BREEDING ECOLOGY OF BARRED OWLS IN THE CENTRAL APPALACHIANS

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ABSTRACT - Eight pairs of breeding Barred Owls (*Strix varia*) in western Maryland were studied. Nest site habitat was sampled and quantified using a modification of the James and Shugart (1970) technique (see Titus and Mosher 1981). Statistical comparison to 76 random habitat plots showed nest sites were in more mature forest stands and closer to forest openings. There was no apparent association of nest sites with water. Cavity dimensions were compared statistically with 41 randomly selected cavities. Except for cavity height, there were no statistically significant differences between them.

Small mammals comprised 65.9% of the total number of prey items recorded, of which 81.5% were members of the families Cricetidae and Soricidae. Birds accounted for 14.6% of the prey items and crayfish and insects 19.5%. We also recorded an apparent instance of juvenile cannibalism.

Thirteen nestlings were produced in 7 nests, averaging 1.9 young per nest. Only 2 of 5 nests, where the outcome was known, fledged young.

The Barred Owl (*Strix varia*) is a common nocturnal raptor in forests of the eastern United States, though few detailed studies of it have been published. Most reports are of single nesting occurrences and general observations (Bolles 1890; Carter 1925; Henderson 1933; Robertson 1959; Brown 1962; Caldwell 1972; Hamerstrom 1973; Appelgate 1975; Soucy 1976; Bird and Wright 1977; Leder and Walters 1980). Habitat was described qualitatively by Nicholls and Warner (1972) and Fuller (1979). Barred Owl food habits were reported by Cahn and Kemp (1930), Errington (1932), Errington and McDonald (1937), Wilson (1938), Mendall (1944), Hamerstrom and Hamerstrom (1951), Blakemore (1960) LeDuc (1970), and Korschgen and Stuart (1972). The food habits studied, however, were all from midwestern states, except Mendall's (1944) study from Maine. Dunstan and Sample (1972) reported the number of fledglings from 1 cavity each year for 5 years, but provided no other productivity information. Clutch sizes in various geographic regions can be found in Bent (1961) and Murray (1976).

This study was conducted in an area where 4 diurnal raptor species, the Red-shouldered Hawk (*Buteo lineatus*), Broad-winged Hawk (*B. platypterus*), Red-tailed Hawk (*B. jamaicensis*) and Cooper's Hawk (*Accipiter cooperi*), were also under study (see Titus and Mosher 1981, Janik and Mosher 1982). Our objectives were to quantitatively describe vegetation structure at Barred Owl nest sites and compare it with surrounding habitat, measure and compare dimensions of cavities used by them with those from randomly selected cavities, describe their food habits for this geographic region, and determine their breeding chronology and productivity.

STUDY AREA AND METHODS

The study was conducted in Green Ridge State Forest (GRSF), Allegany County, Maryland. It is within the Ridge and Valley physiographic region (Stone and Matthews 1977), characterized by narrow mountain ridges oriented northeast to southwest separated by steep narrow valleys (see Titus 1980).

About 74% of the county and nearly all of GRSF is forested Major forest types were described by Brush et al. (1980). Predominant tree species include white oak (*Quercus alba*), red oak (*Q. rubra*), chestnut oak (*Q. prinus*), scarlet oak (*Q. coccinea*), red maple (*Acer rubrum*), and pignut and mockernut hickories (*Carya glabra* and *C. tomentosa*). Predominant understory species include flowering dogwood (*Cornus florida*), sassafras (*Sassafras albidum*), serviceberry (*Amelanchier* spp.), and saplings of the dominant trees.

The study area was systematically searched for active nests from late February through May in 1981 and 1982. During 1982, tape recorded Barred Owl calls were broadcast in order to elicit responses and help localize nesting pairs.

Nest sites were plotted on 7.5 min USGS topographic maps and County Soil Conservation Service maps. A nest site was defined as a 0.4 ha plot (11.3 m radius) centered on the nest tree. This size plot was considered more time and field efficient than either smaller or larger size plots when making quantitative estimates of the vegetation (Lindsey et al. 1958, James and Shugart 1970).

Nests were checked periodically each season to obtain nesting chronology and productivity information. At the same time, regurgitated pellets found in the cavities were collected and any prey remains were noted.

