the status of the Cooper’s Hawk as a breeding bird in Wisconsin, with little room for mention of much deserving research in other parts of North America. For broader summaries of current knowledge of the species and better reviews of the literature, see Palmer (1988) and Rosenfield and Bielefeldt (1993).

NESTING CHRONOLOGY

Robbins (1991) proposed that the bulk of spring migration in the Cooper’s Hawk in Wisconsin occurs between late March and early May. We have also suggested a similar migration schedule for Wisconsin and other eastern states at comparable latitudes (Rosenfield and Bielefeldt 1993). However, the link between spring migrants and the state’s breeding population is muddied by overwintering birds (as Robbins noted) as well as the six to eight weeks of overlap between nesting activities in some Wisconsin birds and presumed migration in others.

January captures of marked birds indicate that some of the state’s Cooper’s Hawks may spend the winter as little as 1–2 km from their nest sites of previous or following years. Paired birds (winter residents?) engaged in “courtship” behaviors have been seen on subsequent nest sites as early as 6 March in southern Wisconsin, and nest building and copulations are underway at many breeding sites in southern counties by mid to late March (Rosenfield et al. 1991b), when migration has supposedly just begun. Statewide, a majority
of pairs has started to lay by late April and early May, after several on-site weeks of nest building, at a time when migration is supposedly still in progress.

Local breeders, which may become somewhat more conspicuous both visually and vocally as nesting begins, might be mistaken for migrants in some cases. We suspect, for example, that peak observational frequencies circa 1 May (Temple and Cary 1987) are probably attributable in most instances to breeding birds rather than migrants. It remains difficult to square nesting schedules with known or perceived migration schedules in Wisconsin, partly because we know almost nothing about the destinations of the state’s spring migrants or their subsequent breeding status, in or out of Wisconsin.

Historical data available to Robbins (1991) suggested that Cooper’s Hawks had initiated incubation at nearly all of 37 Wisconsin nests “before” 15 May (Oconto County) or “between” 1 and 15 May (Wood County), with extreme laying dates approximately 10 April to 10 June. By backdating from estimates of nestling age at the time of banding for 358 successful nests throughout the state, 1980–1995, we have calculated the median hatching date in Wisconsin as 7–8 June. Individual nests have hatched young as early as 22 May and as late as 20 July.

Further backdating for an incubation period of about 34 days and a preincubation laying period of about five days yields median dates for onset of incubation circa 4 May (extremes about 18 April–16 June) and first eggs circa 29 April (extremes about 13 April–11 June). These results agree well with Robbins’ chronology except that a laying date as late as 10 June is exceptional: at several hundred successful nests we have had only one hatch date later than 30 June and consequently only one first-egg date later than 21 May.

A median fledging date circa 10 July (extremes about 23 June–21 August) was estimated by adding 32 days to the median hatch date for our sample. Many pairs will re-nest if an initial clutch is lost during laying or early incubation, and the latest extremes for hatch and other above dates may involve such re-nests. Parents may provide food to fledglings for as much as seven weeks after young leave the nest (Kelly and Kennedy 1993, RNR and JB). The breeding season of the Cooper’s Hawk in Wisconsin may thus last about five months, on average, between nest building in the latter half of March and fledgling independence in mid to late August.

**Reproductive Success**

When we started our study in 1980, some colleagues thought that the state’s breeding population was so low that we might not find any nests, while others suggested that we would be doing well to find two or three nests per year. Indeed, at the time and between the both of us (RNR and JB) we had only seen two Cooper’s Hawk nests in our lives. Nevertheless, with the help of many cooperators—WDNR staff, falconers, birders, and others—we found 25 nests in 1980 and 60 more in the two succeeding years. Nest success, calculated as the proportion of clutches producing one or more bandable young ≥ 14 days in age, averaged 69% (n = 83) in 1980–1982. After three years of fieldwork, it seemed that the
Wisconsin population of the Cooper’s Hawk was nesting more successfully, in larger numbers, than we or WDNR had anticipated. Nesting densities, discussed later, were often as high or higher than those reported elsewhere, including western states in which the species was still considered a “common” breeder.

Other reproductive indices from Wisconsin in the 1980–1982 breeding seasons—eggshell thickness, mean clutch size (4.3), hatching rates (96%), and mean number of bandable-aged young per successful nest (3.5)—were comparable to historical figures for the northeastern U.S. in the pre-DDT years before 1945 (Henny and Wight 1972, Rosenfield and Anderson 1983). Contaminants such as PCBs, heavy metals, and especially DDE (a metabolic by-product of DDT) were present in each of 12 Wisconsin eggs collected in 1980, but contaminant levels were usually below those considered harmful. No ill effects on reproductive success were detected.

