J. Field Ornithol., 64(4):433–439

NESTING OF RED-TAILED HAWKS AND GREAT HORNED OWLS IN A CENTRAL NEW YORK URBAN/SUBURBAN AREA

WILLIAM F. MINOR AND MAUREEN MINOR
125 Apple Lane
Charlottesville, Virginia 22903 USA

MICHAEL F. INGRALDI[1]
Department of Forest Biology
State University of New York
College of Environmental Science and Forestry
Syracuse, New York 13210 USA

Abstract.—Productivity of Red-tailed Hawks (*Buteo jamaicensis*) and Great Horned Owls (*Bubo virginianus*) in a 208 km² urban/suburban complex in central New York was documented between 1980 and 1989. Mean productivity for 134 Red-tailed Hawk nesting attempts within 24 distinct areas was 1.10 ± 0.13 fledglings/nest with a nest density of 0.08 ± 0.01 nesting pair per km². Compared with other Red-tailed Hawk studies conducted in non-urban areas, the density and productivity of nest sites in this study are not statistically different ($P > 0.05$), though the average density of the non-urban studies was over three times as large. Mean productivity of 34 Great Horned Owl nesting attempts was 1.63 ± 0.16 fledglings/nest with a density of 0.02 ± 0.003 nesting pair per km². Both species successfully nested close to human activity.

ANIDAMIENTO DE *BUTEO JAMAICENSIS* Y DE *BUBO VIRGINIANUS* EN UN ÁREA URBANA/SUBURBANA DE LA PARTE CENTRAL DE NEW YORK

Sinopsis.—Entre 1980 y 1989 se documentó la productividad del halcón *Buteo jamaicensis* y del buho *Bubo virginianus* en un área urbana/suburbana de 208 km² de la parte central de New York. La productividad promedio de 134 intentos reproductivos de los halcones dentro de 24 áreas diferentes resultó ser de 1.10 ± 0.13 volantones/nido con una densidad de nidos de 0.08 ± 0.01 por parejas reproductoras por km². Los resultados obtenidos no son estadísticamente diferentes ($P > 0.05$) a los de otros estudios en áreas no urbanas, aunque la densidad promedio en las áreas no urbanas resultó tres veces mayor. La productividad promedio de 34 intentos reproductivos de parejas de buhos resultó ser de 1.63 ± 0.16 volantones/nidos con una densidad de 0.02 ± 0.003 parejas por km². Ambas especies anidan exitosamente en la proximidad de actividades de humanos.

Red-tailed Hawks (*Buteo jamaicensis*) and Great Horned Owls (*Bubo virginianus*) are two of the most widely-distributed raptors in North America and exploit a great variety of habitats, from continuous forest land to fragmented agricultural landscapes (Brown and Amadon 1968). Both species being generalists in diet (Errington 1933, Peterson 1979, Terres 1982) and both species possessing the ability to travel between patches of greenspace with relative ease may make these species ideally suited for urban/suburban landscapes.

The quality of a particular area supporting these two raptor species can be measured by the reproductive success of a specific nest site. In an earlier paper, Minor and Minor (1981) reported on 10 nestings of Red-

[1] *Current address: Arizona Game and Fish Department, 2221 West Greenway Road, Phoenix, Arizona 85023 USA.*

tailed Hawks (*Buteo jamaicensis*) and two nestings of Great Horned Owls (*Bubo virginianus*) during 1980 in a suburban area to the east of Syracuse, New York. Minor and Minor continued observations from 1981 through 1988 and expanded the number of nest sites to 25. Ingraldi continued the census in 1989. This paper reports 10 yr (1980–1989) of continuous observations, analyzing the nest site selection and productivity of Red-tailed Hawks and Great Horned Owls in an urban/suburban landscape.

STUDY AREA

The area is located in central Onondaga County, New York, and includes the eastern half of the city of Syracuse and a large portion of the towns of Manlius and Dewitt. The area encompasses roughly 208 km^2 and contains a human population of approximately 130,000 (Dwayne Koughenour, Syracuse Onondaga Co. Planning Commission, pers. comm.). The topography of the area is quite varied, with the Allegheny plateau to the south and the Oneida Lake plains of the Lake Erie–Ontario lowlands to the north (Davis 1977). The majority of land is in urban or suburban development with scattered patches of greenspace. The southern portion of the area is hilly, with scattered, relatively steep drumlins, and is dominated by patches of upland mixed-hardwood and old field communities. The dominant floral species include eastern white pine (*Pinus strobus*), shagbark hickory (*Carya ovata*), sugar maple (*Acer saccharum*), and northern red (*Quercus rubra*) and white oaks (*Quercus alba*). The northern portion is relatively flat with scattered patches of wet hardwoods and emergent hardwood communities. The common floral species in these communities are cattail (*Typha* spp.), *Phragmites communis*, eastern cottonwood (*Populus deltoides*), northern white-cedar (*Thuja occidentalis*) and red maple (*Acer rubrum*). Interstate routes 90, 81, 690 and 481 are major highway corridors within the study area and contain nesting and foraging areas for both raptor species.

