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CHARACTERISTICS OF NEST SITES USED BY CRESTED CARACARAS IN SOUTH-CENTRAL FLORIDA

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Abstract.—Understanding habitat needs of nesting Crested Caracaras (*Caracara cheriway*) requires knowledge about nest trees and nest sites, particularly when surveying areas targeted for conversion projects and planning for habitat restoration. Here, I describe nest sites of breeding pairs of caracaras from 76 different breeding areas in south-central Florida. Most nest sites found were on privately owned cattle ranches. Most nests were built in cabbage palms, and nest trees typically occurred in short-stature pasture or grassland habitat. Nests were generally oriented in a south-southeast direction within the nest tree, and all nest sites had cover (vegetation suitable to hide a fledgling on the ground) within 100 m of the nest tree. Differences in vegetation structure on private and public lands may result from differences in management activities conducted on these lands. Further study to understand how these structural differences influence selection of a nest site by breeding caracaras, their nesting success, and post-fledgling survival, is recommended.

Florida's population of the Crested Caracara (*Caracara cheriway*) occurs in the prairies and grasslands of the south-central peninsula. Believed to be isolated and relatively small, this population is listed as Threatened by both the U.S. Fish and Wildlife Service (USFWS 1987) and the state of Florida (Logan 1997). Historically recorded in prairie ecosystems (Scott 1892, Nicholson 1929, Bent 1938), caracaras are now primarily associated with privately owned cattle ranches (Morrison and Humphrey 2001), although some nesting pairs persist on publicly owned lands such as floodplains along the Kissimmee River owned by the South Florida Water Management District (SFWMD), Avon Park Air Force Range, and the Kissimmee Prairie Preserve State Park.

Over the past decade, conversion of pasture and grassland habitats to urban development in this region has accelerated. More recently, water-holding areas are being constructed in conjunction with the Comprehensive Everglades Restoration Plan (CERP) in pasture and grassland habitats within the Kissimmee River basin and on other SFWMD lands. These conversions have resulted in loss of caracara nest sites and nesting habitat across the region. Availability of suitable nest sites may be a critical factor influencing the distribution and persistence of caracaras in Florida. Permitting for conversion projects increasingly requires information about potential effects of projects on this species. To aid biologists in these evaluations and when planning for habitat restoration, information about nest site characteristics is necessary. In this paper, I describe nest sites used by breeding caracaras in south-central Florida including the nest tree and surrounding habitat.

Study Area and Methods

I characterized the nest tree and nest site at 87 active Crested Caracara nests in south central Florida found during 1994-2000 (Morrison and Humphrey 2001), defining active nests as those in which eggs were laid. These nest sites represented 76 different breeding areas within Highlands, Glades, DeSoto, Osceola, Okeechobee, Indian River and Polk counties. Much of this region is characterized by large open expanses of grasslands dotted with numerous shallow ponds, wetlands, and marshes and scattered or small clumps to large hammocks of live oaks (*Quercus virginiana*), cabbage palms (*Sabal palmetto*), pine (*Pinus* spp.), and cypress (*Taxodium* spp.). Principal land uses on private lands include cattle grazing and citrus, sugar cane, and other agricultural production. Lands in state and federal ownership are managed primarily as natural areas (no agricultural production and limited livestock grazing) to support native plant and animal communities.

Seventy-five sites described in this study were on privately owned land, mostly cattle ranches, and 12 were on publicly owned land (Morrison and Humphrey 2001). Caracaras are very site faithful, often using the same nest tree or alternate trees within the same general area among years (distance between alternate nest trees: mean = 0.7 ± 0.1 km, range 0.02-1.6 km). For pairs that used alternate nest trees (n = 55, 72%), I included alternate nest trees in data analysis only if they were at least 200 m apart (n = 11) to avoid duplication in measurements of ground vegetation and shrub cover within 100 m of each nest tree.

For each nest tree, I recorded tree species, tree height, nest height, and whether it was a single tree, in a group of 2-3 trees, 4-5 trees, 6-10 trees, or >10 trees. I measured the angle of nest orientation within the nest tree as the deviation from north around the central vertical axis of the trunk. Because fledgling caracaras spend much time on the ground (J. Morrison, unpubl. data), I also measured distance from each nest tree to the nearest cover and cover height. I defined cover as any vegetation ≥0.5 m in height that would be sufficient to hide a fledgling caracara on the ground, assuming the presence of cover around a nest tree is essential in minimizing exposure of fledglings to predators; for example, eagles, owls, foxes, coyotes, bobcats, and domestic dogs or cats.

