

# **BALD EAGLE MONITORING GUIDELINES**

**Prepared For**

**United States Fish and Wildlife Service**

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**(revisions highlighted in text)**

## PREFACE

These monitoring guidelines are published and issued by the U.S. Fish and Wildlife Service's Jacksonville, Panama City and Vero Beach Field Offices in Florida. A number of Federal and State laws and/or regulations prohibit, cumulatively, such acts as harassing, harming, disturbing, molesting, pursuing, etc. bald eagles, or destroying their nests. The purpose of these guidelines is to provide agency personnel and others in Florida a scientific standard for documenting and evaluating bald eagle response to human development activities, which may indicate an alteration of otherwise normal nesting behavior and which may lead to nest abandonment and/or death. These guidelines are supplemental to the *Habitat Management Guidelines for the Bald Eagle in the Southeast Region*, and similarly are advisory in nature. The monitoring guidelines do not replace the habitat management guidelines.

The development of this document is a collaborative effort by Federal, State and private biologists who have extensive experience in the research and management of bald eagles in the Southeastern United States. J. Steve Godley<sup>1</sup> prepared the initial draft and all attachments, while Tom H. Logan<sup>2</sup> served as editor and coordinator of technical and editorial reviews of subsequent drafts. Stephen A. Nesbitt<sup>2</sup>, John H. White<sup>2</sup>, Don Palmer<sup>3</sup>, Candace Martino<sup>3</sup>, Annie Dziergowski<sup>3</sup>, Jeff Weller<sup>3</sup> and Linda Ferrell<sup>3</sup>, provided technical and editorial comments that were invaluable to the completion and technical quality of these guidelines.

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# BALD EAGLE MONITORING GUIDELINES

## A. Introduction:

Approximately 10 percent of Florida's 1,133 known occupied bald eagle territories (Nesbitt et al. 2002) occur in suburban settings, defined as nests with > 50 percent of the natural habitat within 1,500 feet of the nest tree having been altered by some form of human development (Millsap et al. 2001, Nesbitt personal communications). Eagles in these settings either continue to nest, or sometimes establish new nests at other sites that are in proximity to human development (Millsap et al. 2001). No significant differences in territory occupancy, nesting success (occupied territories that fledge young) or productivity (number of young fledged), have been detected between eagle pairs nesting in these suburban versus more rural settings, so long as a 750-foot primary protection zone around the nest tree has been maintained in an undisturbed (i.e., current) state (Nesbitt et al. 1993, Millsap et al. 2001). However, the tolerance of individual eagle pairs to human disturbance, defined as a change in eagle behavior that is induced by any human activity (Fraser 1985) or habitat alteration, may vary widely. Accordingly, the U.S. Fish and Wildlife Service (USFWS) and Florida Fish and Wildlife Conservation Commission (FWC) typically require biological monitoring of the nesting territory if new human development, specifically residential and/or commercial construction, is proposed to occur within 1,500 feet of the nest tree and during the nesting season (October 1 - May 15, USFWS 1987).

These bald eagle monitoring guidelines have been developed to provide agency personnel and others a scientific standard for evaluating eagle responses to human development activities, which may indicate an alteration of otherwise normal nesting behavior. The monitoring guidelines (1) identify specific behavioral responses of adult and young eagles that may warrant cessation of development activities, (2) quantifies development activities which may indicate that harm or harassment of eagles has occurred, such that otherwise normal behavior has been altered, (3) proposes the type and level of monitoring necessary to detect a change in normal behavior and (4) develops a procedure for reporting the observations to the USFWS/FWC and for halting or modifying construction activities, if necessary.

