Effectiveness of Bald Eagle Habitat Protection Guidelines in Florida

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Abstract: Aerial overflights were used to assess impacts of the application of habitat management guidelines to 24 experimental and 38 control bald eagle (*Haliaeetus leucocephalus*) nesting territories. No significant differences in productivity were found between nests where management guidelines had been applied and control nests where no development had occurred. No changes in the minimums called for in the guidelines or their application are indicated at this time.

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Florida has the largest population of nesting bald eagles (*Haliaeetus leucocephalus*) in the Southeast. About 75% of Florida's eagles nest on private property (Wood et al. 1989); however, private properties are being developed or otherwise subjected to human-induced disturbances with increasing frequency. The effects of human activity in the vicinity of bald eagles and bald eagle nests have been studied elsewhere (Mathisen 1968, Stalmaster and Newman 1978, Fraser et al. 1985). Generally the impact of human disturbance alone on bald eagles was found to be negligible (Fraser et al. 1985) or controllable by enforcing 250-m diameter activity control zone (Stalmaster and Newman 1978). Habitat alteration is a greater problem.

Recommendations based on "Habitat Management Guidelines for the Bald Eagle in the Southeastern Region" (U.S. Fish and Wildl. Serv. 1987) have been applied by Florida Game and Fresh Water Fish Commission (FGFWFC) and/or U.S. Fish and Wildlife Service staff to about 100–150 nesting territories in Florida where development or other major land use changes have been proposed. The long-term effects of the application of these management recommendations have

not been fully evaluated. When management recommendations are made for protection of a bald eagle nesting territory (nest), the goal has been to maintain the eagles' use of that site and provide for occupation by succeeding generations of eagles. Depending on the site, recommendations usually consist of suggestions that development be set-back and/or be modified as to density and type. A preliminary study (Millsap and Holder, FGFWFC unpubl. 1988) and other unpublished information led us to conclude that 3–5 years post-impact is the minimal time period required to evaluate results of application of recommendations and to detect long-term or indirect impacts associated with development. The objective of this study was to evaluate the effectiveness of current management recommendations as they are being applied ≥3 years after having been made and to make appropriate modifications in their design or application if required.

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Methods

Known bald eagle nesting territories in Florida have been inspected annually since the 1972–73 nesting season (Nesbitt et al. 1988). The existing database for eagle productivity from 1972 to 1991 was modified to include variables that allowed analyses for effects of habitat disturbance. Experimental nests were identified as those for which recommendations had been made and for which ≥3 years of nest-monitoring data existed beyond the year that recommendations were made. Copies of letters that had been sent out to developers were the source of information on the type (commercial, private, land use changes) of development.

Control nests were selected randomly from a pool that met the following criteria: recommendations had not been made, no habitat disturbances had occurred within 228 m (750 ft, the minimum "primary zone" called for in the recommendations) of the nest, and ≥6 years of monitoring data were available. This study assessed human disturbance associated with habitat change within ≤228 m around bald eagle nests. The "secondary zone" called for in the guidelines was not dealt with because most recommendations involving secondary zones were concerned only with timing the activities to occur during the non-nesting season. Repeated flights to assess compliance with temporal recommendations were not made. Also, visual estimates of distances that habitat disturbances occurred in relationship to the nest became unreliable outside of the primary zone.

Habitat at experimental and control nests was checked during April and May of 1991 for compliance (yes or no) with recommendations. Productivity data for experimental nests were divided into those from before ("pretreatment") and after ("post-treatment") the year ("treatment year") that the guidelines were applied. If the guidelines were followed, the treatment year was the year development occurred. In

a situation where recommendations (development) were made in more than year, the median year was selected as the treatment year. The simulated treatment year for control nests was the median of all years for which a nest was monitored.

Four variables were used to describe and analyze the trend in productivity within a bald eagle territory: 1) percent of years when active nests were successful pretreatment minus post-treatment; 2) mean number of chicks fledged per nest annually pretreatment minus post-treatment for all years the nest was checked; 3) mean number of chicks fledged per nest annually pretreatment minus post-treatment for active territories only; and 4) mean number of chicks fledged per nest annually pretreatment minus post-treatment for successful nests only. Productivity trend variables derived in this manner result in a single value for each territory, thereby avoiding potential biases from non-independence of observations. Active territories were those in which a pair of bald eagles were present during the breeding season; successful nests were active ones from which at least 1 chick was fledged (Nesbitt et al. 1975).

