

# CRESTED CARACARA IN ARIZONA: BACKGROUND & RECENT EXPANSION

DOUG JENNESS, 4375 E. Rollins Rd., Tucson, AZ 85739, d\_jenness@hotmail.com

**ABSTRACT:** This paper reviews the research history on the Crested Caracara (*Caracara cheriway*) in Arizona and summarizes the current knowledge of caracara distribution, which shows that caracaras are expanding in the state. I show that part of this expansion is reflected by new field observations and data documenting nesting northeast of its previously known breeding territory, as well as the extent of nonbreeding caracaras to wander and socially forage in the state.

The Crested Caracara (*Caracara cheriway*; Fig 1), a unique member of the falconidae, is found in the southern United States, parts of Mexico and Central America, northern South America, and Cuba (Ferguson-Lees and Christie 2001). In the United States it breeds in central Florida, the southwestern corner of Louisiana, southern Texas, and southern Arizona (Morrison and Dwyer 2012, Wheeler 2003). Caracaras in Louisiana, Texas, and Arizona are contiguous with breeding populations in Mexico. The Florida population is isolated and has been classified as threatened by state and federal governments since 1987 (Morrison and Dwyer 2012).

In 1986, the Arizona Game and Fish Department (AZGFD) contracted Levy to conduct a "status survey" of the Crested Caracara in Arizona with funds from Section 6 of the Endangered Species Act (*vide* R. Glinski). This three-year study, conducted on the Tohono O'odham Nation, remains the principal source for our understanding of caracara breeding behavior in Arizona. The findings, submitted in a report to AZGFD (Levy 1988), were never published, although Levy included highlights in an article a decade later (Levy 1998). Although the Crested Caracara is nonmigratory and monogamous, and breeding adults remain on their nesting territory year-round (Morrison and Dwyer 2012), foraging slightly beyond it in the nonbreeding season (Morrison and Humphrey 2001), nonbreeding juveniles and subadults, as well as nonbreeding birds in adult plumage, may forage far from their natal territory (Morrison and Dwyer 2012). Little data on wandering individuals has been previously compiled in Arizona.



Figure 1: Adult Crested Caracara at Santa Cruz Flats, Pinal Co., Arizona, 29 November 2013. Photo by Muriel Neddermeyer

## METHODS

To evaluate the historical record, available records of Crested Caracara's breeding range and distribution in Arizona prior to 2000 were examined. This included data prepared by Levy (1988) of nesting distribution and a table consolidating all reported caracara sightings in the state between 1886 and 1988, and the findings of *Arizona Breeding Bird Atlas* (Atlas) surveys conducted 1993-2000 (Corman 2005), AZNMbirds listserv (2014), eBird (2012), Arizona Field

Ornithologists AZFO seasonal reports (2008-14), Santa Cruz Flats Annual Raptor Count (2006-15), Ganley (1997), and personal communications. To evaluate range expansion since 2000, I monitored reports of caracara sightings and nests since 2000 in the above listserv and eBird, reviewed the results of surveys conducted by the AZFO at Santa Cruz Flats (Jeness and Glinski 2013; Jenness and Glinski 2014), and drew on personal field observations, particularly at Santa Cruz Flats since 2003.

## RESULTS

### Historical Record, Nesting

Prior to 2000, the known breeding population of the Crested Caracara in Arizona was confined to the south-central part of the Tohono O'odham Nation about 80 km west of Tucson (Levy 1988, Corman 2005). It was part of a larger breeding range that included northern Sonora, Mexico (Fig. 2). Only two nests had been found in Arizona outside this area (Levy 1988). An estimated 25-30 pairs were nesting in the state prior to 2000 (Levy 1988), and the largest group of caracaras reported in the state was six (Monson and Philips 1981). No roosts had been reported.