The probability that a pair of bald eagles will abandon their nest increases with the intensity and proximity of development activities to their nest, and decreases with the time and energy the adult eagles have invested in the eggs or young and to what extent the adult birds may habituate to human activities. This is based upon the ecological parental investment theory (e.g., Trivers 1972, Wilson 1975, Dawkins 1977) and practical experience gained from observing bald eagle/human interactions over the past two decades in Florida (e.g., Wood 1992, Nesbitt et al. 1993, Wood and Collopy 1995, Millsap et al. 2001). Accordingly, the intensity of monitoring and concern for abandonment to occur is highest prior to egg laying, the closer and more intense development activities occur to the nest tree and for nesting territories in more rural environments.

All infrastructure development **and exterior building construction** within 1,500 feet of the nest tree should, as a general rule, be completed during the non-nesting season (USFWS 1987). Infrastructure construction includes all land and lot clearing; fill work; construction of roads, drainage, sewer and storm water facilities; and installation of water, electricity and other utilities. However, it often is not possible to complete construction of infrastructure, individual residential homes or commercial developments during the non-nesting season. The purpose of these guidelines is to address those circumstances.

## B. Monitoring Requirements:

Biologists formally educated in **the biological sciences** and well experienced in recognizing specific patterns and changes of eagle behavior and capable of recording those observations in a scientific manner must conduct all monitoring. Continuity of monitoring, data collection and reporting is best maintained if one person conducts all monitoring for a specific project site. Close coordination is essential if more than one monitor is required. Monitoring should be conducted from a location that provides a clear vantage point of the nest and the surroundings (including construction activities), yet far enough from the nest (e.g., > 750 feet where possible) to not cause disturbance to the eagles. Monitoring from closer locations could cause disturbance and should be avoided. Conducting the monitoring from inside a parked vehicle or from a portable blind can further minimize observer disturbance. Monitoring should be conducted using both binoculars and a high-powered spotting scope during periods when construction is occurring during the nesting season (generally October 1 – May 15) and within 1,500 feet of the nest tree.

The purpose of monitoring is to detect any abnormal behavior of the adult eagles or their chicks that may be elicited in response to development activities occurring within 1,500 feet of the nest tree and that potentially could result in abandonment of the nest and/or territory. We recommend that procedures be established for suspension of work activities which may be responsible for such abnormal behavior and that any such suspension be reported immediately to the USFWS (appropriate Field Office) and FWC (Endangered Species Coordinator) for consultation regarding appropriate actions to halt or modify any activities which potentially may increase risk to nesting eagles. Nesting behavior and response of individual eagle pairs to human activities may vary, but nesting chronology and otherwise normal behavior are relatively fixed and predictable. Buehler (2000) and references cited therein provides an excellent summary of the biology and nesting behavior of bald eagles.

Monitoring should begin no later than October 1 and continue through fledging, if construction is anticipated or planned to occur within 1,500 feet of the nest tree and during the nesting season. Fledging is considered to have occurred at that age when young of the year have achieved the ability to sustain flight (see Section C.2 for details).

- Initial monitoring of eagles on nesting territories should be conducted a minimum of one day per-week for four hours each day starting ½ hour before sunrise to document when eagles return to the territory and resume nesting behavior (i.e., nest reconstruction or construction). Some birds may initially return to the territory during afternoons. This may be detected by including some afternoon monitoring and/or checking under nest trees for droppings or other evidence of presence during mid-day.
- Nesting eagles should be monitored a minimum of three days each week and four hours each day (beginning at 1/2 hour before sunrise) from onset of nesting behavior through four weeks post-hatching.
- Monitoring frequency may be reduced to one day each week (four hours beginning 1/2 hour before sunrise) beginning five weeks post-hatching and continue until fledging occurs or May 15, whichever occurs first.
- Additional monitoring may be appropriate should special circumstances arise (see Section C.6 for details).
- The monitoring and construction plans for any nesting territory may be re-evaluated for modifications during any year, if eagles have not been observed using the territory by February 1 of that year or if great horned owls (*Bubo virginianus*) have assumed occupancy of the nest.

