BREEDING ECOLOGY OF THE RED-SHOULDERED HAWK IN NORTH CENTRAL NEW YORK

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The northern subspecies of the Red-shouldered Hawk (*Buteo lineatus lineatus)*, has exhibited a well documented decline throughout its range (Peterson 1969, Brown 1971, Henny *et al.* 1973, Fyfe 1976, Nagy 1977, Bednarz and Dinsmore 1981). New York populations have not escaped this phenomenon (Rusk and Scheider 1969, Temple and Temple 1976). In 1982, the Red-shouldered Hawk was added to the state's Threatened Species list. In 1985, we undertook a study of the status and nesting ecology of the Red-shouldered Hawk in north central New York (Johnson 1989, Johnson and Chambers 1990). Here we report on the breeding season chronology and reproductive performance of 39 nesting attempts between 1985 and 1987.

STUDY AREAS

This study was conducted primarily in north central Oswego County, New York (Fig. 1). Sixty percent of the nest sites (n=28) were located in the Happy Valley Wildlife Management Area (HVWMA) and its immediate surroundings. Most of the remaining sites were located within 10 km of HVWMA. HVWMA is a state owned tract with several county and private holdings within its borders. This 3500 ha area is relatively flat with elevations ranging from 200–300 m. It lies in the Tug Hill Transition Ecozone (Will *et al.* 1982) and is characterized by mild summers and long cold winters. Two watersheds drain HVWMA, both of which eventually empty into Lake Ontario. The northern portion of the management area is included in the Little Salmon River watershed and the southern portion drains into the Oswego River. There are three large deep water impoundments created in the late 1930s on the area. Several small ponds were constructed by the state in the 1950s to favor waterfowl production (New York State Dept. of Environmental Conservation 1980). HVWMA is characterized by second growth forests of northern hardwoods and mixed hardwood-conifer stands. The dominant tree species is Red Maple (*Acer rubrum*). Other important tree species include American Beech (*Fagus grandifolia*), Black Cherry (*Prunus serotina*), Eastern Hemlock (*Tsuga canadensis*), Yellow Birch (*Betula*

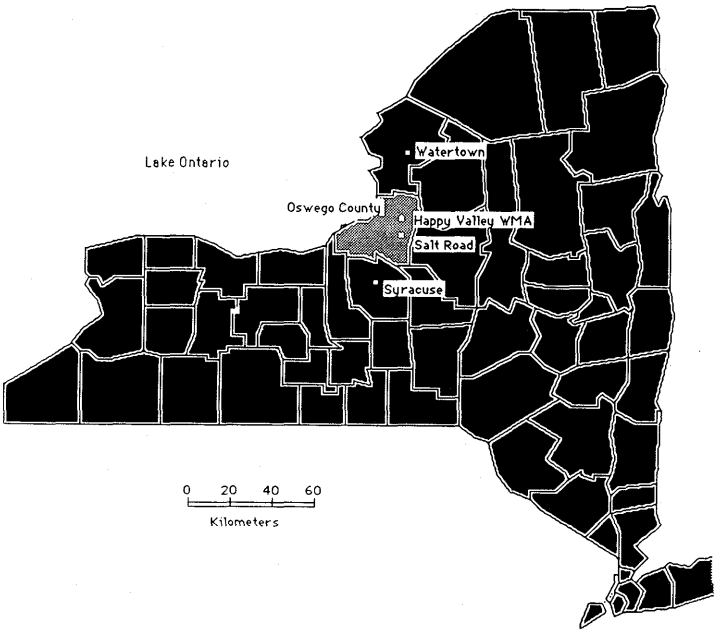

Figure 1. Locations of two Red-shouldered Hawk Study Areas (Happy Valley WMA and Salt Road) in Oswego Co., New York.

alleghaniensis), and Sugar Maple (*Acer saccharum*). Small (2 – 4 ha) stands of aspens (*Populus tremuloides* and *P. grandidentata*), conifer plantations, low–lying wooded swamps, alder (*Alnus rugosa*) stands, and old fields are interspersed throughout the area. A more thorough description of HVWMA is given by Parris (1986).

The other site, Salt Road, containing many of the nest sites is located 10 km south of HVWMA and 2.2 km north of the village of Constantia. It consists of approximately 3000 ha of mostly forested terrain with sparse residential development. It is contained mostly within two large private holdings. Vegetation, climate, and topography are similar to HVWMA.

Several nest sites were located outside of these two areas. They were included in the analysis because they occur in areas that are floristically and physiognomically similar to the two primary study areas.