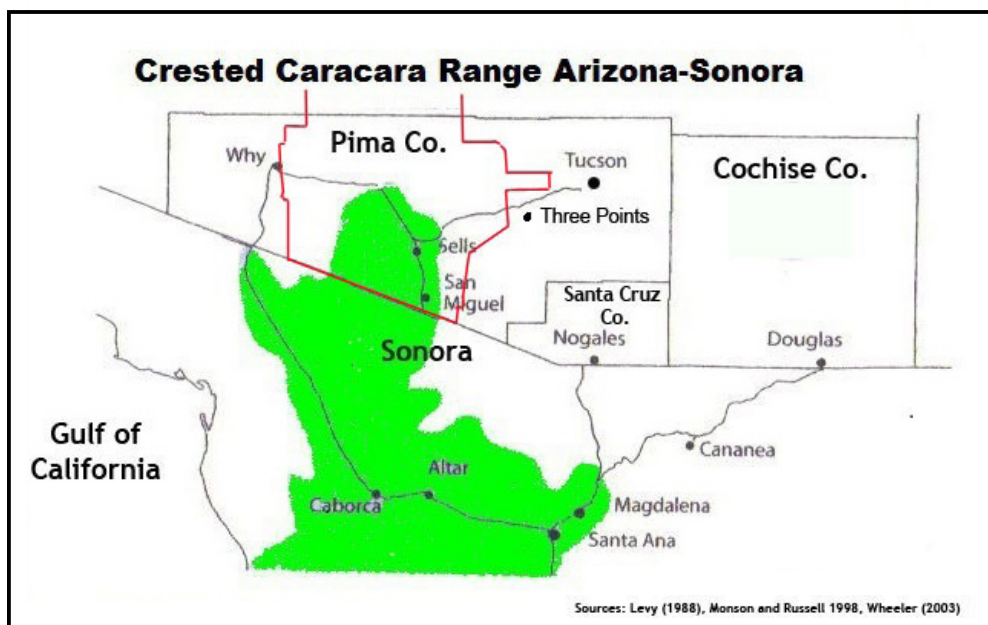


Figure 2: Arizona Crested Caracara population (green) is part of broader historic range that includes Sonora, Mexico. Current range extends farther north than this map shows. Tohono O'odham Nation indicated by red line. Sources: Levy (1988), Monson and Russell (1998), and Wheeler (2003).

Most of what is known about Crested Caracaras in Arizona before 2000 is from the last 40 years of the twentieth century. Knowledge before the 1960s is sparse and summarized here. Philips et al. (1964) suggested the species might have been more numerous in the nineteenth century but was in decline by the beginning of the twentieth century. They cited reports of caracaras in the Tucson area, ranging west to the lower Colorado River valley, and even wandering as far north as the Salt River in 1886. Two caracaras were reported in 1891 near Tucson with occasional observations near Oracle (Rhoads 1892). Based on this scant information, Levy questioned whether caracaras had been more common in the Tucson valley in earlier years. Specimens collected at Tucson in 1927-28 and Sahuarita in 1930 documented their presence, but none were collected in breeding seasons (Levy 1988). Three eggs collected in 1889, identified as caracara eggs and placed in the University of Arizona's bird collection, were later reexamined and revealed not to be caracaras' (Levy 1988). Naturalist expeditions on the Tohono O'odham Nation in the early twentieth century did not report caracaras (Levy 1988), and only one was reported there in the late 1930s (Monson 1942). Despite sporadic caracara sightings at the Organ Pipe National Monument adjacent to the southwest corner of the Nation, no nests were reported (Levy 1988).



Figure 3: First Crested Caracara nest documented in Arizona at Tohono O'odham Nation, 24 May 1960. Photo by John Levy

The first documented nests in Arizona were found on the Tohono O'odham Nation in 1960 (Levy 1961; Fig. 3). The two nests, about 48 km apart, were monitored through 1963 and produced eight fledglings during that time (Levy 1988). In 1964, Levy discovered three more nests; two on the Tohono O'odham Nation and one near Three Points in the Altar Valley about 50 km northeast of the Tohono O'odham nests and about 26 km southwest of Tucson (Levy 1988). These nests produced two birds that year. Additional nests on the Tohono O'odham Nation were found in 1976 ( $n = 2$ ), 1977 ( $n = 1$ ), and 1978 ( $n = 1$ ; Ellis et al. 1988). From 1986-88, Levy located 14 breeding pairs and 21 nests on the south-central section of the Tohono O'odham Nation. The nests produced 28 fledglings during the three-year study. None of these were nests studied in the 1960s. The area occupied by caracaras was bordered to the south by the Arizona-Sonora international boundary, to the east by the foothills of the Baboquivari Mountains and San Miguel, to the west at Ali Chuk (Menager's Dam), and to the north by Quijota, Sells, and Coyote Pass (Levy 1988). Another nest, attended by a crippled adult, was discovered in 1988 near Olsen Wash along AZ 79 about 65 km northeast of Tucson in Pinal County, but the nest was presumed not to have been used for the previous two years (Levy 1988).