At the end of the nesting season, vegetation at each active nest site was sampled using a modificaton of the James and Shugart technique (1970), as described by Titus and Mosher (1981). Thirty-four variables were measured or derived at each site (Table 1). The type of cavity in which a pair nested (hollow tree stub, hole from disease, excavated hole, or hole from broken limb) and successional stage of the cavity tree (Fig. 1) were recorded.

Height to cavity entrance was measured with a meter tape for trees climbed, otherwise height measurements and percent slope were measured with a Haga altimeter. Percent canopy, understory and ground covers were based on 40 ocular tube readings, 10 along each of 4 transects starting at the nest tree and extending in each of the cardinal compass directions.

We compared nest site data with random habitat samples collected by Titus and Mosher (1981) to determine if vegetation structure around nest trees differed from surrounding habitat. Variables measured at random plots are listed in Table 1 except

Table 1. Quantative habitat variables and cavity characteristics used in analysis of Barred Owl nest site habitat

1.	ALTITUDE	Altitude of plot in meters; taken from U.S.G.S. 7.5-min. quadrangles
2.	SOIL	Soil-woods suitability; measures suitability for tree productivity; class 1 indicates high productivity and class 6 indicates low productivity (Stone and Matthews 1977)
3.	SITINDX	Site index; based on SOIL and the tree species present in the plot (Stone and Matthews 1977)
4.	WATER	Distance to water in meters
5.	DISFOROP	Distance to the nearest forest opening in meters; measured to the nearest break in forest continuity, such as created by trail, road, field, etc.
6.	PERSLOP	Percent slope of plot
7.	CANHT	Canopy height of the plot in meters; the mean of 5 measurements taken to the top of the canopy
8.	CANEVER	Percentage evergreen canopy cover
9.	CANTOT	Percentage total canopy cover
10.	UNDEVER	Percentage evergreen understory cover
11.	UNDTOT	Percentage total understory cover
12.	GRNDEVER	Percentage evergreen ground cover
13.	GRNDTOT	Percentage total ground cover
14.	SHRUBDEN	Shrub density (James and Shugart 1970, James 1978)
15.	SHRUBIND	Shrub index (Titus 1980)
16.	NOSPTREE	Number of species of overstory trees in the plot
17.	NOSPSHRB	Number of species of shrubs and saplings in the plot
18.	NOTREES	Number of overstory trees in the plot
19.	UND14	Number of understory stems 1-4 cm diameter in the plot
20.	UND58	Number of understory stems 5-8 cm diameter in the plot
21.	UNDGT8	Number of understory stems greater than 8 cm diameter in the plot
22.	DBHLT26	Number of overstory trees less than 26 cm dbh in the plot
23.	DBH2650	Number of overstory trees 26-50 cm dbh in the plot
24.	DBHGT50	Number of overstory trees greater than 50 cm dbh in the plot
25.	BASAL	Basal area in m^2/ha for overstory trees
26.	DBH*	Diameter at breast height of nest tree
27.	TREEHT*	Height of cavity tree in meters
28.	CAVHT*	Height to lowest point of cavity entrance in meters
29.	%CAVHT*	Percentage cavity height; calculated as: (CAVHT/CANHT) (100) = %CAVHT
30.	TREEDIAM*	Diameter of cavity tree at cavity height
31.	HORIZONT*	Horizontal length of cavity opening in cm
32.	VERTICAL*	Vertical length of cavity opening in cm

(Table 1 continued)

(Table 1 concluded)

33. CAVDIAM*	Inside diameter of cavity in cm; measured from inside of entrance to back wall; for hollow tree stubs, the largest diameter is recorded
34. CAVDEPTH*	Cavity depth in cm; measured from lowest point of cavity entrance to base of cavity.

(* = variables unique to cavities and cavity trees).

for the cavity and cavity tree specific variables.

Dimensions of 41 randomly selected, unoccupied cavities were measured and compared with nest cavities to provide a measure of cavity sizes availble to Barred Owls and assess cavity selection. The random sampling of cavities was stratified. Transects, approximately 100 m apart, 1.6 km long extending on both sides of a road running the length of the study area, were randomly chosen. A coin flip determined which side of the road the transect was walked. Every third cavity encountered was measured but no more than 3/transect to avoid measuring too many within a single habitat type. The criteria for accepting a random cavity was that it be at least 2 m from the ground and have at least a 15 cm diameter opening, or, for a hollow tree stub, a 25 cm dbh.