Variance problems due to observer bias in estimates of distances, etc., were minimized by having 1 observer do all over-flights. Each nest was identified as coming from 1 of 4 north-south oriented locations within peninsular Florida to allow testing for effects due to geographic location.

Nests for which recommendations were made were assigned a categorical variable identifying the potential disturbance as either residential (single-family dwellings) or commercial (office buildings, logging, mining, etc.). These nests were also assigned a variable describing the number of times recommendations had been made.

Results from examination of data plots, tests for departure from normality, and Bartlett's tests for homogeneity of variances indicated that the four productivity variables were suitable for analyses by parametric statistical procedures. We used Proc GLM (SAS 1987) for regression analyses. Review of scatterplots and regression analyses showed no association of treatment year with values for the four productivity trend variables. Therefore, we expect no bias from a treatment-year effect.

Results

Identification of nests for which recommendations were made but not followed was problematical since this category often had multiple habitat disturbances within their primary zones. Further, it could not be determined if those individuals who received the recommendations were the ones who violated the primary zones. It also was difficult to determine when the disturbances to the primary zones took place. Elimination from analyses of those nests with ambiguous or questionable histories left too few nests to provide a meaningful sample size for interpretation. Consequently, the criteria became unusable and the category was excluded from analyses.

Nest type (experimental, $N = 24$; and control, $N = 38$) and location did not account for a significant amount of variation in the 4 measures of productivity trend (Table 1). When guidelines for protecting the primary zone around nests were

Table 1. Regression results for trends in bald eagle productivity data.

Dependent Variable	Independent Variable	df	R^2	F	P
Psuccess[b]	Type[c], Location[d]	6,55	0.13	1.32	0.2623
Prod1[e]	Type, Location	6,55	0.04	0.36	0.9027
Prod2[f]	Type, Location	6,55	0.06	0.59	0.7395
Prod3[g]	Type, Location	6,54	0.09	0.85	0.5356
Psuccess	Disturb[h], recnum[i]	3,20	0.19	1.54	0.2361
Prod1	Disturb, recnum	3,20	0.10	0.71	0.5600
Prod2	Disturb, recnum	3,20	0.04	0.27	0.8488
Prod3	Disturb, recnum	3.20	0.12	0.87	0.4711

[a] Includes the interaction term.
[b] Percent of years when active nests were successful pretreatment–posttreatment.
[c] Nests where recommendations were given and followed or control nest.
[d] Four north-south oriented locations within peninsular Florida.
[e] Mean number of chicks fledged per nest annually pretreatment–posttreatment for all years the nest was checked.
[f] Mean number of chicks fledged per nest annually pretreatment–posttreatment for active territories only.
[g] Mean number of chicks fledged per nest annually pretreatment–posttreatment for successful nests only.
[h] Habitat disturbance either commercial or residential.
[i] Number of times recommendations were made.

followed, we found no evidence that productivity differed from control nests. These findings were based on data from Alachua County southward to Collier County (Table 2).

Regression analyses using only nests where recommendations were made and followed (Table 1) indicated no significant association with potential disturbance (residential [N = 13], commercial disturbance [N = 11]), or the number of times recommendations were made for a nesting territory (range = 1 to 6). When recommendations were followed, productivity of eagles did not differ regardless of the type disturbance (residential or commercial) and regardless of how many times recommendations were made.

Discussion

Several sources of ambiguity in the evaluation of impacts in the original 36 experimental nests and 38 control nests (Table 2) reduced to 24 the number of experimental nests. Nests where development occurred without guidelines being applied or where guidelines were applied but not followed had to be dropped from analysis. Either the timing of impacts was unknown with these nests, or the potential for impact was unclear because the predevelopment habitat situation could not be ascertained.