To characterize the types and height of vegetation throughout the nest stand at each site, I delineated a 100 m transect extending out in each of the 4 cardinal directions from the nest tree. Then, at 2 m and 10 m from the nest tree and at every subsequent 10 m along each transect out to 100 m, I recorded the height of the herbaceous (grass/forb) layer and height of shrubs. I also identified species and recorded the heights of 10 other

randomly selected trees in the nest stand (within 100 m of the nest tree) at sites where the nest tree was in a group of at least 10 trees. Results are expressed as (mean ± SE) unless otherwise indicated.

RESULTS

Most (97%) caracara nests were in cabbage palms (n = 84), although I recorded one nest in a cypress (Morrison et al. 1997), one in oak, and one in eastern red-cedar (*Juniperus virginiana*). Mean nest tree height was 7.5 m (range 3.5-14.0 m, SE = 0.3 m, n = 87). Nest trees ranged from single trees to trees within groups of 2-10 or more (Fig. 1), although nest trees in stands containing >10 trees (n = 26) were generally taller (8.3 ± 0.5 m) than other trees in the stand (7.0 ± 0.4 m, one-tailed test, t = 8.20, $P < 0.01$, n = 10 other trees measured in each nest stand). The ratio of nest height to nest tree height averaged 0.9 (n = 87). The orientation of caracara nests in nest trees differed significantly from random with most nests facing in a south-southeast direction (mean angle of nest orientation = 164.4°, angular dispersion = 47.8, r = 0.7, Rayleigh test, $P < 0.01$).

Seventy-five percent of nests had vegetation qualifying as cover within 25 m of the nest tree (Fig. 2), and all nests had vegetation that qualified as cover within 100 m of the nest tree. Common species identified as cover included saw palmetto (*Serenoa repens*), Brazilian pepper (*Schinus terebinthifolius*), wax myrtle (*Myrica cerifera*), and St. John's wort (*Hypericum perforatum*). Cover height in all nest stands

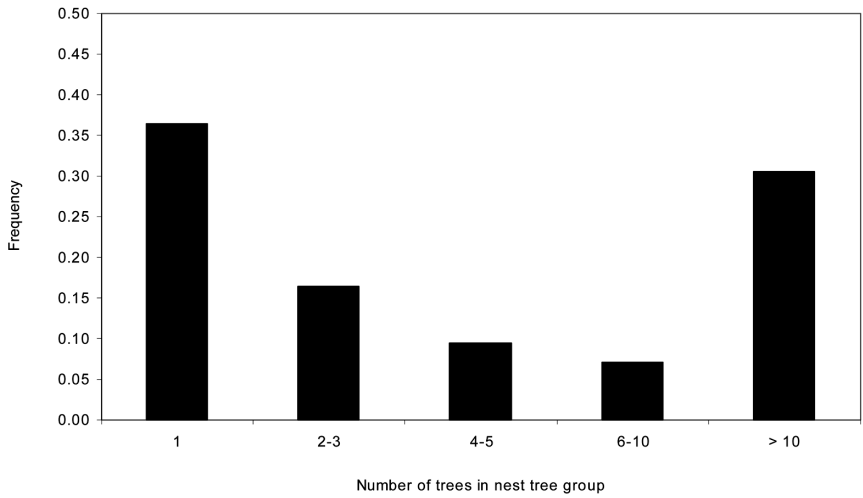

Figure 1. Frequency distribution of the number of trees in the nest tree group for Crested Caracara nests in south-central Florida, 1994-1996. n = 87 nests.

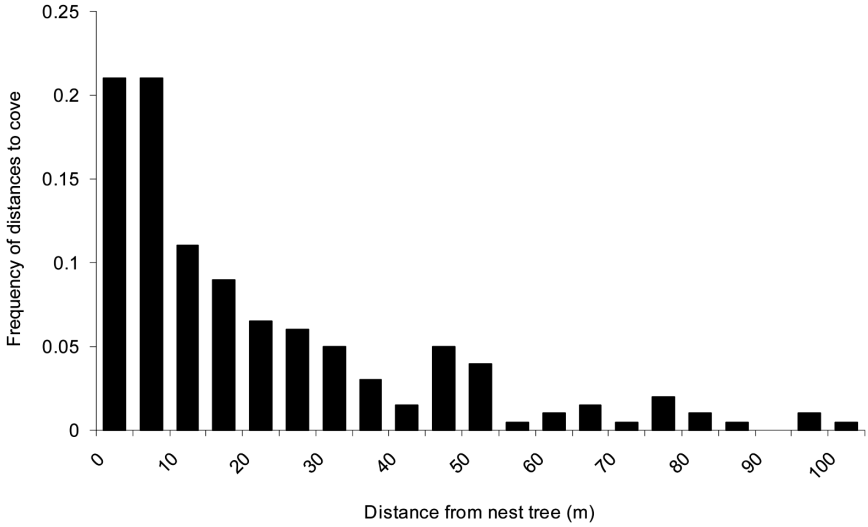

Figure 2. Frequency distribution of distance to cover from the nest tree at Crested Caracara nests in south-central Florida, 1994-1996. *n* = 87 nests.

ranged from 0.5 to 7.0 m (1.6 ± 0.1 m), although heights of vegetation qualifying as cover did not differ among nest sites on public lands and at nest sites on private lands (t = -1.61, P = 0.11).