Minimum sample sizes were calculated for each variable to determine if random sampling was adequate. Sample sizes were considered adequate if they met the criteria of remaining within 20% of the mean for 95% of the samples. Twenty of 25 variables pertaining to habitat structure met this criteria with < 76 samples. Seven of 9 cavity and cavity tree variables met this criteria with sample sizes of < 41.

Habitat data were subjected to nonparametric statistical analyses conducted on the Statistical Package for the Social Sciences (SPSS) computer program (Nie et al. 1975, Hull and Nie 1981). Two sets of Kruskall-Wallis one-way analysis of variance (Siegal 1956) tested for similarity between nest site habitat and random habitat plots, and nest site cavity and random cavity dimensions. Spearman rank correlation coefficients (Siegal 1956) were calculated to determine the extent of correlation among structural features of habitat and among cavity characteristics X^2 goodness-of-fit tests were used on pooled samples of nest site and random cavities to determine if differences existed among the number of each cavity type found and number of cavity trees in each successional stage. Test results were considered significant if $P < 0.05$.

RESULTS AND DISCUSSION

Habitat. — Eight-Barred Owl nests were located. The 4 found in 1981 were not reused in 1982. Nest site habitat and random habitat plots were significantly different between groups for 7 of 25 variables (Table 2). Nest sites were found significantly closer to forest openings than random sites, in habitats with well developed understories. Percent understory cover and the number of stems greater than 8 cm diameter, both positively correlated with each

Table 2. Means ± standard deviations and ranges of habitat variables at Barred Owl nest sites and random habitat plots, and results from Kruskal-Wallis one-way ANOVA (chi-square statistic) testing for significant differences between groups.

Habitat variable[a]	Barred owl nest sites (N = 8)	Random sites (N = 76)	Kruskal-Wallis X^2 value
ALTITUDE	1239 ± 517 (820 − 2420)	1356 ± 613 (560 − 2860)	0.084
SOIL	3.6 ± 1.4 (1 − 6)	3.9 ± 1.3 (1 − 6)	0.093
SITINDX	65 ± 11.7 (45 − 85)	61.4 ± 12.5 (40 − 90)	0.410
WATER	218 ± 222 (15 − 675	320 ± 243 (35 − 1050)	1.860

(Table 2 continued)

(Continuation of Table 2)

Habitat variable[a]	Barred owl nest sites (N = 8)	Random sites (N = 76)	Kruskal-Wallis X^2 value
DISFOROP	85 ± 116 (4 – 350)	221 ± 209 (8 – 1110)	7.481**
PERSLOP	9.4 ± 12.9 (0 – 40)	21.6 ± 13.3 (3 – 80)	0.107
CANHT	23.5 ± 3.3 (19 – 28)	20.6 ± 4.5 (10 – 31)	2.991
CANEVER	7 ± 13 (0 – 32)	6 ± 14 (0 – 53)	0.019
CANTOT	68 ± 21 (30 – 98)	75 ± 9 (43 – 90)	0.230
UNDEVER	0	2 ± 7 (0 – 37)	0.535
UNDTOT	67 ± 14 (50 – 90	53 ± 14 (17 – 80)	5.120*
GRNDEVER	0	.5 ± 3 (0 – 30)	0.059
GRNDTOT	43 ± 13 (23 – 68)	38 ± 16 (10 – 75)	0.893
SHRUBDEN	23 ± 19 (5 – 68)	24 ± 11 (3 – 64)	1.074
SHRUBIND	42 ± 23 (10 – 83)	50 ± 21 (14 – 115)	1.220
NOSPTREE	4.5 ± 1.7 (3 – 7)	4.6 ± 1.8 (1 – 10)	0.046
NOSPSHRB	11.4 ± 2.8 (8 – 16)	10.1 ± 2.9 (5 – 17)	1.395
NOTREES	10.9 ± 3.6 (4 – 17)	19.5 ± 10) (7 – 48)	7.315**
UND14	69.8 ± 34.9 (28 – 131)	74.3 ± 33.3 (9 – 154)	0.245
UND58	17.5 ± 8.8 (3 – 33)	12.7 ± 8.7 (1 – 45)	2.874