Possible, probable, or confirmed Crested Caracara breeding was reported in 24 of 1834 26-km<sup>2</sup> Arizona Breeding Bird Atlas blocks surveyed on the Tohono O'odham Nation (Corman 2005). One occupied nest and several used nests were found 1997-99. In the 1990s, surveyors for the Atlas did not find any nests in three areas hypothesized by Levy or anywhere else in the state away from the Tohono O'odham Nation. Most of the likely breeding was in the area where Levy found nests, but adult birds were also observed in two locations farther to the north and northwest on the Nation suggesting that caracaras were extending their breeding territories (Corman 2005, Corman pers. comm.).

### Historical Record, Nonbreeding Wanderers

Levy didn't observe social foraging or communal roosts in Arizona, but he compiled a table of wandering Crested Caracara sightings within Arizona but outside the known breeding range at the time (Levy 1988). His compilation included 78 sightings between 1886 and May 1988. Wanderers were found in the southern two-thirds of the state. Of these reports, 67 were single birds, nine were two birds, one was six birds, and one did not report a count. Only a few reports indicated whether the sightings were of subadult or adult birds, so they offer little light on the proportion of birds by age. The report of six birds was from near Red Rock in November 1965 at the southeast corner of the Santa Cruz Flats. From the documented nests and other sightings of caracaras away from the Tohono O'odham Nation, Levy hypothesized nesting in the Altar Valley, the Santa Cruz River south of Tucson, and the Santa Cruz Flats to AZ 79 (Levy 1988; Fig. 4).

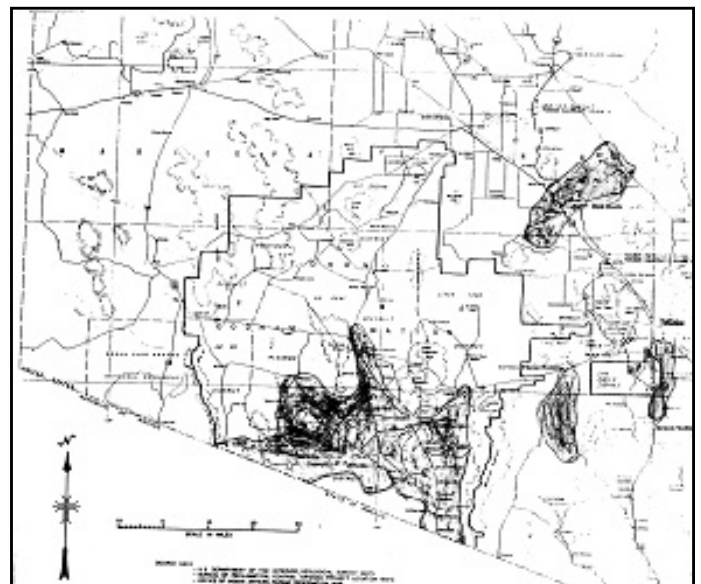


Figure 4: 1988 map prepared by S. Levy shows known caracara breeding area at Tohono O'odham Nation and three other possible breeding areas.

## Nesting expansion since 2000

Since 2000, eight Crested Caracara nests have been documented outside the Tohono O'odham Nation, six of which were in areas predicted by Levy (1988). Two nests were in the Altar Valley south of Three Points and east of the Baboquivari Mountains. One was discovered and photographed in 2007, when one chick fledged (pers. comm. J. Dawson; Fig. 5), but the nest subsequently disappeared. Another nest with adult caracaras present was discovered in 2012, 1.6 km east of the 2007 nest, which was possibly an alternate nest in the same nesting territory. Whether the nest produced any young is unknown. The adults were present again in 2013 and fledged at least one chick (J. Dawson pers. comm.). During the 2014 breeding season a single downy nestling was reported in May, but no activity was observed thereafter (pers. obs.) and fledging was not confirmed. In 2015, the nest was not occupied but an adult pair remained in the vicinity, possibly nesting in an alternative nest.



Figure 5: Caracara nest in Three Points area 10 June 2007 with single nestling. Photo by John Durham

Two more Crested Caracara nests were discovered in the Avra Valley, which is a northward extension of the Altar Valley. The first was reported April 2013 in the Ironwood Forest National Monument about 25 km west of Tucson (E. Hough pers. comm.). Both open-range cattle grazing and cultivated row crops are found in the Avra Valley; the nearest fields to the nest are about 8 km away. Incubation appeared to be underway by mid-May and a single downy nestling was observed at the end of June (B. Walsh pers. comm.), though fledging was not confirmed (pers. obs.). In 2014 and 2015 Great Horned Owls (*Bubo virginianus*) occupied the nest (pers. obs.). A second nest was discovered in March 2015 in a saguaro in the Tucson Mountain District of Saguaro NP. Consistent monitoring of the nest confirmed that two young fledged successfully (pers. comm. L. Norris).