Similar figures on reproductive success have prevailed through 1996 in aggregate work at more than 500 nests. Annual fluctuations do occur, mainly because of inter-year (but trendless) differences in nest success, which has ranged from 57% to 93% over 17 breeding seasons.

**Nesting Densities**

During 1980–1982, we made intensive repetitive ground searches to try to find all Cooper’s Hawk nests on search areas in Lincoln, Portage, Waukesha, and Oconto Counties; the last site courtesy of J. Mosher, M. Fuller, and K.
Titus. These efforts totalled nine site-years. Nest search areas, each 2,400–2,900 ha in size (9–11 sq. mi.), were objectively delineated without advance information on the presence or absence of nesting hawks. Woodland nesting cover on these four search areas varied from 30% to 90%.

The number of active Cooper’s Hawk nests per area per year ranged from zero to four. (“Active nests” are those in which eggs were known to have been laid.) Maximum density was one nest per 734 ha (about 2.8 sq. mi.) in Portage County in 1981. Mean density across years and search areas was one nest per 1,907 ha (about 7.4 sq. mi.) in 1980–1982. It may be easier to visualize density in terms of the distance between active nests. At highest density in 1981 in Portage County, where two-thirds of the search area was cropland, nests were spaced 1.3–1.9 km apart (about 0.8–1.2 mi.).

At the time, three of the four Wisconsin search areas in four of nine site-years had nesting densities comparable to or greater than the small set of previously reported densities elsewhere in North America (Rosenfield and Anderson 1983). We have since found even higher densities of nesting Cooper’s Hawks in the state: one nest per 331 ha (1.3 sq. mi.) in mostly wooded rural habitat in Waukesha County in 1986 and again in 1992, and one nest per 272 ha (1.0 sq. mi.) in lightly wooded suburban habitat in Stevens Point, Portage County, in 1993, where median inter-nest distance was 0.8 km (range = 0.5 to 2.4 km, Rosenfield et al. 1995). These Wisconsin densities continue to exceed those reported in recent studies in other parts of the species’ breeding range. Both breeding success and nesting densities thus suggest that the Wisconsin population of the Cooper’s Hawk is reproducively and numerically healthy at this time (1980–1996).

**Nesting Habitats**

Robbins (1991) and Zimmerman (1991) needed to use concise, broad brush descriptions of vegetational associations in characterizing the habitats of Wisconsin’s breeding birds. Robbins’ shorthand portrayal of the summer habitat of the Cooper’s Hawk as “deciduous forest” and “northern maple-hemlock-pine forest” is partly but not entirely illustrative of the breadth of the species’ nest site habitats.

We have found Wisconsin nests in at least 25 species of trees, predominately oaks (*Quercus* spp.) and pines (especially white pine (*Pinus strobus*)) but also spruces (*Picea* spp.), aspens (*Populus* spp.), ashes (*Fraxinus* spp.), willows (*Salix* spp.), maples (*Acer* spp.), birch (*Betula* spp.), black walnut (*Juglans nigra*), American beech (*Fagus grandifolia*), black cherry (*Prunus serotina*), etc., and even, in one case, a dead tree. Aged trees in “old” forests are not essential as nest sites. Mean diameter of the nest tree at 52 randomly discovered Cooper’s Hawk nests across the state, 1980–1994, was 33 cm (about 12 in) with a range of 12–50 cm (Treixel et al. 1999). Rosenfield and Anderson (1983) arrived at an identical mean for nest tree diameter at 60 statewide nests, 1980–1982. Many conifer plantations and other woodlands used by nesting Cooper’s Hawks are thus ≤40–50 years in age.

“Natural” woodlands, large forests, forest-interior habitat, and sites remote from human activity are also unnece-
nary as breeding habitat. Pine plantations, for instance, are frequent nest sites in southeastern counties where native pinewoods are virtually absent (Bielefeldt and Rosenfield 1994). We have studied many successful nests in suburban yards or urban woodlots as small as one hectare, or approximately three acres (Rosenfield et al. 1996). For example, we found 12 active Cooper’s Hawk nests in 1996 in city parks, residential subdivisions, and other fragments of urban woodland in Milwaukee County; at least eight and possibly up to 12 additional sites were also known to be occupied by presumably nesting pairs in that year (WES, unpubl. data). Nest success at urban/suburban sites in Milwaukee and adjoining counties in 1996 was 70% (n = 20), with 3.2 bandable-aged young per successful nest (WES).