- Single-family homes typically require a minimum of 5 months for completion of construction, and all major stages of construction (described below), except truss placement, occur over multiple days. Monitoring should be timed to include truss placement.
- The monitor should use a site plan of the project to prepare weekly maps on which to document the specific construction activities that are occurring within 1,500 feet of the nest tree. Recorded construction activities should include, but not be limited to, the stage of construction of each home (i.e., fill placement, slab pouring, sidewall construction, truss placement, roofing, external finish work, internal finish work and landscaping).
- All observations of construction and eagle behavior must be recorded using the attached data sheet (Figure 1).

The following nest cycle activities must be documented and monitored for comparison with normal nesting behavior (see Section C for details) and for detecting and evaluating behavior that may be indicative of disturbance and/or pending risk:

1. Temporal patterns of nest attendance by the adults.
2. Observations of courtship, mating and nest building/maintenance.
3. Incubation and brooding behavior.
4. Feeding, growth and care of the eaglet(s).
5. Flight patterns to and from the nest tree.
6. Fledging of the eaglet(s).

All behavioral data and construction activities must be recorded within 15 minute intervals to facilitate analysis as a basis for detecting and evaluating behavior which may indicate pending risk. Figure 2 summarizes the typical nesting chronology of bald eagles in Florida. Please note that egg laying typically occurs during mid-December in Florida, but may vary by year, pair and latitude, and can extend from October through April, with most late nesters likely representing second breeding attempts (Buehler 2000). Figure 3 provides a typical pattern of nest attendance and phenology of a pair of eagles in Sarasota County, Florida, monitored over a three-year period during one 4-hour observation period each week from October through May.

Nesting behavior which may be interpreted as abnormal, a response to construction activities and/or indicative of pending risk may include, but not be limited to: 1) adults raising or standing up over the nest, 2) increased time spent away from the nest by the adults that is not associated with normal nesting phenology, 3) changes in flight patterns or perch tree use, 4) distress calls, 5) flushing behavior from the nest tree or perch trees, 6) changes in the feeding schedule of the eaglet(s) and 7) premature fledging of the eaglet(s). Descriptions of specific behaviors that would warrant concern and may be indicative of pending risk are described below. Please note that many such behaviors occasionally result from factors other than human disturbance, such as death of an adult, sterility or immaturity (i.e., one member of the pair not in definitive plumage), entrance of a foreign adult eagle or great horned owls into the territory, inadequate food supply for the number of eaglets present, etc. Therefore, it is very important that observations of any abnormal behavior be reported immediately to assure proper interpretation and appropriate courses of action (see Section D for details).

## C. **Definitions of Human Disturbance:**

### 1. Adults Raising or Standing Up Over the Nest

Eagles often assume an alert posture in response to a disturbance event. This behavior also may be accompanied by distress calls and ultimately result in flushing behavior (Fraser et al. 1985, Buehler et al. 1991, McGerigal et al. 1991). Incubating adults may react to a disturbance by rising from their incubation posture and standing over their eggs. They also may step off the eggs and stand on the side of the nest. They may or may not vocalize in conjunction with this behavior. Such standing behavior may be seen prior to flying and as an indication that the bird may flush from the nest in response to a disturbance. The bird also may settle back down into incubation posture without flying, once the disturbance has passed or the bird has decided the disturbance is not a sufficient threat to warrant flushing from the nest. This behavior (whether the adult flushes or not) does indicate that the disturbance is great enough to interfere with normal behavior and is of concern. This posture could be confused with stretching or egg turning which are normal parts of incubation behavior. It will be the responsibility of the monitoring biologist to accurately judge whether a bird is exhibiting normal behavior or is reacting to disturbance.

### 2. Increased Time Spent Away From the Nest Tree

Figure 3 provides a representative example of normal baseline nest attendance by at least one adult eagle during the nesting season. Please note that attendance may be sporadic early in the nesting season, but increases dramatically immediately prior to egg-laying. At least one adult is present almost 100% of the time during the 35-day incubation period and the first 2-3 weeks post-hatching (Fraser 1981, Wallin 1982). Females average about 1/5 larger in size than males, and the sexes are distinguishable when the pair is together. The female does the majority of the incubation and early nestling attendance, although the male participates in both activities. One adult (usually female) broods constantly during inclement (i.e., cool or rainy) weather, and will shade the young to avoid heat stress until a chick(s) is approximately 4 weeks of age (Jenkins 1989, Herrick 1924). Nest attendance declines sharply after 5-6 weeks, and the adults often roost and loaf away from the nest.