Within 100 m of the nest tree, grasses and forbs were shorter at nest sites on private lands (0.2 ± 0.0 m, n = 75) than at nest sites on public lands (0.3 ± 0.0 m, n = 12, one-tailed test, t = -11.55, P = 0.00, Fig. 3). More shrubs were recorded along the 4 transects at nest sites on public lands (39 ± 4.4 shrubs per site) than at nest sites on private lands (12 ± 2.7 shrubs per site, one-tailed test, t = -5.26, P < 0.01). On average, shrubs were taller at nest sites on public lands (1.4 ± 0.4 m, n = 12) than at nest sites on private lands (1.1 ± 0.6 m, n = 75, one-tailed test, t = -1.82, P = 0.04, Fig. 4). I found no difference in the number of trees recorded along the 4 transects at nest sites on public lands (30 ± 4.7 trees per site) and at nest sites on private lands (31.5 ± 7.2 trees per site, one-tailed test, t = 0.17, P = 0.87).

DISCUSSION

Raptor nest sites are typically characterized by structures that provide sufficient nest support and protection from the elements and predators and contain suitable foraging sites and adequate area for the adults and young (Titus and Mosher 1987, Speiser et al. 1998). Site location and habitat structure may be more important than tree species composition to breeding raptors (Bednarz and Dinsmore 1982).

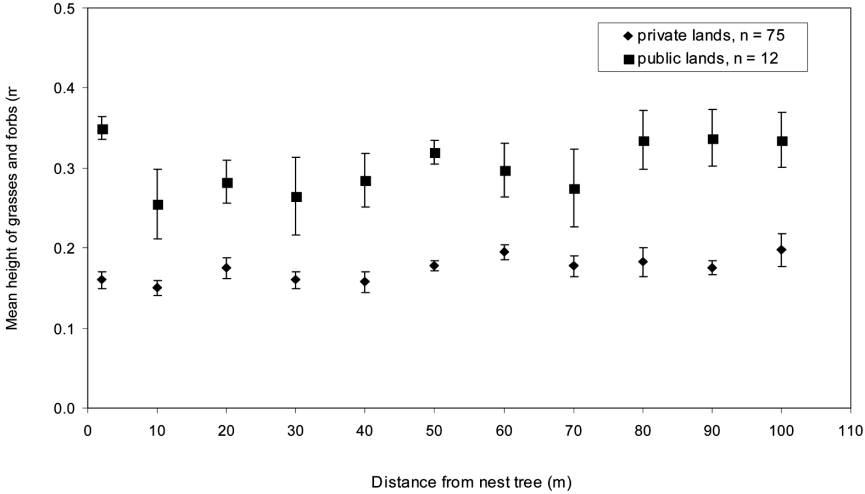

Figure 3. Mean ground cover height within 100 m of Crested Caracara nests on public and private lands in south-central Florida, 1994-1996. *n* = 87 nests.

Throughout their respective ranges, the Crested Caracara and its southern congener, *Caracara plancus*, have been reported nesting in a variety of tree and shrub species, including mesquite (*Prosopis articulata*), elm (*Ulmus* sp.), cardón (*Pachycereus pringlei*), yucca (*Yucca valida*), palo verde (*Cercidium microphyllum*), palo fierro (*Olneya tesota*), palm (*Washingtonia robusta*), McCartney rose (*Rosa bracteata*), and yaupon (*Ilex vomitoria*) (Rivera-Rodríguez and Rodríguez-Estrella 1993, Travaini et al. 1994, Dickinson and Arnold 1996, Goldstein 2000). Among the sites, however, caracara nests share the following: (1) nest support structures typically are isolated and are the tallest structures in the immediate area, and (2) the area around the nest support structure is generally open, for example prairie, pasture, or grassland. Rivera-Rodríguez and Rodríguez-Estrella (1993) suggested that the caracaras' choice of cardóns in the Cape region of Baja California, Mexico may permit construction of bigger and longer-lasting nests in habitat with little tall vegetation. Also commonly reported among these studies is that the canopy of the nest support structure is thick around the nest so the nest is rarely visible from a distance.

