

# The Crested Caracara in the Changing Grasslands of Florida

Joan L. Morrison<sup>1</sup>

Department of Wildlife Ecology and Conservation  
Box 110430, University of Florida, Gainesville, FL 32611-0430

## ABSTRACT

Although the Crested Caracara is recognized as a flagship species for Florida's dry prairie ecosystem, relationships between the species and these habitats are not well understood. Historic records of the caracara in Florida are primarily anecdotal, and historic patterns of abundance, distribution of nest sites, and habitat use by caracaras throughout their Florida range are not known. New information acquired over the past decade about the caracara's distribution and habitat associations suggest that although nest sites can occasionally be found in remaining native prairie, most breeding areas now occur in "improved" pastures on privately-owned cattle ranches. Although caracaras appear to have been able to persist through this conversion of the native land cover, the present trend of ranch conversion to urban development may now be the greatest single threat to caracaras. Thus, high priority must be placed on forging partnerships among private and public landowners and conservation biologists to seek workable conservation alternatives across both natural and managed landscapes. Further research needs include determining exactly which management activities favor or disfavor caracaras living on ranchlands or prairie, finding nest sites in areas where gaps in our understanding of the species' current distribution remain, and obtaining a better knowledge of the caracara's ecology at remaining sites.

## INTRODUCTION

The northern Crested Caracara (*Caracara cheriway*) is a unique raptor/scavenger in the Falconidae family. It is a resident, diurnal, and non-migratory species that occurs throughout much of Central and northern South America but has only a limited range in the southwestern U.S. and Florida. In Florida, this species occurs as an apparently isolated population in the south-central peninsula. Historically, the caracaras' distribution in Florida conformed closely to the original location of major prairie ecosystems in this region (Davis 1967) although knowledge about the species' historic range or habitat associations is based primarily on anecdotal accounts.

Most early accounts offer little information about habitats where these raptors were observed. Typically, these accounts focus instead on the species' unusual appearance or behavior when in association with other scavengers at carcasses. In the first description of the species at a site near St. Augustine where the type specimen was taken, Audubon (1840) does not mention the habitat where he first saw the bird but did eventually note that it was feeding in "open savanna." Subsequent reports of the species in Florida over the next 100 years consistently inferred its close association with prairie habitats and suggested that it occupied a larger range in Florida than it does currently, but few details were given. Pairs of caracaras were reported at Enterprise, just north of Lake Monroe in Volusia county and at Indian River City, Brevard county (Bryant 1859) and near Ft. Myers in Lee county (Phelps 1912). Scott (1892) reports the species as "quite common" in the upper part of the Caloosahatchee River and in the large prairie north of the river near Fort

Thompson. Nicholson (1929) describes the caracara's distribution as "the prairie region close to the St. Johns River just west of Indian River City south to the prairie region west of Fellsmere, and as far north as Canoe Creek, Osceola county." He indicated caracaras "... are also found on the west side of the Kissimmee River on the vast Arcadia prairie and southward into Collier County, which is the most southern range of species." Nicholson (1929) further describes the caracara: "It loves to hunt its prey on windswept prairies." Bent (1937) reports that the caracara's "center of abundance seems to be on the great Kissimmee prairie north of Lake Okeechobee but it may be found anywhere that similar prairies exist. It is not a woodland bird, is seldom seen in the pines and still more rarely in the cypress country." Howell (1932) describes the caracara as "essentially a bird of open country and is found on prairies and borders of the everglades," and as a species "most numerous on the Kissimmee prairie where it nests commonly." He reports numerous records including Lake Kissimmee, Lake Istokpoga, Lake Flirt (Glades County), Manatee River, Kissimmee River, Fort Pierce, Deerfield prairie (12 miles west of Malabar, Brevard county), and Everglade, in Collier County. Kuerzi (1938) reports seeing as many as 50 birds per day in February between Okeechobee and Basinger; another center of abundance was noted as Myakka River State Park in Sarasota County (Sprunt 1954).