Four more recent nests were discovered in Pinal County at the Santa Cruz Flats 50 km northwest of Tucson. Crested Caracara sightings from this area increased through the 2000s, including adults in the breeding season, suggesting that nesting may be occurring. Two one-day surveys conducted by the Arizona Field Ornithologists resulted in the discovery of an occupied nest in April 2014 (Jenness and Glinski 2014); two months later a second nest was discovered 4.8 km away (pers. obs.). The first nest was at least 1.2 m deep, indicating that it had been in use for a few years. Two chicks fledged from this nest in 2014, and the nest was occupied again in 2015 (pers. obs.), although apparently two nesting attempts in the spring and late summer failed. The second nest was occupied in 2014, but successful fledging was not confirmed, and it was unoccupied in 2015. A third nest was discovered 6.4 km from the second nest in December 2014 with two adult birds present, but the nest remained unoccupied through the 2015 breeding season. A fourth nest was discovered in the vicinity of the unoccupied second nest in May 2015 with two adult caracaras present.

## Expansion of nonbreeding wanderers

Crested Caracara sightings away from what was accepted as their traditional breeding range have increased to 798 since Levy prepared a table of 78 sightings between 1886 and 1988 (Table 1).

The greatest increase in reports and numbers of nonbreeding birds is from agricultural fields at the Santa Cruz Flats in Pinal County. The first report of six caracaras in 1965 was followed by a few reports of single birds in the 1980s and 1990s, with a substantial increase over the past decade. Groups of more than 20 have been reported beginning in 2007 and a high of 104 was reported feeding together in freshly disked cotton fields 24 January 2014. A total of 111 were seen that day throughout the Santa Cruz Flats (pers. obs.). Most of the reports are from October-May, with the greatest concentrations in November-February (Fig. 6). These large groups of caracaras consist of subadult birds, together with birds in breeding plumage.

**Table 1** Crested Caracara Sightings in Arizona 1886-2014

Location*	Number						Total
	1	2	3-5	6-20	>20	?	
Santa Cruz Flats	145	69	81	85	26	5	411
Santa Cruz R. (between Tucson & Nogales)	64	5					69
Altar Valley	41	10	2	1		2	56
Avra Valley	26	6	1			2	35
Hwy 79, Picacho Reservoir	36						36
Other parts of the state	176	13	1			1	191
<b>Total</b>	<b>488</b>	<b>103</b>	<b>85</b>	<b>86</b>	<b>26</b>	<b>10</b>	<b>798</b>

\*Sightings from south-central part of Tohono O'odham Nation not included. Sources Levy (1988). Jenness unpub.

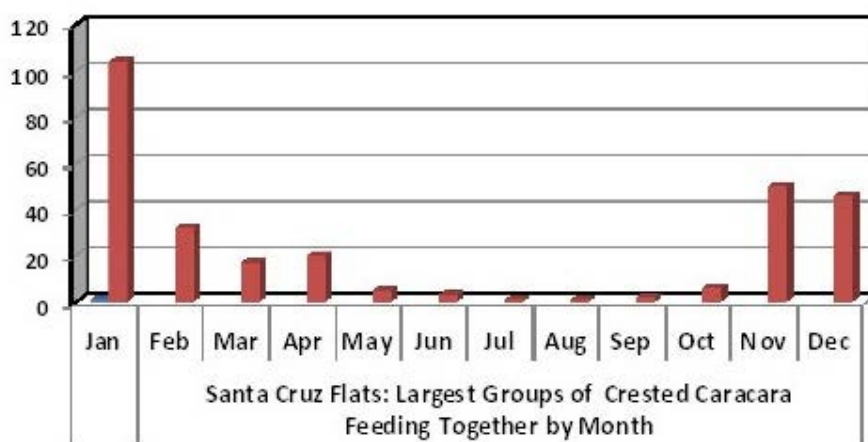


Figure 6: The highest number of caracaras reported feeding together at the same time by month in the Santa Cruz Flats.

## DISCUSSION

Results indicate that nesting Crested Caracaras and congregations of wandering nonbreeding birds are expanding north of the species' previously known range in Sonora, Mexico, and south-central Arizona. This expansion has implications for potential nesting habitat, foraging opportunities, and management.