METHODS

Monitoring of nesting areas began in early to mid-February to determine the number of Red-tailed Hawk nests used by Great Horned Owls. Nest searches were made from a vehicle early in the nesting season when tree foliage was absent because many of the nesting areas were close to roads. After the foliage became fully developed by late spring, areas were walked to determine nesting activity. Observations were made with a 30× spotting scope. Incubation by both species was assumed if the birds sat low for prolonged periods on the nests. Periodic nest monitoring was continued throughout the nestling period and continued until fledging with many nests being monitored only once a week. Young were considered fledged when they were at least 5 wk of age (Steenhof 1987).

The number of successfully fledged birds at each nest and the number of nesting attempts were recorded in Tables 1 and 2. Productivity was measured as the number of young fledged per nesting attempt and per successful nest. Nesting density was measured as the total area of the

TABLE 1. Productivity of Red-tailed Hawks nesting in a central New York urban/suburban landscape 1980–1989.

Nest area #	# nesting attempts	# successful attempts	Mean # young fledged per nesting attempt	Mean # young fledged per successful nest
1	7	4	0.71	1.25
2	8	6	1.88	2.50
3	5	4	1.00	1.25
4	3	0	0.00	0.00
5	8	8	1.88	1.88
6	9	8	1.33	1.50
7	1	0	0.00	0.00
8	2	2	1.50	1.50
9	2	1	0.50	1.00
11	10	3	0.60	2.00
12	7	4	0.86	1.50
13	8	6	1.13	1.50
14	9	7	1.00	1.29
15	9	8	1.33	1.50
16	4	4	2.50	2.50
17	5	5	2.00	2.00
18	3	1	1.67	2.00
19	5	5	1.60	1.60
20	8	5	1.13	1.80
21	5	3	1.00	1.67
22	6	2	0.50	1.50
23	2	2	2.00	2.00
24	1	1	1.00	1.00
25	7	2	0.57	2.00
Total	134	91	1.10	1.67

study site divided by the number of nesting pairs (successful and unsuccessful).

In comparing this study, conducted in an urban/suburban setting, with those in non-urban areas a t-test comparing a single observation with a sample mean (Sokal and Rohlf 1981:231) was used. Means are expressed as ± the standard error unless otherwise noted.

RESULTS AND DISCUSSION

During 1980–1989 we observed 134 Red-tailed Hawk nesting attempts and 34 Great Horned Owl nesting attempts (Tables 1 and 2).

Nesting chronology, productivity and nesting density.—Exclusive of renestings, average initiation date for Red-tailed Hawks incubating was 23 March (range: 13 March–20 April) during the 10-yr period. All nesting Red-tailed Hawks had rufous tails and were considered to be adults. Over the 10-yr period 134 nestings of Red-tailed Hawks were observed in 24 nesting territories (Table 1). Mean productivity for 91 successful hawk nestings was 1.67 ± 0.1 young, ranging from 1.0 to 2.5 young/nest site. The mean productivity for 134 total nesting attempts was 1.10 ± 0.13

TABLE 2. Productivity of Great Horned Owls nesting in a central New York urban/suburban landscape 1980–1989.

Nest area #	# nesting attempts	# successful attempts	Mean # young fledged per nesting attempt	Mean # young fledged per successful nest
2	2	2	2.50	2.50
3	1	1	1.00	1.00
6	1	1	3.00	3.00
7	2	2	2.00	2.00
8	1	1	2.00	2.00
10	5	4	1.20	1.50
11	1	1	1.00	1.00
12	3	3	1.00	1.00
14	2	2	2.00	2.00
15	1	1	2.00	2.00
17	5	3	1.20	2.00
18	2	1	1.00	2.00
19	1	1	1.00	1.00
21	1	1	2.00	2.00
22	1	1	2.00	2.00
23	1	1	2.00	2.00
24	2	2	2.00	2.00
25	2	1	1.05	1.00
Total	34	29	1.63	1.77

young/nest, ranging from 0 to 2.5 young/nest site. The average nesting density of Red-tailed Hawks in the study area over the 10-yr period (1980–1989) was 0.08 ± 0.01 nesting pair/km^2. We observed no human predation on young Red-tailed Hawks.

Four Red-tailed Hawk re-nestings were observed during the study. All of the re-nestings occurred in alternate Red-tailed Hawk nests 90–180 m from the original nesting attempts.