I found similar characteristics associated with caracara nest sites in south-central Florida; these raptors nested in isolated or small groups of trees generally surrounded by open pasture or grassland, and habitats on private lands where most nest sites were found contained few shrubs. The overwhelming use of cabbage palms by nesting caracaras may reflect this tree's abundance in the landscape or its suitability as a support structure for the caracara's bulky yet somewhat

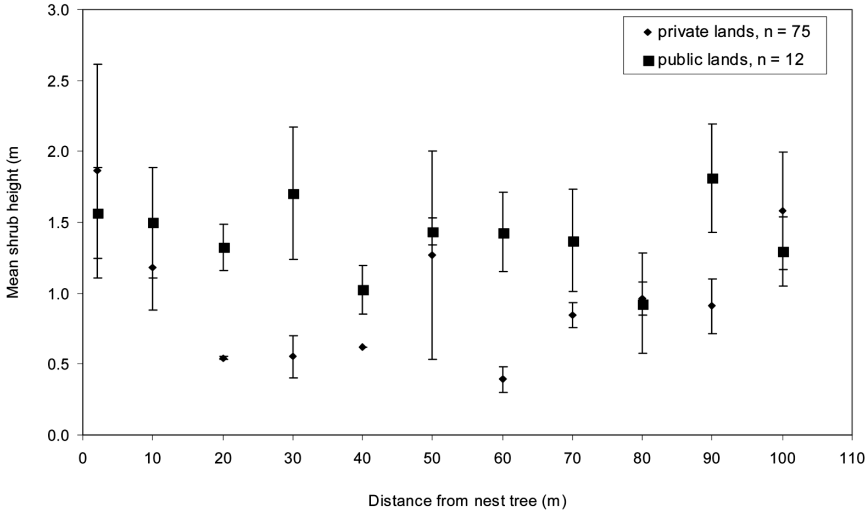

Figure 4. Mean height of shrubs within 100 m of Crested Caracara nests on public and private lands in south-central Florida, 1994-1996. *n* = 87 nests.

flimsy nests, which are typically constructed with thin, long, and dried pieces of vines, weed stalks, briars, twigs, and fruiting clusters of palm (Morrison 1996). Caracara nests were rarely visible in the crown of palms and generally could be seen only by standing directly at the nest tree and looking up into it. Such thick cover around the nest in the nest tree may provide protection for young from inclement weather, excessive insolation, and aerial nest predators such as crows (*Corvus* sp.). Because nests are so concealed, guidelines for nest searching recommend careful inspection of all palm trees at a suspected nest site (Morrison 2000). In addition, planting of palms may be appropriate at sites where habitat is restored with a goal of attracting nesting caracaras.

The finding of a strong orientation of caracara nests in Florida is similar to results reported by Travaini et al. (1994), who suggested that such orientation would protect nests from prevailing, cold winter winds. In Florida, the south-southeastern orientation of caracara nests may provide chicks with greater insolation on cold winter days and protection from prevailing winds that, during the caracara's winter breeding season (November through March, Morrison 1999) come primarily from the northwest.

Differences in the number of nest sites found on public and private lands may reflect selection by caracaras possibly associated with differences in vegetation structure on these two land ownership types. On privately owned cattle ranches, management activities routinely conducted include regular and intensive grazing, burning, mowing, and

plowing, all disturbance activities that reduce shrub cover in favor of grasses (Peroni and Abrahamson 1986). In contrast, reduced or absence of these activities on public lands managed primarily as natural areas may favor growth of shrubs and taller ground cover vegetation. As noted by Morrison and Humphrey (2001), breeding pairs of caracaras are rarely found on public lands, and those pairs attempted breeding during fewer years, initiated egg-laying later, and had lower nesting success than pairs nesting on private lands. While more shrubs at nest sites found on public lands should provide more cover to protect fledglings, more shrubs may also provide more cover for predators. Additionally, caracaras, unlike other raptors, are quite terrestrial and spend much of their foraging time walking about on the ground, thus may favor short ground vegetation as it facilitates foraging or improves their ability to scan for predators. Further study is needed to improve our understanding of how vegetation structural differences on private and public lands may influence selection of a nest site by breeding caracaras, their nesting success, and post-fledgling survival.

Caracaras' selection of nest sites also may vary depending on exposure to humans. I found some pairs nesting close to houses or barns and near roads. Response to habitat conversion within a breeding area and near an active nest may vary among pairs, perhaps according to their prior exposure to human activity (Knight 1984). As suitable nesting habitat continues to be lost to development, displaced breeding pairs of caracaras will be forced to seek other nest sites. While some pairs nest successfully quite close to human activity, recent reports of what seem to be atypical nest sites, for example on a power pole in a sugar cane field (J. Layne, pers. comm.) and near commercial buildings (T. Dean, pers. comm.) may be a consequence of pairs relocating after loss of suitable habitat in parts of the breeding range. Such atypical nests should be monitored to determine breeding success. While other studies have suggested that caracaras can adapt to human activities and moderate habitat changes (Rodríguez-Estrella 1996, pers. obs.), range-wide population declines in Florida are likely to result if continued loss of nest sites occurs.

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