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OBSERVATIONS OF NESTING SHORT-TAILED HAWKS (*BUTEO BRACHYURUS*) IN CENTRAL FLORIDA

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Abstract.—The Short-tailed Hawk (*Buteo brachyurus*) is one of the least understood birds in Florida. With fewer than 200 breeding pairs in the state, little is known about their nesting ecology. We provide a summary of observations of a pair nesting in central Florida over three years. Previous reports suggest this species has low nesting success. However, we observed at least one fledgling every year. The hawks chose nest trees which were larger than a random selection of trees, suggesting that nest site selection of large, mature trees is important to nest success. Short-tailed hawks were also sighted in central Florida earlier than previous reports which may signify a response to climate change.

The Short-tailed Hawk (*Buteo brachyurus)* is considered one of the rarest, least understood birds in North America. Its distribution is primarily tropical, with an isolated population of no more than 200 breeding pairs in Florida (Meyer 2005, but see Williams et al. 2007). The species breeds from north-central to south peninsular Florida and winters in south Florida. Fewer than 75 breeding season locations have been documented since 1951 (K. Meyer, pers. comm.; Meyer 2005; Millsap et al. 1996). Little information is available on nest site selection or egg and hatchling development.

Of 17 nests in central and south Florida described in detail prior to the present study, most were at 9-29 m height near the top or just below the crown of cypress (*Taxodium distichum*) or pine (*Pinus* sp.) trees (Ogden 1988, Miller and Meyer 2002). Nest sites were located in large patches of mature swamp forest (>400 ha; Miller and Meyer 2002).

Short-tailed hawks usually built a new nest each year, though they infrequently used nests from previous years. Incubation has been observed to be 32-39 days (Meyer 2004, Ogden 1988); however, developmental milestones were unknown. Nest success was low; approximately 41% of nests were successful in fledging at least one young (Meyer 2005). Here, we increase the state of knowledge and report on three years of observing a short-tailed hawk nest in central Florida.

METHODS

On 1 February 2005 we discovered one pair of dark-morph Short-tailed Hawks building a nest in a patch of cypress-loblolly bay (*Gordonia lasianthus*) wet forest on Walt Disney World's Wildlife Management and Conservation Area (WMCA). The WMCA is a 3380 ha network of protected wetland and upland areas in Orange and Osceola counties designed as a buffer area for Reedy Creek. In order to minimize disturbance of the pair, the nest was not revisited until 14 March during which a copulation event was observed. The nest site was subsequently revisited 17 times at irregular intervals for *ad hoc* observation through 28 July. In 2006, we returned to the nest site on 16 February and observed that hawks had returned to the same nest. The nest site was visited ten times approximately every two weeks until 28 August. In 2007, we returned to the nest site on 23 January. During this visit, one hawk was heard calling and another was observed perched approximately 50 m from the nest tree. On seven subsequent visits, hawks were never observed at the nest. On 2 April, the active nest was located approximately 180 m from the previous nest. This nest was visited 12 times until 23 July. All visits during the three nesting seasons occurred between 07:00-11:00 EST, with each observation lasting approximately two hours.

In order to increase the scope of our observations in 2007, on 14 May we installed a PicoCam Starlight Color Video camera and remote surveillance system (Sandpiper Technologies, Inc.) to record nest activity. The camera was mounted on a fallen log approximately 40 m from the nest tree. A field equipment container housed a video recorder (Sentinel MAGNUM 4100 Digital Video Recorder), modem (Sprint Raven EVDO V3215E), video server (AXIS 243sa), methanol fuel cell (25W EFOY), methanol fuel cartridge, and a rechargeable 12-volt marine battery. Details on the surveillance system are available on request.

We had to address several technical challenges and lost recording time after rodents chewed through several sections of cable. We replaced the cable, covered it with rodent-proof conduit, and then raised it off the ground to protect it. Our camera position was too far from the second nest to zoom in close enough for detail and backlighting compromised exposure. Still, we were able to record two sequences of continuous real-time footage in May 2007 lasting 12 and 36 hours, in which we could see hawks flying into and out of the nest and could detect young in the nest. Due to the placement of the camera and our observers, we could not be sure when eggs hatched. Therefore, all references to hatchling age are estimated from the first sighting.