Urbanization is generally thought to have a negative effect on raptor populations due to the reduction in habitat necessary to sustain adequate prey populations and the lack of undisturbed nesting areas associated with metropolitan landscapes (Howard and Postovit 1987). The productivity (number of young fledged/nesting attempt) and nest density (nesting pair/km^2) of a few Red-tailed Hawk studies are summarized in Table 3. These studies were conducted in rural landscapes of the northeastern, northwestern and the midwestern United States. There was no significant difference ($P > 0.05$) between the mean density of the non-urban studies (0.274 ± 0.09) and mean density of this urban/suburban population, even though the mean density of the non-urban studies was over three times as large. The relative low nest density in this urban/suburban area can be deceiving. Large parts of the heavily urbanized areas of the city are barren of suitable greenspace for foraging and nesting. If these areas were excluded from the density estimate, the number of

TABLE 3. A comparison of density and productivity among Red-tailed Hawk populations (mean ± SE).

Investigator(s)	Years examined	Mean nest density[1]	Mean nest productivity[2]
Craighead and Craighead (1956) (W. Wyoming	1947	0.32	1.70 ± ?
and S. Michigan)	1948	0.05	0.80 ± ?
Orians and Kuhlman (1956) (S. Wisconsin)	1954–1955	0.12 ± 0.01	1.45 ± 0.20
Gates (1972) (E. Cent. Wisconsin)	1962–1964	0.89 ± 0.01	1.13 ± 0.15
Siedensticker and Reynolds (1971) (S. Cent. Montana)	1966–1967	—	1.70 ± 0.20
McInvaille and Kieth (1974) (Cent. Alberta)	1967–1971	0.18 ± 0.002	0.94 ± 0.14
Johnson (1975) (S. W. Montana)	1971–1972	0.10 ± 0.01	1.19 ± 0.17
Petersen (1979) (S. Wisconsin)	1972–1975	0.31 ± 0.04	1.46 ± 0.16
Bohm (1978) (Cent. Minnesota)	1976–1977	0.22 ± 0.0	1.07 ± 0.09
This study (Cent. New York)	1980–1989	0.08 ± 0.01	1.10 ± 0.13

[1] Density = number of nestings pairs/km^2.
[2] Productivity = number of young fledged/nesting attempt.

hawks nesting per km^2 would be increased. Runyan (1987) reported a nesting density of one pair per 3.6 km^2 (0.278 nesting pair/km^2) for Red-tailed Hawks nesting in the urban landscape of Richmond, British Columbia. Yet in his density estimates he arbitrarily excluded areas within his total study area that did not contain suitable nesting habitat. Productivity was not reported.

There was no significant difference ($P > 0.05$) between the mean productivity of the non-urban studies (1.27 ± 0.11) and the mean productivity (1.10 ± 0.13) in this study. It appears that with adequate nest sites Red-tailed Hawks can propagate under these human-made habitat conditions just as well as in non-urban habitats. With the apparent endless encroachment of urban/suburban development this information appears especially significant.

The average initiation date for Great-horned Owl incubation was 14 Feb. (range: 1–21 Feb.). Mean productivity for 29 successful nests of Great Horned Owls was 1.77 ± 0.14 young, ranging from 1.00 to 2.50 young/nest site. For all 34 nesting attempts the mean productivity was 1.63 ± 0.16 young/nest, ranging from 0.5 to 3.0 young/nest site. The average density of nesting Great Horned Owls (0.016 ± 0.003 nesting

pair/km^2) is not particularly meaningful because all but three Great Horned Owl nesting attempts occurred in old Red-tailed Hawk nests. Nestings of Great Horned Owls in other structures may have been missed.

Red-tailed Hawk/Great Horned Owl interactions.—Preemption of Red-tailed Hawk nests by Great Horned Owls was common because Great Horned Owls begin to nest about a month earlier than Red-tailed Hawks in central New York. Nests of Red-tailed Hawks were used by Great Horned Owls in 16 of the 25 nesting areas (64%). Great Horned Owls were seen or heard in five additional areas, but their nests were not found. Some Red-tailed Hawk nests were used alternately by Red-tailed Hawks and Great Horned Owls. In 1987 and 1988, Red-tailed Hawks successfully nested in the same nest where Great Horned Owls failed in their nesting attempt in February of the same year.

There were instances of Great Horned Owls and Red-tailed Hawks nesting approximately 200 m apart during the same year. The proximity of nesting by these two species is probably due to the limited availability of suitable nesting habitat within this urban/suburban landscape. Throughout the study area the distribution of suitable undisturbed nesting habitat appeared clumpy. Houston (1975) reports on the proximity of Great Horned Owls and Red-tailed Hawks nesting on 'island' clumps of 'aspen parkland' in Saskatchewan. The short distances between Great Horned Owl and Red-tailed Hawk nests in this study and that of Houston's (1975) study may be due to the similarity in structural characteristics of the two habitats.