Moreover, Cooper’s Hawks have nested successfully and repeatedly ≤100–200 m from some of the state’s busiest traffic, including Interstate 94 and the entrance road at Devil’s Lake State Park. One pair fledged young in an isolated tree above a path used daily by hundreds of school children. Many successful nests have been built ≤50–100 m from houses, secondary highways, horse or hiking trails, popular campsites, picnic grounds, etc. Although we have not yet quantified the effect of human proximity on nest success, it seems that there is little human (or researcher) impact in the absence of prolonged disturbance at the nest tree itself (Rosenfield and Bielefeldt 1993).

On the other hand, nesting also occurs in large woodlands at remote forest-interior sites, far from the nearest house or paved road. Nest finding is logistically difficult in such areas, so we
have studied relatively few nests in northern Wisconsin (Figure 1). Nonetheless, mean density of active nests on a heavily forested search area in Oconto County, 1980–1982, was one nest per 2,175 ha, not much less than that on other search areas in the same years (one nest per 1,788 ha). Aspen and birch rather than mature forest provided most of the woodland cover on this Oconto County search area.

The Cooper’s Hawk in Wisconsin thus seems to employ the state’s entire spectrum of upland forest habitats as nest sites. It breeds in deciduous, mixed, or coniferous woodlands as well as conifer plantations—large or small, urban or rural, younger or older, “natural” or not. So far, however, we have discovered only a handful of nests in lowland forests and lowland trees (green ash [Fraxinus pennsylvanica], swamp white oak [Quercus bicolor], black and weeping willows [Salix nigra and S. babylonica], red maple [Acer rubrum]), mostly at stream sides and similar margins between upland and lowland habitats. (One exceptional nest, built in floodplain forest over standing water, was abandoned before egg laying and later expropriated by a tree-nesting Mallard [Anas platyrhynchos]) This paucity of bottomland nests may be partly due to the limited availability of such habitats on our principal study areas, although breeding seems to be truly unusual in the state’s conifer swamps (Rosenfield et al. 1991a).

Habitat needs of the Cooper’s Hawk during the breeding season are, of course, not limited to nesting sites but also include foraging and roosting areas. Data on these other aspects of habitat use are minimal. One radio-tagged male breeding in Portage County usually roosted >120 m (400 ft) from his nest site, mainly (61% of sample nights) in pine plantations that occupied only 10% of his breeding season home range (Murphy et al. 1988). Small parts (12%) of his seasonal home range also showed disproportionate use (88%) in daytime radio tracking. These favored areas, possibly foraging areas, were a mix of suburban oak-pine woodlots, pine plantations, semi-open shrublands, and semi-wooded residential lands.

Nestling diets may also allow some inferences about foraging habitats used by adults at the mid-season stage of breeding (June to early July). At Wisconsin nests watched from blinds, eastern chipmunks (Tamias striatus) provided one third of 329 prey items delivered to nestling Cooper’s Hawks (Bielefeldt et al. 1992). Other mammals, including thirteen-lined ground squirrels (Spermophilus tridecemlineatus), accounted for 5% of items. Remaining prey was mostly medium-sized birds such as American Robins (Turdus migratorius), European Starlings (Sturnus vulgaris), Common Grackles (Quiscalus quiscula), Blue Jays (Cyanocitta cristata), Northern Flickers (Colaptes auratus), and Mourning Doves (Zenaida macroura). This list of prey species seems to show that parental hunting habitats are not restricted to woodlands but also include forest-edge and open-country sites. Other dietary studies reviewed in Bielefeldt et al. (1992), including Errington’s (1932) work in southern Wisconsin, have also found that open country birds such as Northern Bobwhite (Colinus virginianus) and young Ring-necked Pheasants (Phasianus colchicus) are sometimes frequent prey of the Cooper’s Hawk.
**Wisconsin Status**

In 1983, we proposed that the state’s apparently thriving population of breeding birds warranted the removal of the Cooper’s Hawk from Wisconsin’s formal list of threatened species. It was so removed in 1989 but retained for a time on the informal list of birds of “special concern.” Recently, it was also deleted from the latter list. In his review of forest raptor population trends and the shortcomings of current data on the numbers of woodland raptors in North America, Fuller (1996) cited collaborative Wisconsin research on the Cooper’s Hawk as an example of the utilitarian benefits of intensive statewide studies of breeding populations.

However, despite demonstrably high reproductive success and nesting densities, tolerable contaminant levels, considerable habitat latitude, and eventual delisting—as summarized above—our studies did not and could not show that the Wisconsin breeding population had “conclusively ... increased” (Bureau of Endangered Resources 1989) or exhibited an “encouraging increase” (Robbins 1991). Although it is certainly conceivable that the number of nesting Cooper’s Hawks in the state has risen in recent decades, neither we nor others have the data to confirm an “increase.” It is also conceivable, for want of data, that no real decrease in the breeding population had occurred in Wisconsin in earlier decades, even though some experienced observers believed that a decline in the state’s breeding population had occurred at mid-century (e.g. F.N. Hamerstrom, pers. comm.).