(Table 2 continued)

(Table 2 concluded)

Habitat variable[a]	Barred owl nest sites (N = 8)	Random sites (N = 76)	Kruskal-Wallis X^2 value
UNDGT8	9.5 ± 3.7 (4 – 16)	5.9 ± 3.6 (0 – 14)	5.870*
DBHLT26	5.1 ± 3.2 (0 – 10)	14.7 ± 11.6 (0 – 48)	6.554**
DBH2650	3.9 ± 2.2 (2 – 8)	4.6 ± 2.8 (0 – 12)	0.665
DBHGT50	1.8 ± 1.2 (0 – 4)	0.2 ± 0.6 (0 – 3)	12.714***
BASAL	28.4 ± 5.8 (21.7 * 40.1)	20 ± 5.5 (3.9 – 34.2)	11.755***

[a]Mnemonic names defined in Table 1.
(* = P < 0.05; ** = P < 0.01; *** = P < 0.001).

other (r = 0.24, P = 0.03, N = 84), were significantly higher at nest sites. There were fewer overstory trees, because of fewer trees in the < 26 cm dbh size class. There were significantly more trees > 50 cm dbh at nest sites (45/ha vs 5/ha at random sites), and greater basal area.

These results are in general agreement with the qualitative habitat descriptions provided by previous authors (i.e., Barred Owls utilize forest stands mature enough to provide suitable nesting cavities). Craighead and Craighead (1969) suggested one of the reasons Barred Owls were absent from part of their study area was a lack of mature basswoods (*Tilia* sp.) and a lack of heart rot fungus in woodlots that had mature trees. However, owls are known to nest in old hawk or squirrel nests, as did 1 pair in this study, and 23 of 38 pairs reported by Bent (1938). Bent suggested that they choose alternative nests because of lack of cavities. Hilden (1965) and Temple (1977) indicated that birds may shift from their traditional nesting sites by imprinting on the type of nests from which they fledge. If this occurs in Barred Owls, those raised in old hawk or squirrel nests may subsequently use these nest types regardless of cavity availability.

Much literature on Barred Owls indicates an apparent association with wet areas (Carter 1925, Errington and McDonald 1937, Bent 1938, Appelgate 1975, Soucy 1976), perhaps because such areas are often inaccessible or too wet to be logged, thereby providing old growth timber and abundant nesting cavities. We found no difference in the proximity to water between nest sites and random habitat plots. The average distance to water was 218 m with only 1 nest located on a stream "floodplain". Furthermore, Nicholls and Warner (1972) and Fuller (1979), both radiotelemetry studies, reported that Barred Owls utilized oak-upland habitat more frequently and consistently than any other habitat type including white cedar (*Thuja occidentalis*) swamps, alder (*Alnus* spp.) swamps, and marshes. Nicholls and Warner (1972) suggested that owls used upland sites because of more suitable nest sites, abundance of hunting perches, open understory for hunting, and the opportunity to hear prey better in dry areas.

Bent (1938) reported that distribution of Barred Owls in southern New England coincides with Red-shouldered Hawks and noted they are often found in the same woodlot. In this study, forest structure around Barred Owl nest sites was similar to that of sympatric Red-shouldered Hawks, both species utilizing old growth timber for nesting. Six of the 7 significant variables listed in Table 2 were also significant for the Red-shouldered Hawk (Titus and Mosher 1981). Apparent differences between them were that Red-shouldered Hawk nests were no closer to forest openings than random habitat plots, but were significantly closer to water, and there was a higher shrub density at Red-shoulder occupied sites.

Cavities. — Six Barred Owl nests were in the top of hollow tree stubs, 1 in a cavity created by disease and 1 in an old stick nest. The high incidence of hollow tree stubs as nest sites is probably a reflection of cavity type availability in this area. Sixty-nine percent of the total number of cavities measured were hollow tree stubs, significantly more than the other 3 types ($X^2 = 54.17$, 3 df, $P < 0.05$). Twenty-three percent were holes,resulting from broken limbs and 8% were holes created by disease. No excavated holes were found that met the criteria to be included in the random cavity sample. Four of the 7 nesting cavities were in trees in the second successional stage (see Fig. 1) and 1 each in the third, fourth and fifth stages. There was no statistical difference in the total number of cavity trees in each of the 5 successional tree stages ($X^2 = 9.29$, 4 df, $P < 0.05$).