Land cover for the WMCA and Walt Disney World property was digitized from a 1998 aerial photo at 30 m resolution. We reclassified the map into seven classes (cypress/bay wet forest, pine/mixed forest, marsh/shrub wetland, water, low intensity use/disturbed land, roads/clearings, and urban) and created a 2.5 km buffer around the 2007 nest site. This distance is considered the maximum foraging area for the species, as determined by direct observation of unmarked birds (Ogden 1975, 1988). We used Arcview 3.2 (ESRI, Redlands, CA) to measure the proportion of each landcover class within this buffer. We estimated nest height for both nests using a laser rangefinder. We collected

the following vegetation data for the nest tree and 5 randomly selected overstory trees within a 0.4-ha circular plot (*sensu* Meyer 2005): tree height, dbh, vertical spread of crown, and basal area. We visually estimated canopy cover from the base of the nest tree in November 2007; this prevented disturbance of the nest since the hawks had not yet arrived for the season, but was late enough in the year to give an accurate measure of canopy cover when the hawks arrived to select nest sites in January/February. We also estimated canopy cover within a 0.4-ha circular plot as the average of four measurements in each cardinal direction taken from the base of the nest tree.

RESULTS

The earliest sighting of short-tailed hawks at our site was 23 January and the latest was 25 July. We assume that the same pair has nested in the WMCA in each of the three years. However, turnover of at least one member of the pair has been reported based on observations of radio-tagged individuals where old and new hawks were the same color morph (Meyer 2005). Two young fledged in 2005, one in 2006, and two in 2007. Observation dates of important milestones have been assembled into a chronology of nesting in this region (Fig. 1). Nest building was observed to occur in February in two years. Incubation posture was observed in March-April. We observed incubation posture for at least 41 days for clutches containing two eggs, which may be longer than the incubation time of a single egg due to asynchronous laying and, therefore, hatching. Nestlings were at least 26 days old when they began hopping around on support branches. At 30 days, they were taking short flights to other branches and neighboring trees. At 33 days, long flights (30-40 m) were observed. Full flight and soaring were observed at 43 days.

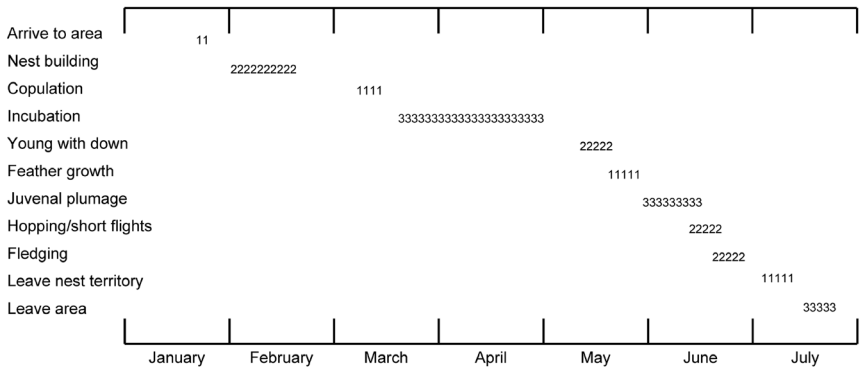

Figure 1. Short-tailed Hawk nest chronology based on whether the event was observed in 1, 2, or 3 years. Length of integer strings indicates the span of observation dates, and not necessarily the true limits of breeding stages.

In the 48 total hours of camera recording during the nestlings' first four weeks, they were left alone once, for 17 minutes. This represents less than 1% of the observation time. Adults other than the breeding pair also visited the nest occasionally. On 24 March, 2006, five adult birds were seen at or near the nest. And in 2007, our camera captured three adults at the nest with the two young on three separate occasions (14, 28, 29 May). Unfortunately, we were unable to observe whether these birds interacted with the young.

Both nests were in cypresses. The nest tree used in 2005-2006 was 468 m from the nearest patch edge (Fig. 2) and approximately 28 m high. The 2007 nest was about 21 m up in a 34.5 m-tall tree 580 m from the nearest patch edge. The nest tree was larger than other trees in the area (Table 1) and was in an area with greater canopy closure than in the surrounding circular plot (75 vs. 40.8%). The forest patch containing the nests was 210.6 ha. Land cover in a 2.5-km buffer surrounding the nests was dominated by forest (60.2%). Urban areas, roads and clearings covered 27.3% of the area. Canals, lakes and marsh covered 6.2%.