Use and productivity of the experimental nests where guideline recommendations had been applied and followed did not differ significantly from that of the control nests. When the guidelines were applied and followed there was no negative effect on the reproductive potential of the nesting territory. Any negative effect of development that proceeded without guidelines could not be documented within the scope of the current study. Randomly selecting 150 territories that had been

Table 2. Frequency of adherence to guidelines of bald eagle nests evaluated during the study in Florida, 1985–91.

	North-south distribution of within Florida			
	1[a]	2[b]	3[c]	4[d]
Compliance with guidelines—yes	6	2	16	0
Compliance with guidelines—no	0	3	3	6
Controls	8	5	20	5

[a] Alachua County.
[b] Brevard (North), Marion, Orange, and Pasco counties.
[c] Brevard (south), Hillsborough, Indian River, Manatee, Osceola, Pinellas, Polk, Sarasota, and St. Lucie counties.
[d] Lee and Collier counties.

active in 1993, and then monitoring them over the subsequent 3–5 years, would perhaps give us insight into the negative impacts of unmanaged change that occurred to these nests.

Application of the guidelines for more than 1 development occurrence did not alter territory use or productivity at a significantly greater rate than a single event. At some point the effect of multiple disturbances to the same territory will become too great for the birds (or future birds) to tolerate. It is not known where this point lies (it probably varies among individuals), but it is advisable to be conservative when recommending guidelines in such situations.

Conclusions

No changes to the minimums called for in the guidelines or application of the guidelines are warranted as a result of this study. The ability of bald eagles in Florida to tolerate or adjust to the disturbance and habitat modifications brought about by proximate development notwithstanding, the loss or degradation of supporting habitat is ultimately the most pernicious threat to maintaining the distributional continuity and viability of the species in Florida. The number of nesting pairs has increased since 1973 (see Nesbitt et al. 1988), and the population is now recovered to perhaps half to two-thirds of what it was estimated to be in 1947 (Peterson and Robertson 1978), the year DDT came into widespread use. The amount of feeding and nesting habitat remaining in Florida is probably insufficient to support the eagle population that existed before 1947. Whether the current bald eagle population will continue to thrive depends on our ability to accommodate the need of the eagle and expanding human demand for development of the natural environments of Florida.

Literature Cited

Fraser, J. D., L. D. Frenzel, and J. E. Mathisen. 1985. The impact of human activities on breeding bald eagles in north-central Minnesota. J. Wildl. Manage. 49:585–592.

Mathisen, J. E. 1968. Effects of human disturbance on nesting of bald eagles. J. Wildl. Manage. 321:1–6.

———, D. J. Sorenson, L. D. Frenzel, and T. C. Dunstan. 1977. Management strategy for bald eagles. Trans. North Am. Wildl. and Nat. Resour. Conf. 42:86–92.

Nesbitt, S. A., R. R. Roth, and W. B. Robertson, Jr. 1975. The status of the bald eagle in Florida 1972–1975. Proc. Southeast. Assoc. Game and Fish Comm. 29:424–428.

———, G. L. Holder, D. A. Mager, and S. T. Schwikert. 1988. Use of aerial surveys to evaluate bald eagle nesting in Florida. Pages 207–210 *in* Proceedings of the Southeastern raptor management symposium and workshop. Natl. Wildl. Fed., Washington, D.C.

Peterson, D. W. and W. B. Robertson, Jr. 1978. Threatened southern bald eagle. Pages 27–30 *in* H. W. Kale II, ed. Rare and endangered biota of Florida: Volume two, birds. Univ. Presses Fla. Gainesville.

SAS Institute Inc. 1987. SAS/STAT guide for personal computers, Vers. 6 edition. Cary, N.C. 1,028pp.

Stalmaster, M. V. and J. R. Newman. 1978. Behavioral responses of wintering bald eagles to human activity. J. Wildl. Manage. 42:506–613.

U.S. Fish and Wildlife Service. 1987. Habitat management guidelines for the bald eagle in the Southeastern region: Third revision. Atlanta, Ga. 9pp.

Wood, P. B., T. C. Edwards, Jr., and M. W. Collopy. 1989. Characteristics of bald eagle nesting habitat in Florida. J. Wildl. Manage. 53:441–449.