Nest attendance would be considered abnormal if: 1) at least one adult is not present during two consecutive, 4-hour (minimum) monitoring days prior to egg laying or 2) both adults are absent for more than two consecutive 15-minute periods during incubation, early brooding or inclement weather prior to 4 weeks post-hatch.

### 3. Changes in Flight Patterns

Florida eagles generally nest in proximity to water, and flight paths to and from the nest often are relatively direct to their feeding areas. Flight information should include recording the direction of each flight to and from the nest in the eight cardinal directions. Simple chi-square or other non-parametric statistics can be used to test if flight patterns are random, directed towards foraging areas or away from on-going construction.

### 4. Distress Calls

Verner and Lehman (1982) describe three distinctive calls of nesting birds that are typical responses to human approaches: 1) a “chatter call” described as consisting of 3-4 introductory notes separated by short gasps of silence (<1s) followed by a rapid sequence of descending notes, usually 6-9 notes in sequence (*kwit kwit kwit kwit kee-*

*kee-kee-kee-kee*), 2) a “peal” consisting of a high-pitched, prolonged, gull-like cry, often repeated 3-5 times and 3) a “wails” call that is seldom given (Beuhler 2000) . Variants of these calls may also be given in response to an intruding adult eagle or other raptors, such as great horned owls, and the chatter call also is often given upon approach to the nest tree by a member of the pair, independent of human disturbance.

Any distress call must be investigated to determine cause, and any construction or associated human activity that may be responsible for the distress call, must be halted or modified immediately.

### 5. Flushing Behavior

Adult eagles may flush from the nest tree, particularly if humans are on foot (Fraser et al. 1985, Beuhler et al. 1991, Grubb and King 1991, McGarigal et al. 1991, Grubb et al. 1992). Risk increases with the duration and frequency of events. The sensitivity of eagles to human disturbance varies between individuals and across populations, as measured by experimental flushing studies (e.g., Stalmaster and Newman 1978, Knight and Knight 1984, Fraser et al. 1985, Buehler et al. 1991, McGarigal et al. 1991). Unfortunately, no similar studies have been conducted in Florida. The response of individual eagles may range from temporary agitation (alert posture) to flushing from the nest or perch tree, to permanent displacement. Humans in vehicles generally elicit a much lower response than those on foot. Additionally, eagles that nest in proximity to existing human activities may habituate and be more tolerant to forms of human activity than they may have previously experienced.

Flushing behavior is more typically in response to human approach to the nest on foot; therefore, it is imperative that the monitor attempt to stop all such approaches. Any construction activities that appear to have caused flushing should be halted immediately.

### 6. Changes in Feeding Schedule of the Eaglet(s)

Although both sexes secure food and feed the young, the male provides most of the food in the first two weeks, while the female tends the young in the nest (Wallen 1982, Gerrard and Bortolotti 1988). The female often delivers as much prey as the male after 3-4 weeks. Adults typically bring the food to the nest and tear off small pieces to feed the young. Eaglets are able to tear off food and feed themselves at approximately 6 weeks of age, although the adults often dismember larger prey (Palmer et al. 1988). Adults typically deliver food 2-8 times per day (mean = 4), and the early morning period accounts for proportionately more food deliveries (Herrick 1924). Food delivery rates also typically decrease as eaglets mature and or eaglet numbers decline with normal attrition. Therefore, deliveries may not be observed during some monitoring periods for older broods. Additional monitoring may be appropriate, should this phenomenon be observed in conjunction with other behavioral indicators of stress. The nutritional requirements of eaglets have not been reported in the literature (Buehler 2000), but free ranging adult bald eagles in Washington at 5°C need to consume about 77.3 g/kg per day (425.5 kJ/kg per day), slightly less than 10% of their body weight per day (Stalmaster and Gessaman 1984). Nestlings may use food that accumulates at the nest for more than one day, unless fresh food is provided (Herrick 1993). Both adults and chicks are capable of storing food in their crop, then digesting the food over time.