There was a significant difference between ran-

Table 3. Means ± standard deviation and ranges of cavity and cavity tree dimensions for Barred Owl nest site cavities and random cavities, and results from Kruskal-Wallis one-way Anova (chi-square statistics) testing for similarity between groups.

Cavity variable[a]	Nest site cavities	N	Random cavities	N	Kruskal-Wallis X^2square value
DBH	61 ± 15 (42 – 88)	7	53 ± 13 (26 – 90)	41	1.652
TREEHT	15.4 ± 5.8 (10 – 25)	7	12.9 ± 7.1 (3 – 24)	41	1.137
CAVHT	9.1 ± 2.9 (4 – 14)	7	6.3 ± 3.1 (2 – 17)	41	5.5999*
%CAVHT	39 ± 11 (17 – 50)	7	30 ± 14 (10 – 71)	41	2.724
TREEDIAM	46 ± 8 (36 – 54)	4	48 ± 11 (25 – 69)	33	0.048
HORIZONT	15 ± 0	1	21 ± 8 (12 – 40)	12	2.571
VERTICAL	45 ± 0	1	49 ± 35 (20 – 140)	12	2.571
CAVDIAM	33 ± 8 (22 – 41)	6	30 ± 10 (11 – 60)	33	0.985
CAVDEPTH	54 ± 44 (3 – 130)	6	167 ± 203 (0 – 800)	33	0.767

[a]Mnemonic names defined in Table 1.
(* = P < 0.05).

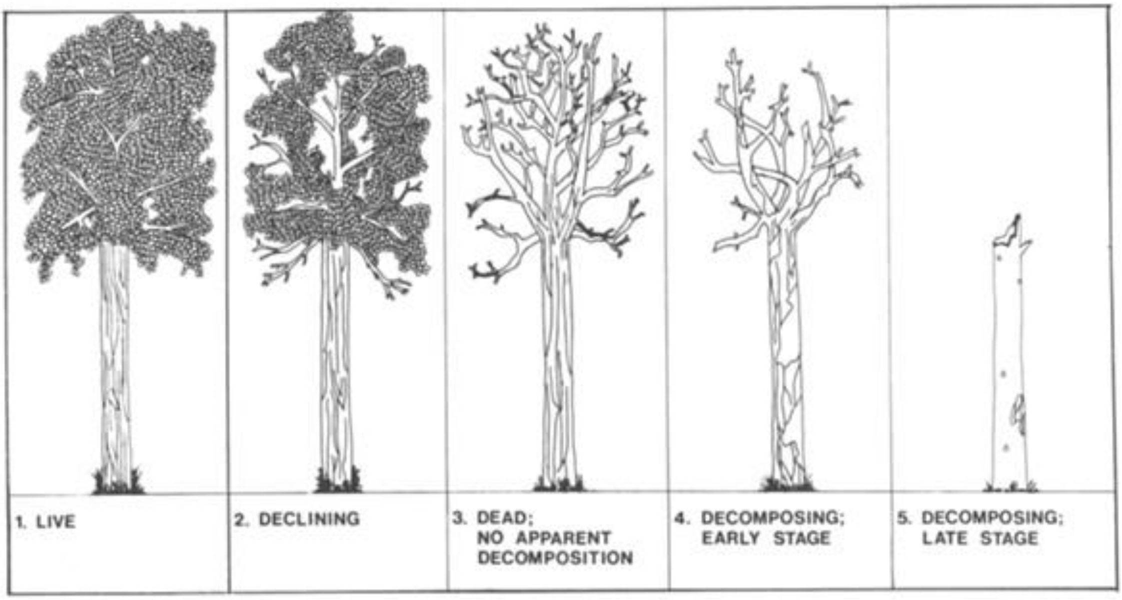

Figure 1. Successional stages for describing Barred Owl cavity trees: 1. LIVE - tree is apparently healthy except for cavity; 2. DECLINING - tree is obviously declining; losing leaves; some dead branches; 3. DEAD; NO APPARENT DECOMPOSITION - no leaves; tree still has all or most of bark; some branches may be broken; no apparent rotting of wood; 4. DECOMPOSING; EARLY STAGE - many broken branches; bark falling off; wood becoming soft in spots; 5. DECOMPOSING; LATE STAGE - little or no bark on tree; very soft wood; broken tree stub is often all that remains