Collectively, these historic accounts, while not providing a wealth of information on the caracara's habitat associations, are consistent in reporting the species from prairie-type habitats in Okeechobee, Osceola, Highlands, Glades, Polk, Indian River, St. Lucie, Hardee, Desoto, and Martin counties and from the St. Johns River marshes in Brevard county. Shriver and Vickery (1999) estimated

<sup>1</sup>Present address: Department of Biology, Trinity College, 300 Summit St., Hartford, CT 06106-3100; e-mail: joan.morrison@trincoll.edu.

that 88% of the dry prairie habitat was converted to other land uses between 1965-1995, raising concern about core caracara habitat. Cattle ranching remains the dominant land use on the former prairie acres, which now are mostly “improved” pastures. These changes raise concern regarding the status of Florida’s caracara population. Based on information obtained from road surveys conducted in the 1970s and late 1980s (Heinzmann 1970, Millsap et al. 1990, Layne 1996), this population was believed to be in a long-term decline and was listed as federally Threatened in 1987 (U.S. Fish and Wildlife Service 1987). The caracara in Florida has been little studied until recently; thus, its relationship to native prairie and to managed pasture habitats is not well understood. The objectives of this paper are (1) to describe the species’ current distribution and (2) to evaluate habitat selection by breeding pairs of caracaras with regards to use of native and altered habitats in the current landscape of south-central Florida.

## METHODS

In 1994, in an effort to evaluate the current status and reproductive ecology of Florida’s caracara population, my assistants and I began searching for nest sites throughout south-central Florida. We visited areas where breeding pairs had been recorded previously (J. Layne, unpubl. data) and searched areas of grassland and prairie habitat. We also found many nest sites opportunistically while driving along roads and recorded sites reported by a broad network of collaborators throughout south-central Florida. Over the period 1994-2004, we recorded 103 nest sites within an area that includes northern Brevard, southern Osceola and Polk counties, western Indian River, St. Lucie, and Martin counties, eastern Hardee and Manatee counties, northern Collier and Hendry counties, and most of Okeechobee, Highlands, Desoto, and Glades counties (Fig. 1).

Johnson (1980) describes second-order selection as an individual’s selection of a home range or breeding area within the geographic range of the species. I sought to evaluate second-order selection by breeding pairs of caracaras throughout south-central Florida by examining habitats at these nest sites. For this analysis, I defined a study area that ranged from the northern boundary of Brevard County to the southern boundary of Collier and Broward counties and between the two coasts. The study area totals approximately 479 km<sup>2</sup> in size (Fig. 1).

I created a habitat map for the study area using the vegetation and land cover map derived from 2003 Landsat Enhanced Thematic Mapper satellite imagery (Florida Fish and Wildlife Conservation Commission 2004). I condensed the original 40 vegetation cover classes into 13 classes (Table 1) and identified as no data 13 classes that occurred outside the study area or are not used by caracaras (i.e., open water). In this paper, “prairie” refers to the native dry prairie habitat, also commonly known as palmetto prairie. “Improved pasture” refers to planted tame grass pastures, most commonly bahia grass (*Paspalum notatum* Fluegge). Unimproved pasture refers to other grasslands that are partly converted from native cover, or ruderal sites such as along ditches and roads.

For this analysis I used only 97 nests because the nest trees and habitat at the remaining 6 nest sites had been