Mean brood size for successful nests in Florida bald eagles is 1.55 young per brood, with 3 young not uncommon (Nesbitt et al. 2002). One egg is laid per day, although often not always on successive days. Hatching is asynchronous and differential growth between the sexes can lead to differential mass among siblings, facilitating competition and fratricide (Bortollotti 1986). Sibling competition and mortality is greatest early in the nestling period, when size differences are greatest. The largest chick typically gets the majority of food in clutches with more

than one chick. Brood reduction from starvation of the youngest chick may occur in broods of any size, unless food is abundant (Gerrard and Bortollotti 1988).

It is important to quantify, to the extent possible, the size and type of prey brought to the nest during all observation periods. These data may be useful for determining if the eaglet(s) is receiving adequate food and if construction may be interfering with food delivery schedules.

#### 7. Premature Fledging of the Eaglet(s)

Eaglets typically fledge at approximately 11 weeks of age in Florida (Wood 1992), but nest departure can occur at 8-14 weeks (Buehler 2000). The eaglets usually begin to move about the nest and branches of the nest tree at least 2 weeks before fledging, flapping and developing muscle strength, flight coordination and landing ability in preparation for their first flight from the nest tree. These eaglets are referred to as “branchers.” Fledging typically is considered to have occurred when the eaglets have begun to make extended flights from the nest to adjacent trees, have begun to soar and/or are seen flying around the territory with the parents. It is not uncommon for up to half of initial nest departures to be unsuccessful, with the eaglet falling to and remaining on the ground for days or weeks before regaining flight ability; in most cases, the parents will continue to feed these young (Kussman 1977, Fraser 1981). Successful fledging, for purposes of these guidelines, is defined as the time at which the eaglet(s) has near fully developed primaries; is capable of strong, coordinated, independent flight; and would not glide to the ground if flushed.

Care must be taken to confirm that any premature fledging is, in fact, human related, since premature fledging is a common occurrence that may be independent of human activity.

#### **D. Reporting Requirements:**

The monitor will send monitoring reports by facsimile or e-mail to the USFWS (appropriate Field Office) and the FWC (Endangered Species Coordinator, Tallahassee) on a **monthly** basis when construction is occurring within 1,500 feet of the nest tree and during the nesting season. The monitor has the obligation to immediately report any suspension of work activities and/or any documented abnormal behavior, as defined in Section C above, to the USFWS and FWC and the developer/home builder. The USFWS and FWC will coordinate a review of the reported behavior and circumstances associated with any suspension of work activities to make a verbal determination whether construction should resume or be modified, or if monitoring frequency should be increased, followed up by a written recommendation.