CONCLUSIONS

Today the populations of Red-tailed Hawks and Great Horned Owls in this urban/suburban ecosystem appear to be relatively stable. We believe from their presence as successful breeding populations in and around Syracuse that with proper maintenance of undisturbed nesting areas and adequate open space for foraging, they will persist as top predators.

ACKNOWLEDGMENTS

We wish to acknowledge the assistance of Dr. Larry VanDruff for introducing us to the following students from the SUNY College of Environmental Science and Forestry who aided in collecting nest data: Glenn Johnson, Bruce Hopkins, L. Kroon, Rich Smith, Jeff Zehr, Lisa Truffeli and Dave Seyler. Roy Slack and Dr. Walter Spofford offered valuable advice and assistance. We also appreciated the assistance of Dorothy Crumb, Dale Hildebrand, Dr. Robert Long, Kay McIntyre, Dr. F. G. Scheider, Gerald A. Smith and William Johnson, who supplied us with information and technical support relative to the study. Special thanks go to Glenn Johnson and Michelle Hirth for reviewing the manuscript, and to Merry Jo Ingraldi for her patience, understanding and support over the years.

LITERATURE CITED

BOHM, R. T. 1978. A study of nesting Red-tailed Hawks in central Minnesota. The Loon: 129–137.

BROWN, L., AND D. AMADON. 1968. Eagles, hawks, and falcons of the world. McGraw-Hill Book Co., New York, New York. 945 pp.

CRAIGHEAD, J. J., AND F. C. CRAIGHEAD, JR. 1956. Hawks, owls, and wildlife. Stackpole Co., Harrisburg, Pennsylvania. 443 pp.

DAVIS, J. A. 1977. An ecosystem classification of New York State for natural resources management. N.Y. Fish and Game J. 24:129–143.

ERRINGTON, P. L. 1933. Food habits of southern Wisconsin raptors part II. Hawks. Condor 35:19–29.

GATES, J. M. 1972. Red-tailed hawk populations and ecology in east-central Wisconsin. Wilson Bull. 84:421–433.

HOUSTON, C. S. 1975. Close proximity of Red-tailed Hawk and Great Horned Owl nests. Auk 92:612–614.

HOWARD, R., AND B. C. POSTOVIT. 1987. Impacts and mitigation techniques. Pp. 183–213, *in* B. A. Giron Pendleton, B. A. Millsap, K. W. Cline, and D. M. Bird, eds. Raptor management techniques manual. Natl. Wildl. Fed., Washington, D.C.

JOHNSON, S. J. 1975. Productivity of the Red-tailed Hawk in southwestern Montana. Auk 92:732–736.

MCINVAILLE, W. B., AND L. B. KEITH. 1974. Predator-prey relations and breeding biology of the Great Horned Owl and Red-tailed Hawk in central Alberta. Can. Field-Nat. 88:1–20.

MINOR, W. F., AND M. MINOR 1981. Nesting of Red-tailed Hawks and Great Horned Owls in central New York suburban areas. Kingbird 31:68–76.

ORIANS, G., AND F. KUHLMAN. 1956. Red-tailed Hawk and Horned Owl populations in Wisconsin. Condor 58:371–385.

PETERSON, L. 1979. Ecology of Great Horned Owls and Red-tailed Hawks in southeastern Wisconsin. Tech. Bull. No. 111 Dept. of Natl. Res., Madison, Wisconsin. 79 pp.

RUNYAN, C. S. 1987. Location and density of nests of the Red-tailed Hawk, *Buteo jamaicensis*, in Richmond, British Columbia. Can. Field-Nat. 101:415–418.

SEIDENSTICKER, J. C., AND H. V. REYNOLDS. 1971. The nesting, reproductive performances, and chlorinated hydrocarbon residues in the Red-tailed Hawk and Great Horned Owl in south-central Montana. Wilson Bull. 83:408–418.

SOKAL, R. R., AND F. J. ROHLF. 1981. Biometry. W. H. Freeman and Co., New York, New York. 859 pp.

STEENHOF, K. 1987. Assessing raptor reproductive success and productivity. Pp. 157–170, *in* B. A. Giron Pendleton, B. A. Millsap, K. W. Cline, and D. M. Bird, eds. Raptor management techniques manual. Natl. Wildl. Fed., Washington, D.C.

TERRES, J. K. 1982. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf, New York, New York. 1109 pp.

Received 28 Feb. 1991; accepted 30 Sep. 1992.

ERRATUM

The natural leg injury rates for Black-necked Stilts (*Himantopus mexicanus*) contained in Banding is infrequently associated with foot loss in Spotted Sandpipers by J. M. Reed and L. W. Oring (1993:146, J. Field Ornithol. 64:145–148), as a personal communication from C. Gratto-Trevor and H. L. Dickson, is erroneous. The reported rates are for Stilt Sandpipers (*Calidris himantopus*).

J. Michael Reed and Lewis W. Oring