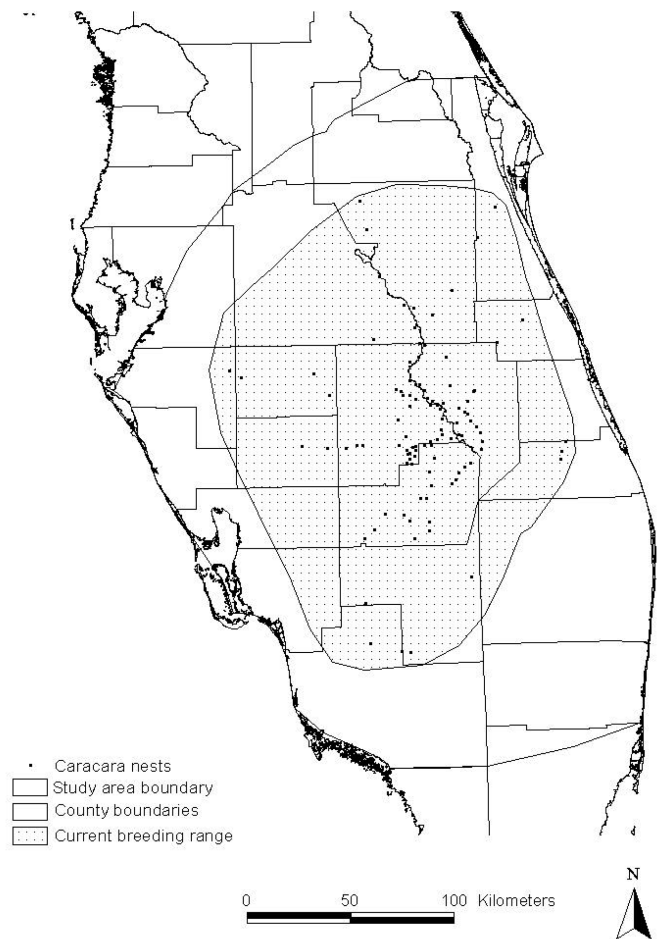


Figure 1. Northern Crested caracara nests ( $n = 103$ ) and estimated current distribution on 2003 land-use /land-cover map of south central Florida.

lost by 2003, when the habitat map was constructed. The data layer of nest tree coordinates for the 97 sites and the habitat map were imported into GIS [ArcView v. 3.2a (ESRI 2004)] in grid-cell format using a cell resolution of 30 m. Then, using the GIS, I mapped areas of 1 km and 2 km radius centered on each of the 97 nest trees. Telemetry data on breeding adults obtained during 1994-1999 indicated that approximately 35% and 75% of locations were within 1 km and 2 km, respectively, of an active nest (J. Morrison, unpubl. data). Therefore, I assumed that these 1 km and 2 km radius areas (approximately 314 and 1256 ha, respectively) were good representations of habitats likely to be used by a breeding pair of caracaras and, as such, were indicative of a breeding pair’s selection of a nest site within the south-central Florida landscape.

I used compositional analysis (Aebischer et al. 1993) to compare the overall proportional habitat composition within these 1-km and the 2-km radius areas, separately, to the habitat composition within the entire study area. Univariate  $t$ -tests were used to evaluate pairwise differences among all habitats within these areas around nests. I performed compositional analysis using the Microsoft® Excel tool ComposAnalysis ver. 5.1 (Smith Ecology Ltd. 2004). The significance of Wilk’s lambda and  $t$ -values was determined by randomization with 1000 iterations (Aebischer et al. 1993, Manly 1997). A value of 0.001 was sub-

Table 1. Vegetation cover classes developed using the FWC vegetation and land cover map, 2003.

Habitat classification	Includes these original FWC vegetation cover classes
Improved pasture	improved pasture
Dry prairie	dry prairie
Grassland	grassland + unimproved pasture
Freshwater marsh	freshwater marsh
Mixed upland hardwoods	mixed hardwood pine forests + upland hardwood forest + hardwood-cabbage palm hammock
Pinelands	pinelands + mixed pine cypress
Shrub and brush land	shrub and brush land
Shrub swamp	cypress swamp + mixed hardwood swamp + bay swamp + shrub swamp
Scrub	sand hill + xeric oak scrub + sand pine scrub
Bare soil	extractive + bare soil/clear-cut
Citrus	citrus
Agriculture	sugar + row/fields crops + other agriculture
Urban	high impact + low impact urban

stituted for zero values in the matrix of “used” habitats, habitats within these 1-km and 2-km radius areas.