Other raptor species known to reside and nest in the same region include the Broad–winged Hawk (*Buteo platypterus*), Northern Goshawk

(*Accipiter gentilis*), American Kestrel (*Falco sparverius*), Barred Owl (*Strix varia*), and Great Horned Owl (*Bubo virginianus*). Raptors encountered on the two primary study areas, but not recorded by us as nesting, include the Red-tailed Hawk (*B. jamaicensis*), Cooper's Hawk (*A. cooperii*), Sharp-shinned Hawk (*A. striatus*), Northern Harrier (*Circus cyaneus*), and Northern Saw-whet Owl (*Aegolius acadicus*).

METHODS

Most nest sites used by Red-shouldered Hawk were found by systematic searching during leafless periods. These sites were checked in spring to determine activity status. Other nests were located by observing soaring adult hawks and intensively searching the surrounding area. Local landowners and other interested individuals provided locations of additional nest sites. All active nest sites discovered were monitored for use in subsequent years. All nest sites were plotted on USGS 7.5 minute topographic map quadrangles.

A nest site was considered active if it was occupied by a breeding pair and contained a nest in which at least one egg was laid. Alternate and "dummy" nests were not included in the analysis. A nest was considered active based on one or more of the following criteria: 1) flushing of an adult bird from a nest upon approach, 2) observation of an adult in incubation posture, 3) presence of down in the nest or "whitewash" around the base of the nest tree, 4) presence of nestlings, or 5) presence of eggshell fragments or nestling remains in or near the nest. Nests were not visited or approached closely prior to fledging of the young to minimize disturbance (Fyfe and Olendorff 1976).

A nest was considered successful if it produced one or more young that reached fledging age (Steenhof 1987). Productivity was calculated as the number of young that reach 80% of the average age of first flight (Steenhof 1987) since accurate counts were impossible once the young began to fledge.

RESULTS AND DISCUSSION

Breeding Chronology: Adult Red-shouldered Hawk were first observed in the area during the third week of March for the years 1985–1987, at which time nest "decoration" (lining of nests with fresh evergreen sprigs) was noted. By the first week of April, hawks were observed in incubation posture on nests. The latest period in which an adult was first observed in this posture was the fourth week of April. Hatchlings (Fig. 2)

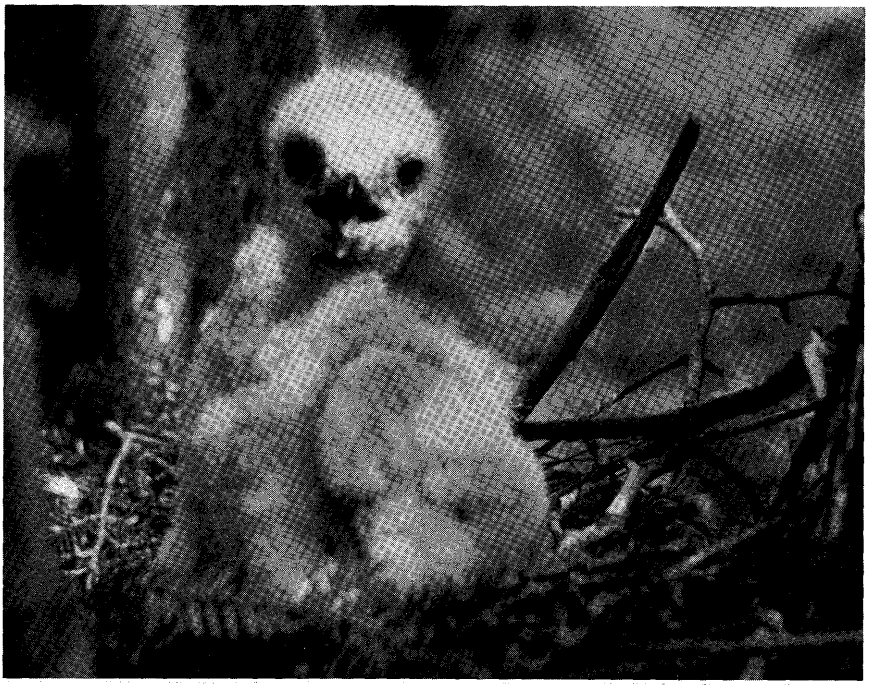

Figure 2. Nestling Red-shouldered Hawk, Oswego Co., New York. Photograph by James Spencer.

were first observed in mid May. Young were fledged from all successful nests by 11 July and mean fledging age was 32 days. The nesting chronology we observed was similar to that reported by others from similar latitudes (Beardslee and Mitchell 1965, Bull 1974, Morris 1980, Janik and Mosher 1982,Crocoll and Parker 1989).