dom and nest site cavity dimensions for only 1 of 9 variables (Table 3). Cavities used by owls averaged 3 m higher than random cavities. Cavity depth of nest site cavities was highly variable, ranging from 3 - 130 cm. Bent (1938) recorded a depth for 1 Barred Owl cavity of 244 cm.

The cavity data suggest that most cavities, given certain minimum dimensions, may be suitable for nesting. Nest trees generally have at least a 25 cm dbh and those with cavities 9 m or more above ground may be preferred. Most reported dimensions (Bent 1938; Allin 1944; LeDuc 1970; Dunstan and Sample 1972; Soucy 1976 Leder and Walters 1980) are less than the maximum cavity dimensions we found. Few data exist on the length and/or width of cavity openings. Hamerstrom (1972) recommended a 20 cm dia opening when constructing a nest box for this species but did not indicate the basis for this measurement. Forsman (1975) reported a range of cavity entrance widths of 15.2 - 55.9 cm for 10 cavities used by the closely related Spotted Owl (*Strix occidentalis*).

Food Habits. — Barred Owl food habits in the GRSF region are summarized in Table 4. The percent occurrence of mammals and birds is fairly typical of what has been reported in the literature. Fish, reptiles, amphibians, and arthropods have also been recorded as prey items but are probably more important to individual owl pairs than to a regional population. The majority of crayfish recorded as prey in this study, for example, were from 2 nests.

Jaksic (1982) hypothesized that temporal segregations of falconiform and strigiform raptors may not reduce competition for food between groups. However, his data for Barred Owls revealed little dietary overlap with falconiform species, except with the American Kestrel (*Falco sparverius*). We also observed little overlap. Sciuridae mammals were clearly the major prey for the 4 hawk species on the study area (Janik and Mosher 1982), while Cricetidae and Soricidae species, which accounted for 81.5% of the mammals and 53.7% of the total number of prey items, were the predominant prey for owls. Furthermore, Flying Squirrels and Crayfish, both nocturnal and not recorded as prey items for the hawks, comprised 8.5% and 12.2% of the total number of prey items recorded, respectively.

Table 4. Food habits of Barred Owls in the Central Appalachians[a].

Prey Species	Occurrence	%
Mammals		
Southern Flying Squirrel (*Glaucomys volansi*)	7	
Shorttail Shrew (*Blarina brevicauda*)	7	
Peromyscus spp.	5	
Meadow Vole (*Microtus pennsylvanicus*)	4	
Eastern Chipmunk (*Tamias striatus*)	2	
Red Squirrel (*Tamiasciurus hudsonicus*)	1	
Unidentified *Cricetidae* sp.	16	
Unidentified *Soricidae* sp.	12	
Total	54	65.9
Birds		
Scarlet Tanager (*Piranga olivacea*)	3	
Eastern Phoebe (*Sayornis phoebe*)	2	
Blue Jay (*Cyanocitta cristata*)	1	
Unidentified	6	
Total	12	14.6
Arthropods		
Crayfish (*Cambarus* sp.)	10	
Unidentified insects	6	
Total	16	19.5
Total Items	82	100.0

[a]Based on prey remains and analysis of pellets from seven nests.

One nestling, about 28 d old, was cannabilized by its sibling. Most of its body was eaten; legs, and skin and feathers of the back were all that remained. Based on growth measurements being taken every 3 to 4 d, both nestlings appeared healthy and were of relatively equal size at 27 d old. The cause of death was unknown but fratricide in raptors usually occurs shortly after the second young hatches (Stinson 1979) and among nestlings of considerable size difference (Ingram 1959), neither of which were the case in this incident. Juvenile cannibalism is not an uncommon occurrence among raptors, but to our knowledge has not previously been documented for Barred Owls.

