

## LOSS OF COOPER'S HAWK NESTING HABITAT TO SUBURBAN DEVELOPMENT: INADEQUATE PROTECTION FOR A STATE-ENDANGERED SPECIES

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**ABSTRACT.**—We examined land use and human disturbance factors around 18 nest sites of Cooper's Hawk (*Accipiter cooperii*) in northern New Jersey. Aerial photo analysis of 12 nest sites revealed that surrounding habitats were comprised largely of forest (73.3–99.1%) with very little suburban habitat (0–6.7%). Evidence of new housing construction was observed at 6 nests impacting 33.3% of the known Cooper's Hawk nest sites in this area. A review of current New Jersey laws revealed that very little protection was afforded this species despite its "state-endangered species" status. In order to ensure complete protection, we recommend that any nest site occurring in a wilderness area (>200 ha) be protected permanently against any habitat alterations within a 0.6 km radius around nest sites.

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Gavilán Pechirrojo Mayor (*Accipiter cooperii*) pierde su hábitat para anidar debido al desarrollo suburbano: protección inadecuada en el estado, para una especie en peligro de extinción

**EXTRACTO.**—Se examinó el uso del terreno y la presencia humana, como factores perturbadores en el rededor de 18 sitios donde anida el gavilán de la especie *Accipiter cooperii*, en el norte de Nueva Jersey. Análisis aerofotográficos de 12 de estos sitios de reproducción, revelaron que hábitats de alrededor fueron en su mayoría conformados de floresta (73.3–99.1%) con muy poco hábitat suburbano (0–6.7%). Se observaron las evidencias del efecto de la construcción de nuevas casas en seis nidos, cuyo impacto afectó el 33.3% del total de sitios de anidar conocidos en el área para este estudio. Una revisión de las leyes de actualidad que rigen este aspecto en Nueva Jersey, reveló que muy poca protección se ha venido dando a esta especie, pese a su estatus de "especie en peligro de extinción en el estado." A fin de asegurar protección completa, se recomienda que cualquier sitio de anidar del *A. cooperii* que surja en áreas silvestres (>200 ha), sea protegido permanentemente contra cualquier alteración del hábitat dentro de un radio de 0.6 km alrededor del sitio.

[Traducción de Eudoxio Paredes-Ruiz]

The Cooper's Hawk (*Accipiter cooperii*) has been classified as an endangered species in New Jersey since 1974. Although not a federally endangered species, it was "Blue Listed" by the National Audubon Society in 1972–81, relisted as a Species of

Special Concern in 1982 and returned to their Blue List in 1986 (Tate 1981, 1986). Although many reports suggest that this accipiter is "doing better" in the eastern part of North America (Tate 1986), several northeastern states continue to list the Cooper's Hawk as a "Species of Special Concern" (Moshier 1989). Concern for its status began in the early 1970s when migration data showed a steady decline in numbers following widespread use of DDT (see Snyder et al. 1973). However, recent migration data

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suggest that the population may be partially recovering (Mosher 1989).

One consequence of urbanization in the Northeast has been the loss of significant forest area for breeding birds (Robbins et al. 1989). Since Cooper's Hawks may utilize traditional nest sites for several years (Bent 1937, Reynolds 1983, this study), the loss of even a few sites may jeopardize local population stability. We describe encroachment at several nest sites, consider the lack of protection afforded to these sensitive areas and make recommendations for improving legal protection of nest sites and habitat in New Jersey.

#### STUDY AREA AND METHODS

The study was conducted in the highlands of northern New Jersey, an area of rolling, granitic hills. Dominant relief extends from northeast to southwest and elevations vary from 507 m to nearly sea level. The region is heavily forested and sporadically populated with suburban and occasional rural housing. Wilderness tracts are more extensive in northern and central sections. Forests are mostly a mosaic of mature and submature, second growth oak (*Quercus*) dominated stands. Old growth stands are rare and <10 ha in area. Small plantations of conifers (50–60 yr old) occur in some areas. A more detailed description of the highlands study area has been previously reported (Bosakowski 1990, Bosakowski et al. 1989, Speiser and Bosakowski 1988).