Nesting densities are the readiest and among the best of local and state level measures of trends in the breeding population of the Cooper’s Hawk (and other raptors). Accurate information on raptor densities requires thorough nest searches on specified areas of relatively large size, preferably over a span of years and several objectively chosen search sites. Such data are not available for the Cooper’s Hawk in Wisconsin from the 1940s to 1970s, when declines were suspected, or from earlier decades, and reliable comparisons of past vs. present numbers of nesting Cooper’s Hawks are not possible.

This hawk is ordinarily an inconspicuous bird in the breeding season, even where common. It is often difficult to detect and sometimes hard to identify in a quick glimpse, even for practiced...
observers. (In one extraordinary case, we found a nest, counted eggs, and banded young yet we never saw or heard either parent.) For such reasons, roadside breeding bird surveys have not yielded an adequate sample of summer numbers or population trends of the Cooper’s Hawk in the midwestern U.S. (Rosenfield et al. 1991a).

Christmas counts suffer the same problems, and seeming changes in these early-winter counts since the 1950s (Robbins 1991)—if credible—do not necessarily index the state’s nesting population. Migration counts by experienced hawk watchers usually offer larger sample sizes and surer identification, but tallies of migrants in other states, or even in-state, may not be pertinent to summer numbers in Wisconsin. As previously noted, birth and breeding grounds are unknown for nearly all migrants.

We therefore lack unambiguous evidence of a recent increase (or historical decline) in the breeding population of the Cooper’s Hawk in Wisconsin. Although we have demonstrated that the number of nesting birds was at least stable in the short term on one study area in Waukesha County in 1986–1992 (Rosenfield et al. 1995)—a conclusion that does not preclude an increase—long-term trends in the state’s breeding population are undocumented. Most birds do not nest until two or more years of age, and the past or present size of the non-breeding segment of the state’s summer population is entirely unknown.

Robbins (1991) concluded that the Cooper’s Hawk has a statewide distribution as a breeding bird. We concur (Figure 1). However, he also rated it an “uncommon” summer resident in the state in comparison to other hawks, and in this we do not agree. We have conjectured that the Cooper’s Hawk may instead be one of the commonest diurnal raptors in Wisconsin in the nesting season (Rosenfield et al. 1996). Some other hawks also show a statewide breeding range, or relatively high densities in widely available habitats including urban habitats (e.g., Stout et al. 1996), or broad tolerances in nest site use, but none seems to combine all these features to the degree that Cooper’s Hawks do. The relatively large numbers of nests (>10 per year) near our homes in Portage and Waukesha Counties illustrate the ease with which we have found breeding birds in our own backyards, sometimes literally so.

The magnitude of the breeding population of the Cooper’s Hawk in Wisconsin can only be guessed. Risky extrapolations of average nesting densities on a few areas searched intensively in 1980–1982, as summarized earlier, would lead to tentative statewide estimates on the order of 15,000 breeding adults (7,500 nests per year), not including non-nesters known to be present in summer. This guess might even be conservative in light of higher nesting densities on two Wisconsin sites in several recent years, as also noted earlier. In any event, these preliminary estimates of the nesting population of the Cooper’s Hawk in one average sized state are about the same as the continental estimate of 20,000 adults (apparently breeding or otherwise) as recently proposed by Johnsgard (1990).

Although numbers of the Cooper’s Hawk no doubt vary from state to state and province to province across diverse nesting habitats in its wide North American breeding range, there seems little reason to think that the Wiscon-
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sin landscape provides a remarkable haven for this species. On the contrary, present populations may have been misperceived and possibly underestimated in other states as well as Wisconsin.

As a breeding bird, the Cooper's Hawk is still regarded as extirpated, endangered, threatened, or otherwise of "concern" in approximately 14 midwestern and eastern states, usually without benefit of adequate field research in the nesting season (Mosher 1989, Rosenfield et al. 1991a, Rosenfield and Bielefeldt 1993). Meanwhile, a perception persists in the popular literature that this hawk is "seldom found" (Peterson 1980) or "gone" (Mackenzie 1986) as a breeding bird in the eastern U.S. This perception is clearly inaccurate in Wisconsin (Rosenfield et al. 1996) and perhaps so in other midwestern states such as Iowa (Conrads 1997).

In Wisconsin, at least, the Cooper's Hawk has retained or possibly regained—we do not know which—its former status as one of the state's most numerous nesting hawks.

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