## RESULTS

Of the 103 nest sites found, only 3 were in prairie—these occurred at Three Lakes Wildlife Management Area (WMA) and in the Kissimmee Prairie Preserve State Park (KPPSP). Most nests found (76%) were in improved pasture and another 15% were in other grassland habitats, for example, unimproved pasture (Table 1).

Results of compositional analysis indicate that selection of nest sites by caracaras (second order selection) is non-random across south-central Florida. Overall habitat composition in the 1-km and 2-km radius areas around nest trees differed from habitat composition within the overall study area (Wilk’s lambda = 0.07,  $P < 0.01$ ,  $df = 12$ ; Wilk’s lambda = 0.06,  $P < 0.01$ ,  $df = 12$ ; respectively). Improved pasture occurred in greater proportions within both the 1-km and 2-km radius areas around nests than in the overall study area (Table 2) and occurred significantly more than all other habitats within these areas around nests (univariate t-tests,  $P < 0.01$ ).

Compositional analysis provides a ranking of habitats based on their relative occurrence within the “used” areas. For the 1-km radius areas, habitats were ranked as follows with high to low ranks going from left to right: improved pasture >>> dry prairie > freshwater marsh > mixed upland hardwoods >>> shrub swamp > shrub and brushland > grassland > pine > bare soil > urban >>> other agriculture >>> citrus > scrub. Habitats to the left occurred in greater proportions (thus are assumed to be of higher importance to caracaras) than those to the right. The >>> symbol indicates a significant difference at  $P = 0.05$  between 2 consecutively ranked habitats. Although prairie did not occur in greater proportion in 1-km radius areas around caracara nests compared to its proportional availability in the overall study area, it occurred significantly more than all other habitats ( $P < 0.01$ ) except improved pasture, mixed upland hardwoods, and

Table 2. Habitat proportions within 1 km and 2 km radius areas around active caracara nests ( $n = 97$ ) and within the overall study area (approximately 479 km<sup>2</sup>).

Habitat classification	Proportions		
	1 km radius areas (mean ± SE)	2 km radius areas (mean ± SE)	Study area
Improved pasture	47.85 ± 2.52	41.68 ± 2.14	15.01
Dry prairie	8.46 ± 1.04	9.49 ± 0.96	9.18
Grassland	3.91 ± 0.99	3.80 ± 0.73	1.37
Freshwater marsh	8.37 ± 0.83	9.12 ± 0.68	11.86
Mixed upland hardwoods	4.00 ± 0.50	4.06 ± 0.38	3.91
Pinelands	2.37 ± 0.31	3.36 ± 0.43	8.21
Shrub and brush land	0.96 ± 0.17	1.03 ± 0.12	1.57
Shrub swamp	4.97 ± 0.55	6.60 ± 0.61	13.37
Scrub	0.13 ± 0.09	0.16 ± 0.08	0.81
Bare soil	1.96 ± 0.49	2.02 ± 0.39	3.67
Citrus	3.48 ± 0.91	5.27 ± 0.92	7.39
Agriculture	9.36 ± 1.78	9.83 ± 1.67	8.32
Urban	3.81 ± 0.56	3.67 ± 0.62	15.32

freshwater marsh. For the 2-km radius areas, habitats were ranked similarly: improved pasture >>> dry prairie > freshwater marsh > grassland > mixed upland hardwoods >>> shrub and brushland > shrub swamp >>> pine > bare soil >>> urban >>> other agriculture > citrus >>> scrub.

## DISCUSSION

In comparing the geographic distribution of the 103 caracara nest sites we found with the historic distribution inferred from early records as noted above and later, from surveys conducted in the late 1970s Layne (1978), it seems the caracara’s overall range in Florida has not changed much during the past century. However, during that time much of the landscape within this distribution has changed from native prairie to improved and unimproved pasture. Current findings suggest that caracaras persist in this landscape, although most of the habitat they rely on is no longer prairie, but rather managed grazing lands of private cattle ranches.