Forest raptor populations in northern New Jersey and southeastern New York have been monitored since 1979 (Speiser and Bosakowski 1987, 1988, Bosakowski et al. 1987, 1989, Bosakowski 1990). Most nests were found by methodically searching woodlands on foot. Particular attention was given to areas where adults were seen during the breeding season, or where protesting calls were heard. We also checked nests and nest site areas discovered during the fall and winter to ascertain occupancy. Two nests were spotted while driving through the study area during routine field work.

Aerial photographs (1:8000) were obtained for 12 nest sites which occurred in the Pequannock Watershed drainage (Sussex, Passaic, and Morris counties). Habitat areas were calculated from 300 m radius plots around the nest tree following the methods outlined in Bosakowski (1990). Distance from the nest tree to the nearest house was measured to the nearest mm.

For the purpose of this paper, a nest site is defined as the area immediately surrounding an active nest and alternate nests (if any) and geographically distinct from other active or previously used nests (at least 1.2 km distant—the minimum nearest-neighbor distance in Bosakowski 1990). Wilderness was broadly defined as "an uncultivated, uninhabited region." This paper is specific with regard to New Jersey endangered species laws, zoning regulations, and authority of local planning commissions. Furthermore, it is also specific to the known habitat requirements of Cooper's Hawks in New Jersey (Bosa-

kowski et al. 1992) and may not be applicable to other regions where habitat selection may differ.

#### RESULTS

From 1979–90 we located a total of 18 Cooper's Hawk nests during the breeding raptor surveys. All 18 nest trees were still standing by 1990, but nest site encroachment via clear-cutting associated with residential development has occurred at six (33.3%) of these sites. Below we describe the type and extent of encroachment on these impacted Cooper's Hawk nesting sites.

**Case 1.** A nest site located in Morris County was occupied for  $\geq 3$  yr (1985–87). In spring 1988, a suburban housing project was started within 100 m of the nest tree, following which the site was abandoned. Subsequent enlargement of the clear-cut area associated with the housing development now extends to within 50 m of the nest tree and flagging that marks future development extends beneath the old nest tree.

**Case 2.** A nest located in Sussex County was found in 1989. A female was seen on 17 March 1989 about 20 m from a completed nest in a Scotch pine (*Pinus sylvestris*). Multiple nests in this area suggest a traditional nesting territory, used for at least 2–3 yr. Both the older and the active nests were located <30 m from a new road constructed for residential development. On 17 April 1989 the female was incubating on the nest most distant from the old development. At that time, a 0.15 ha lot had been recently cleared to within 40 m of the nest. TB contacted the town planning commission and warned the developer of the state-endangered species nesting on his property. The developer indicated that construction on the lot containing the active nest was not scheduled for several months, but he would try to minimize disturbance. Several weeks later TB returned to find workmen using a chainsaw and woodchipper about 100 m from the nest, but the female continued incubating despite the noise and activity of workers at both lots. Two young fledged from this nest, possibly because the adults were reluctant to abandon the nest after commencing incubation prior to the construction activities. In the 1990 season, the nesting stand was still intact and a female responded vocally to tape-recorded calls once. However, no subsequent nesting activity was observed within 0.5 km of the area despite several intensive searches.

Table 1. Aerial photographic analysis of 12 Cooper's Hawk nest sites in northern New Jersey. Percent habitat areas were determined for a 0.3 km radius around each nest site.

	% FORESTED	% SUBURBAN	NEAREST HOUSE (km)
	99.1	0	2.06
	94.2	0	0.45
	93.8	2.9	0.20
	93.1	1.8	0.14
	92.4	1.3	0.27
	91.1	0	0.70
	90.4	0	0.48
	84.4	0	0.69
	82.6	0	0.34
	78.8	2.7	0.31
	75.6	1.6	0.28
	73.3	6.7	0.11
Mean	87.4	1.4	0.50
SD	8.25	2.00	0.526

**Cases 3 through 5.** Three nest sites active in 1989 in Passaic and Morris counties are now threatened with expanded housing development in already established developments located 100–500 m from the nests. The three nest sites were located on city watershed property but bordered extensive woodlands which were not protected. The nest sites were also near woods roads (2–30 m) and nesting adults were frequently exposed to illegal all-terrain vehicle traffic by neighborhood adolescents. None of these nests were reused in 1990, and no evidence of adults or new nests were found.