## E. Literature Cited:

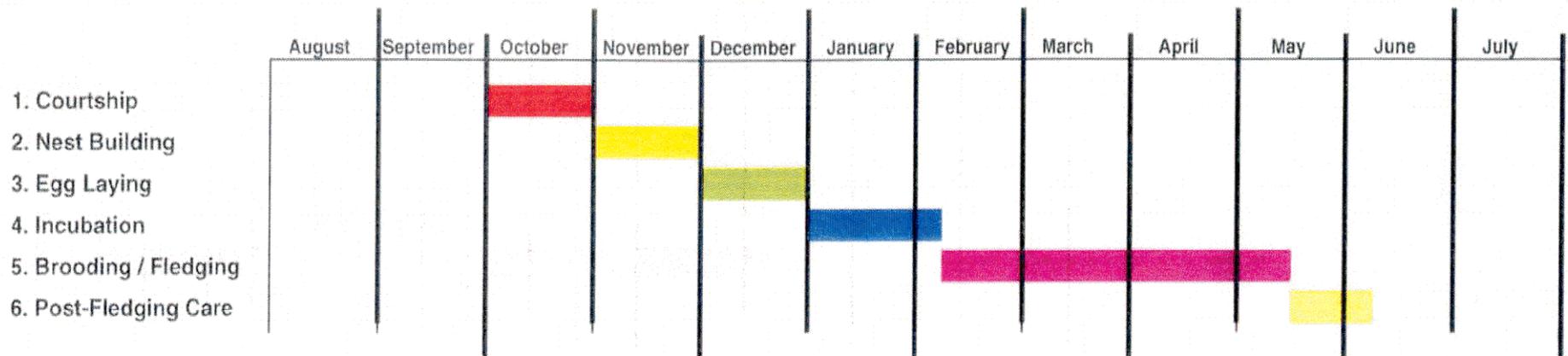
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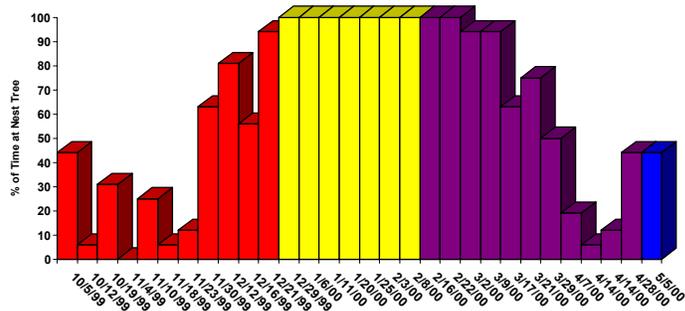
# Nesting Chronology of Bald Eagles in Florida (typical)

Figure 2



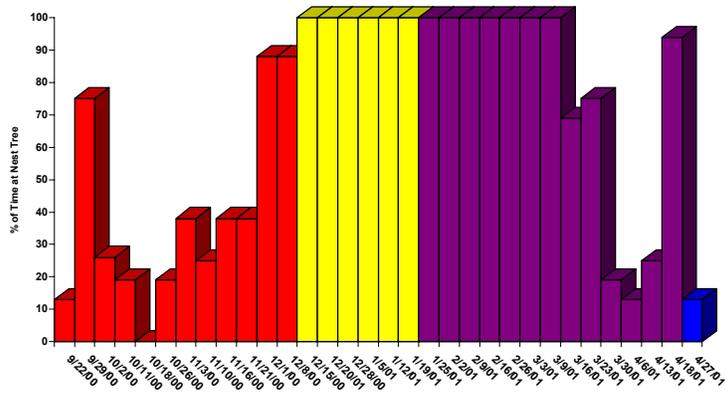
**Figure 3: NEST ATTENDANCE BY AT LEAST ONE ADULT EAGLE DURING 15-MINUTE INCREMENTS OF 4-HOUR OBSERVATIONAL PERIODS**

1999 - 2000 NESTING SEASON		WITHIN 750' PRIMARY ZONE	WITHIN 1500' SECONDARY ZONE
EXISTING HOMES		0	8
HOMES UNDER CONSTRUCTION DURING NESTING SEASON		0	26



**2000 - 2001 NESTING SEASON**

2000 - 2001 NESTING SEASON		WITHIN 750' PRIMARY ZONE	WITHIN 1500' SECONDARY ZONE
EXISTING HOMES		0	34
HOMES UNDER CONSTRUCTION DURING NESTING SEASON		0	8



**2001 - 2002 NESTING SEASON**

2001 - 2002 NESTING SEASON		WITHIN 750' PRIMARY ZONE	WITHIN 1500' SECONDARY ZONE
EXISTING HOMES		0	42
HOMES UNDER CONSTRUCTION DURING NESTING SEASON		17	61