Morrison and Humphrey (2001) examined habitat composition of home ranges of 25 breeding pairs of caracaras estimated with radio telemetry and found similar results. Improved pasture occurred in greater proportion than any other habitat within these home ranges; however, their sample represented only a small portion of the population. Habitat selection by raptors at nest sites is often evaluated by creating circular areas centered on nest trees (i.e., Moorman and Chapman 1996, Daw and DeStefano 2001). In south-central Florida, potential caracara nest trees are often clumped or even occur singly in open pastures. Although the home ranges used by Morrison and Humphrey (2001) may have provided a better representation of habitats regularly used by nesting caracaras than circles around nest trees, results of the current analysis for a much larger sample of nests further support the caracaras’ apparent selection of improved pasture when choosing nest sites in the current landscape.

Although vegetation communities differ greatly between native prairie and improved pastures, these ranch-

lands are structurally similar to the original prairie—wide expanses of open grasslands dotted with wetlands and marshes and scattered clumps of trees. Selection of nest sites in improved pastures may indicate response by caracaras to vegetation structure rather than to particular plant communities. Similarly, the prairie-like habitats of the St. Johns River region are not considered true dry prairie habitat, yet supported caracaras. The short grass typical of improved pastures may facilitate the caracara's foraging in these areas and provide less cover for terrestrial predators. Alternatively, improved pastures may provide a diversity of predictable food resources for caracaras owing to regular schedules of management activities related to the production of livestock.

Although caracaras appear to have been able to persist through conversion of the native land cover, their conservation presents other challenges, particularly since most ranchlands remain in private ownership. How could Alexander Sprunt have known that this unique Florida specialty would become threatened, when in 1954 he wrote:

The caracara is a definitely a valuable bird in the cattle regions of Florida because of its insect and small mammal preferences, to say nothing of its scavenger tendencies. Therefore, grasslands are benefited by its presence in the State. Its future would seem rather well assured because it frequents the type of country not likely to be given over to either real estate development or industry, i.e., the great cattle ranches of the Kissimmee Prairie. (Sprunt 1954)

Within the past decade, development patterns in the south-central Florida landscape have changed dramatically. Urban growth has sprawled inland along both coasts into areas formerly dominated by these great cattle ranches. Real estate developers are quickly acquiring what is left of these ranchlands, prices of these lands have skyrocketed, and new development seems to favor dispersed housing on large acreages rather than clumped housing associated with green space that could serve as conservation lands. Considering the caracara population presently appears to be below the recovery goal of 300 territories in Florida (USFWS 1999), the urbanization of ranch habitats might be the largest single conservation concern for the species at this time.

Of further concern for caracara conservation is the focus of management on ranches recently acquired by public agencies, which favors wetland restoration rather than maintaining improved pasture and other upland habitats. For example, the Comprehensive Everglades Restoration Plan (CERP, USACE 1999) envisioned construction of reservoirs covering about 9,000 ha and storm-water treatment areas (filter marshes) covering about

4,750 ha in the Lake Okeechobee watershed. The final designs are undetermined at this time, but such plans would convert large acreages of improved pasture and other uplands within much of the central core of the caracara's current Florida range to reservoirs and deep water marshes. Although the project might restore some upland/wetland mosaics in the region and, perhaps provide some suitable foraging habitat for caracaras, the projected widespread loss of upland habitats used by caracaras for nesting will not favor the population's long-term persistence and represents a contradictory outcome for a restoration project.

Although improved pastures do not benefit all species that historically used native prairies, cattle ranching may be a land use relatively compatible with the persistence of many animal species. Finding ways to sustain these ranches and new ways to forge partnerships among private and public landowners and conservation biologists are urgently needed steps towards seeking workable conservation alternatives in today's rapidly changing landscape. Although access to private lands remains a constraint when searching for caracara breeding areas, efforts should be made to find nest sites in areas where gaps in our understanding of the species' current distribution remain, for example the upper St. Johns River basin. Additional research needs include obtaining a better knowledge of the caracara's ecology at remaining prairie sites; for example, Three Lakes WMA and KPPSP. Loss of the regal caracara from Florida's rich biodiversity would be a sad loss indeed.

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