**Case 6.** A new nest was found in 1990 on the edge of a large Morris County park in New Jersey, but a second nest 100 m away suggested that this pair had nested in the territory for at least one or two additional seasons. The active nest was located 140 m from a main road and 120 m behind a house constructed within the past year. A half-completed housing development is located about 300 m from the nest. The nest was successful in 1990, but the suitability of the site may be altered after the development is occupied.

**Habitat Analysis.** Analysis of aerial plots for 12 nest sites revealed an average of 87.4% forested habitat and only 1.4% suburban habitat (Table 1). This trend for low suburban development was also consistent with the distance to the nearest house which averaged 0.5 km.

## DISCUSSION

**The Negative Impacts of Development.** Development and associated clear-cutting have encroached on 33.3% of the 18 Cooper's Hawk nest sites that we found in extensively forested habitats in the northern New Jersey highlands. In a review of northeastern accipiters, Mosher (1989) noted that there were only 25 historical confirmed nestings of Cooper's Hawks in New Jersey (prior to 1988). Thus, our results probably represent a significant proportion of encroachment on the current statewide population of nesting Cooper's Hawks. The encroachments may be attributed to inadequacy of current regulatory protection of Cooper's Hawk habitat, inadequate protection on public lands, unknown effects of disturbance and forest fragmentation, and difficulty in evaluating the potential impact of habitat loss on nesting Cooper's Hawks.

Land ownership is an important factor in conservation of the nest sites: 10 of the 18 nests were located on city watershed property, 3 were on state parks or state forests, 2 were on county parklands, 2 were on private property, and 1 was located within a woodland on a U.S. military base. Cooper's Hawks may nest more frequently on private lands than our results indicate since fewer searches were conducted in these areas. Additionally, nests on restricted property may not be noticed or go unreported, hence are vulnerable to development and excessive disturbance.

During the breeding season, we found that Cooper's Hawks are usually secretive and generally avoid human disturbance, although two exceptional nests were placed within 50 m of a busy road or within 110 m of occupied houses. However, these nests were placed on the edge of large tracts of undisturbed woodland. Hennessy (1978) and Lee (1981) also found that Cooper's Hawks could tolerate some disturbance, especially when traditional nest sites are occupied. Thus, the occasional finding of an active nest near houses cannot logically be used as proof that the species can survive well in suburbia.

Suburban developments may also impact local Cooper's Hawk populations by reducing total forested area within the traditional nesting territory and contributing to forest fragmentation (Lovejoy et al. 1986, Robbins et al. 1989). The observation that active nests were surrounded by an average of 87.4% forested habitat and only 1.4% suburban habitat suggests a critical need for contiguous forest areas for nesting. With the nearest house averaging 0.5 km

from the nest, these Cooper's Hawks are selecting an average circular habitat area of 1.0 km in diameter without a single house. The impact of new developments near Cooper's Hawk breeding habitat will produce forest fragmentation effects which lower breeding populations of interior bird species (Robbins et al. 1989), the principal prey of Cooper's Hawk in our area (Bosakowski et al. 1992).

Local forest fragmentation may also reduce availability of "floaters" that can replace lost mates or occupy unoccupied territories. In saturated Cooper's Hawk populations, mate replacement can occur rapidly after mortality of either male or female (as many as three different males in one nesting) and a brood can be raised successfully (Bent 1937). Offspring have even been raised by unrelated parents when mates were sequentially replaced (Bent 1937). Therefore, large wilderness areas need to be set aside to prevent the effects of isolation as forests in the Northeast are increasingly cut into smaller isolated fragments. Small disjunct populations are more vulnerable to extirpation than a large thriving population network (Wilcove 1987).