Nesting Chronology and Productivity. — Nesting chronology and productivity parameters are summarized in Table 5. Hatch dates were fairly consistent among nests, 5 out of 6 hatching within 7 d of each other. Mean egg dates indicate Barred Owls begin nesting about 1 wk before Red-tails (Janik 1980), the earliest nester of the hawk species for this area.

Average clutch size/nest was 2.3, slightly higher than the 2.0 reported by Murray (1976) for Barred Owls in this region and latitude. A total of 13 nestlings were produced in 7 nests, averaging 1.9 young/active nest. The outcome of 5 nests was known. Of these, only 2 fledged young. The eggs rolled out of 1 nest and the nestlings in the other 2 were preyed upon, perhaps as a result of human activity at the nest sites.

The 2 young in successful nests emerged from their cavities when 31 ± 1 d and 30 ± 1 d old, respectively. At this age, Barred Owls are essentially flightless. Primary remiges and rectrices of these 2 owls were only 50 and 12% of adult size, respectively, within 2 d of fledging. Bent (1938) also reported nestling Barred Owls climbing out of their cavities

Table 5. Nesting chronology and productivity of Barred Owls in the central Appalachians, 1981-1982 (# of nests in parentheses).

Mean egg date[a] (6)	20 March
Mean hatch date (6)	10 April
Mean nest departure date (2)	24 May
Mean clutch size (7)	2.3
Total eggs producted[b] (8)	19.0
% hatching success (8)	68.4
# of nestlings per active nest (7)	1.9
Total number fledged (5)	2.0
# fledged/successful nest attempt (2)	1.0
% nesting attempts successful (2/5)	40.0

[a]Egg dates based on back dating from hatch dates using a 28-day incubation period (Bent 1938)

[b]Minimal number of eggs produced based on # of hatchlings and/or eggs found in nests

at 28-35 d old. Forsman (1975) reported Spotted Owls leaving their cavities at 34-36 d old. Dunstan and Sample (1972) and Soucy (1976), however, reported Barred Owls not leaving nests until about 49 d old. The age at which owls emerge may be a factor of cavity size. Those in small, cramped cavities, unable to spread and exercise their wings, may emerge at an earlier age.

Leaving the nest early is a disadvantage from a development standpoint because additional energy is required to compensate for that lost to environmental stress and increased activity. This was suggested by measurements of 1 of the owls that weighed the same 2 d after leaving the nest as 2 d before leaving. However, mobility vs sitting in the nest may be advantageous in terms of predator avoidance. Birds in cavities are especially vulnerable to predation because there is usually only 1 escape route. Young Barred Owls that do leave nests at a preflight stage are not totally helpless. Adult Barred Owls will continue to feed and defend their young throughout the summer, even after they can fly (Henderson 1933, Bent 1938, Dunstan and Sample 1975, Bird and Wright 1977). Also, young Barred Owls have the ability to climb trees using their beaks and talons (Dunstan and Sample 1972). Thus, they are able to move about, first by gliding or fluttering to the ground, then climbing a nearby tree. Tree climbing has also been reported for Great-horned Owl (*Bubo virginianus*), Screech Owl (*Otus asio*) (Dunstan and Sample 1972) and Spotted Owl (Forsman 1975).

CONCLUSIONS

Secondary cavity nesting birds, including the Barred Owl, cannot choose a location within a habitat to "place" their nests. They are limited to what is already available. The data indicate that differences exist between Barred Owl nest site habitat and surrounding habitat, but do not indicate whether cavities are selected based on those differences. Further study is needed to answer this question.

ACKNOWLEDGEMENTS

We thank J. Coleman, L. Garrett, M. Kopeny, D. Lyons, F. Presley, R. Whetstone and K. Titus for their time and assistance We also thank S. Postupalsky for comments on an earlier version of the manuscript. This study was supported, in part, by grants from Sigma Xi, the Maryland Ornithological Society, and the U.S Fish and Wildlife Service (FWS 14-16-0009-80-007). This is Scientific Series No. 1549-AEL of the Appalachian Environmental Laboratory and Technical Report-10 of the Central Appalachian Raptor Ecology Program.

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Received 8 March 1983; Accepted 10 May 1984.