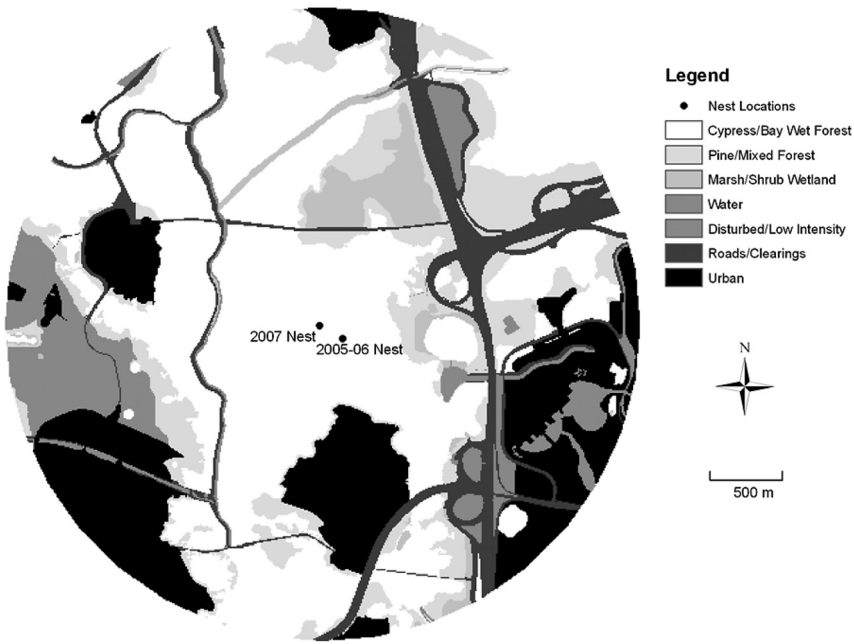

Figure 2. Land cover in a 2.5 km radius buffer surrounding a 2007 Short-tailed Hawk nest on Walt Disney World's Wildlife Management and Conservation Area, Orange County, Florida.

Table 1. Vegetation measurements of the 2007 Short-tailed Hawk nest tree and 5 random trees within a 0.4-ha circular plot.

Variable	Nest tree	Random overstory tree
Tree height (m)	34.5	15.2 ± 9.5
Dbh (cm)	70.4	56.4 ± 20.7
Crown height (m)	13.5	4.7 ± 4.0
Basal area (m^2)	1.4	0.5 ± 0.3

DISCUSSION

Whereas we documented Short-tailed Hawks at our study site in January, previous reports suggested that Short-tailed Hawks nesting north of Lake Okeechobee move northward from south Florida in February (Ogden 1974) and have been sighted in central Florida no earlier than March (Millsap et al. 1996). They return to south Florida in October. However, our last sighting was late July. It is possible that the birds remained in the area in August-September, but were not observed because they expanded their range once nesting was complete. Summer locations of radio-tagged breeding adults spanned an average area of 320 km^2, and up to 844 km^2 (K. Meyer, pers. comm.).

Meyer (2005) determined that only nine of 22 nests were successful in producing at least one fledgling. Low nest success was attributed to egg failure during incubation. Although we have documented only three nests in as many years, we have observed 100% nest success. The nest tree at our site was larger than the average of 20 nest trees measured by Meyer (2005). We cannot generalize from one tree, but perhaps, larger trees with taller crowns provide greater protection to the nest and increase the likelihood of success. However, if we have observed the same nesting pair in each year, the high rate of success may be an artifact of these individuals. Nest success may be due to experience of the hawks, habitat quality, or chance (Meyer 2005), and further study is required to reveal these relationships.

Our comparison of the nest tree to random trees within a circular plot concurs with the findings of Meyer (2005); short-tailed hawks choose trees that are among the largest in the stand. The two nest trees we observed were near the center of a relatively small patch, when compared to previous reports (Miller and Meyer 2002). However, the majority of the landscape is forested and likely provides ample resources. Ogden (1974, 1988) speculated that a radius of 2.5 km likely covers the foraging area. We saw hawks during the nesting stage at locations 1.8 and 2.5 km away from the nest. However, these were chance sightings and it is important to recognize that these distances do not represent estimates of range size. Indeed, the average area (320 km^2) observed by K. Meyer represents a radius of more than 10 km. Fur-

thermore, home range size likely varies with resource availability across the state and between years.

We cannot be certain that our distant sightings were hawks from the breeding pair. We observed more than two adults at the nest in two years and suspect that these were young of the previous year that returned to the area. Unfortunately, we cannot confirm this as we were unable to see any differences in plumage. Many individuals will not reproduce until three or four years of age. Furthermore, summer ranges of radio-tagged one- and two-year-old non-breeding hawks included natal territories (Meyer 2005). Cooperative breeding is rare in raptors (James and Oliphant 1986) and we did not observe any helping behavior. Yearlings may stay in the area for foraging opportunities and may be forced to find their own territory when new young fledge due to increased competition.

Williams et al. (2007) attribute the northward expansion of short-tailed hawks into the southwestern United States to their ability to tolerate modified habitats and/or to an apparent response to climate change. Note that a tolerance for degraded habitat should not be confused with a preference for such habitat (Williams et al. 2007). Within Florida, hawks appear to nest in dense, mature stands of wetland forest (Meyer 2005) and maximize the distance to urban areas. Although a quarter of the area in our buffer zone was urbanized, these were areas of limited use or concentrated human activity, e.g. a hotel and horticultural facility. Thus, we have not observed such tolerance to otherwise altered habitat. We have observed hawks returning to central Florida earlier than previously reported. These observations lend support to the suggestion that this species, like many others (Cotton 2003) may indeed, be responding to climate change.

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