Disturbance factors associated with development, including firewood cutting, hikers, dogs, children playing, recreational vehicles, and associated noise also increase the likelihood of flushing the female from a nest resulting in mobbing by crows, crow predation on eggs/young, or attracting other predators (e.g., Great Horned Owl, *Bubo virginianus*; Hennessy 1978, Craighead and Mindell 1981, Lee 1981). Development may also augment local increases in raccoon (*Procyon lotor*) and opossum (*Didelphis virginiana*) populations; both species are occasional predators on eggs and young of raptors.

**Inadequacy of Current Habitat Protection.** In New Jersey, as in most of the Northeast, all permit applications are reviewed by town planning and zoning commissions and/or town wetland commissions which must approve the regulated activity proposals prior to initiation of any construction. Membership on these review commissions varies with the township and consequently the wildlife "expertise" of each review board varies considerably; certainly very few, if any, boards can be expected to include professional ornithologists. Therefore, most review boards depend on input from local naturalists (D.G. Smith pers. observation) or agency biologists (J. Lincer pers. comm.) who may advise the board during hearings. In any event, these permits have only limited influence in preserving nesting habitat. Town-

ship boards can request developers to consider the pattern of development but they cannot legally stop a developer from building on a property that follows zoning conditions.

State agencies such as the New Jersey Bureau of Freshwater Wetlands can prevent destruction of a habitat only if an active Cooper's Hawk nest occurs within one mile (1.6 km) of a wetland. Such wetlands can then be designated as having "exceptional resource value" and the normal "50 foot wetland buffer zone" can be extended to "150 feet" surrounding the wetland. However, all other upland habitat, excepting the actual nest tree, will still remain unprotected. Given the large home range requirements of Cooper's Hawks (see review by Reynolds 1983), this extra "100 foot of buffer zone" is not likely to help preserve a habitat for future nesting.

Even if the nest or foraging habitat is within the jurisdiction of the state regulatory agencies and the land is protected from development, the agencies do not protect against disturbance. Neither state nor local agencies can protect nest sites from infrequent, but regular, disturbances from children, adults, dogs and other inevitable intrusions from development in adjacent habitats (e.g., three of the nests were adjacent to borders or very close to private land where development was occurring). In addition, only state parks and national wildlife refuges in New Jersey are safe from periodic timber sales which are permitted in state forests.

In New Jersey, environmental impact statement (EIS) surveys do not provide adequate provisions to protect or even locate nesting Cooper's Hawks: 1) they can be performed at any time of the year—not likely that Cooper's Hawks will be nesting, 2) they require only simple qualitative listing of species present and no validation of survey required by state wildlife agency, 3) training of personnel is variable—only an experienced *Accipiter* or Cooper's Hawk researcher can ensure that nests are not present (see Rosenfield et al. 1985, 1988), 4) no consideration is given to nearby disturbance factors—e.g., car traffic, firewood cutting, lawn mowers, recreational vehicles, children playing, general noise pollution, dogs and cats, 5) surveyed habitat could be suitable for Cooper's Hawk nesting, but not necessarily occupied the year of the survey. On this final point, it is obvious that development of a habitat suitability model could be extremely important to set aside existing forest habitat for Cooper's Hawk.

**Recommendations.** We propose that proper sur-

vey techniques (Rosenfield et al. 1985, 1988, Bosakowski 1990) during the breeding season should be mandatory on all EIS surveys that pertain to any development that extends into or adjacent to a forested wilderness area (>200 ha). Where nest sites are located, a radius of half the minimum nearest-neighbor distance (1.2 km) should receive complete protection from habitat alterations (0.6 km radius around nest sites). Reynolds (1983) selected half the mean nearest-neighbor distance to approximate territory size for Cooper's Hawks. Thus, our recommendation of half the minimum nearest-neighbor distance is liberal from a biological standpoint. Given the rapid and often unregulated development occurring in New Jersey and the rest of the Northeast, we urge that these restrictions be applied to safely ensure that nesting populations of Cooper's Hawks will survive in the Northeast in future decades.

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Received 29 June 1992; accepted 12 December 1992