Lack (1950) and Immelmann (1971) suggested that the timing of avian breeding cycles evolved to coincide with maximum availability of each species' particular food requirements. Portnoy (1974) found the time of hatching for Red–shouldered Hawk in Massachusetts roughly corresponds with the emergence of juvenile Eastern Chipmunks (*Tamias striatus*), their principal prey. Morris (1980) reported a similar pattern in southwestern Quebec, and observations during this study agree.

The breeding cycles of some potential competitors observed at HVWMA appear to be separated temporally. Both Great Horned Owl

and Red-tailed Hawk began nesting earlier than Red-shouldered Hawk (Hagar 1957), whereas Broad-winged Hawk began nesting activity as much as a month later. Barred Owl and the accipiters breeding cycles overlap with that of the Red-shouldered Hawk. However, Barred Owl forages at different times of the day and appear to feed less on squirrels and chipmunks and more on mice, moles, and shrews (Devereux and Mosher 1984). Birds appear predominantly in the diet of accipiters (Mueller and Berger 1970, Reynolds and Meslow 1984, Kennedy and Johnson 1986).

Nest Success and Productivity: Of the 39 nesting attempts monitored, 7 of 9 (77.8%) were successful in 1985, 11 of 15 (73.3%) were successful in 1986, and 10 of 15 (66.7%) were successful in 1987. Mean nest success for 39 nesting attempts over the three year period was 71.8%. Fifty-four young were produced at the 28 successful nests over the period 1985–1987 for a mean productivity of 1.92 $\pm$ 0.47 young/successful nest. Mean productivity was 2.20 $\pm$ 0.41 in 1985, 2.00 $\pm$ 0.00 in 1986, and 1.73 $\pm$ 0.65 in 1987. If all nesting attempts (successful + unsuccessful) are included in productivity calculations, the mean is 1.38 $\pm$ 0.95 young/nest attempt over the three year period.

Nest success reported here was higher than that reported from several other populations: 65.5% in California (Wiley 1975); 55.6% in western New York (Crocoll and Parker 1989); 52.9% in western Maryland (Janik and Mosher 1982); 67.6% in central Maryland (Henny *et al.* 1973). Success was lower than that reported in Iowa (87.5%–Bednarz 1979), Massachusetts (80.0%–Portnoy and Dodge 1980), Missouri (100.0%–Kimmel and Fredrickson 1981), and central Ontario (83.3%–Armstrong and Euler 1982). Caution is advised in interpreting these results due to small sample sizes in most cases. Henny *et al.* (1973) based their calculation on the outcomes of 74 nesting attempts and was the only other study with a sample size greater than 20.

Productivity (average number of fledglings per successful nest) reported here was among the lowest in published accounts. Bednarz (1979) reported productivity as great as 3.30 fledglings per successful nest at his study sites in Iowa, while others (Henny *et al.* 1973, Wiley 1975, Portnoy and Dodge 1980, Kimmel and Fredrickson 1981, Armstrong and Euler 1982, Crocoll and Parker 1989) reported values between 2.00 and 2.56. There appears to be no relationship between nest success and productivity.

Nest success and productivity are important measures to assess the status of threatened avian species. However, their values in any given

region must be judged carefully. Our study area was located in a region of New York identified as a stronghold for this species where the quantity and quality of suitable habitat does not appear limiting (Andrle and Carroll 1988). These values may differ in areas of poor quality habitat or along the fringes of a species' range. Variations observed over time may reflect actual population trends that can be related to such factors as forest changes, human disturbances, or management activities, or else they may simply be cyclic phenomena related to variations in food abundance or weather. Obviously, long-term studies are necessary to make important decisions about the management of a species, including adding or removing it from threatened species lists. Ultimately, the number of fledglings that reach breeding age and produce offspring is the most important parameter to the continued success of a bird species.

To date, there have been no published long-term population studies of Red-shouldered Hawk. However, some wildlife agencies may have accumulated such data. Some positive recent examples include the New York State Raptor Nest Information Database developed by the New York State Department of Environmental Conservation (write to Endangered Species Unit, Division of Fish and Wildlife-NYSDEC, Wildlife Resources Center, Delmar, New York 12057-9767) and the Hawk Monitoring Protocol developed by the Ontario Ministry of Natural Resources.

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