### Nesting Habitat

In Arizona, the preferred nesting habitat for Crested Caracaras is Sonoran Desert scrub, which is marked by large columnar cacti, mesquite (*Prosopis spp.*), and palo verde (*Cercidium spp.*; Brown et al. 1980; Levy 1988). All but one nest found in the state was in the lower swirl of saguaro arms. The exception was a recent nest located on a cliff edge (*fide* J. Morrison). In adjacent Sonora, caracaras also use other columnar cacti, including hecho (*Pachycereus pecten*) and organ pipe cactus (*Stenocereus thurberi*) (Monson and Russell 1998). In Baja California Sur, Mexico, caracaras nest in several species of trees but prefer cardon (*Pachycereus pringlei*), a tall, branching columnar cactus similar to the saguaro (Rivera-Rodriguez and Rodriguez-Estrella 1998). Large cardons provide more shade than other desert nesting substrates, enable construction of large, long-lasting nests, and offer protection from climbing predators. These features appear to work in concert to increase productivity in cardon nests compared to nests in other substrates

nearby (Rivera-Rodriguez and Rodriguez-Estrella 1998). In Florida, which does not have desert habitat, caracaras favor cabbage palms (*Sabal palmetto*) for nesting (Morrison and Dwyer 2012). In Texas, caracaras use a variety of trees and shrubs, including oaks (*Quercus spp.*), elms (*Ulmus spp.*), and acacia (*Acacia spp.*) (Morrison and Dwyer 2012, Oberholser 1974). In Florida and Texas, caracaras have recently expanded nesting to anthropogenic structures (Dwyer and Dalla

**Table 2** Crested Caracara Nesting in Arizona

Breeding period	March-July
Incubation period	28-30 days
Number of eggs	Normally 2, sometimes 1 or 3
Time from hatching to fledging	5-6 weeks
Breeding age	3 years +
Double brooding	None recorded
Nest size	As high as 2.1 m, depending on how long in use
Height above ground	2.4-4.4 m
Elevation	Range, 525-915 m; mean 735 m; S-D=390
Parental care	<u>Both parents help with incubation, feeding</u>

Sources Levy (1988), Bent (1938), Morrison and Dwyer (2012)

Rosa 2015). In all habitats, caracaras, unlike other falconiforms, construct their own nests. They use fine twigs, grasses, and weeds rather than the thicker sticks utilized by ravens and buteos (Morrison and Dwyer 2012; Levy 1988).

Crested Caracara nests in Arizona (Table 2) are typically at least 8-16 km apart (Levy 1988); farther apart than in Florida where nests can be as near as 2 km (Morrison and Humphrey 2001). All eight of the nests reported away from Tohono O'odham lands since 2007 were on federal or state land, most with open-range cattle. The original northward movement of caracaras into Arizona from Sonora may have been due in part to the introduction of livestock into the Tohono O'odham Nation, the construction of stock ponds, and the practice of openly disposing of carcasses, creating a ready food source in addition to desert prey (Levy 1988). Similarly, nesting territories at the Santa Cruz Flats are located in desert scrub habitat with livestock grazing. However, they are also near cultivated row crops and irrigated livestock pastures, where nesting adults have been reported feeding (pers. obs.), consistent with habitat preferences of caracaras in Texas and Florida (Morrison and Humphrey 2001, Morrison and Dwyer 2012, Dwyer et al. 2013). The diet of nesting caracaras in Arizona has not been systematically studied. Levy (1988) often found skulls and crowns of horned lizards (*Phrynosoma spp.*) scattered on the ground around nests, indicating that this was a common source of food for nestlings (Levy 1988). Beneath a nest with an adult pair and one subadult bird, Levy collected 30 pellets that all contained mammal remains; 93% had fragments of arthropod exoskeletons, and 26% included scales of horned lizards (Levy 1988). I collected nine pellets and other remains around the Santa Cruz Flats nests following the 2014 breeding season. Of these, eight included mammal remains, six included bird remains, and six had evidence of invertebrates, but none showed evidence of horned lizards or other reptiles. Rodent incisors were found in one pellet and the horn of a Palo Verde beetle (*Derobrachus geminatus*) in another. Pieces of a raven-sized bird spine were found beneath both nests; from one nest a large bird femur-tibia was identified (pers. comm. J. Merems). Caracaras, broadly generalist foragers, may be colonizing human-altered landscapes in Arizona by adapting their diets.

## Foraging Behavior

Socially foraging Crested Caracaras at the Santa Cruz Flats are attracted to row crops, principally cotton and alfalfa, and livestock pastures. The planting and harvesting cycle of these crops, as well as the timing of livestock reproduction, likely have a bearing on why wandering nonbreeding caracaras appear in this area in the winter. Caracaras are found in cotton fields mainly after the harvest November to February, when the fields are disked or plowed, exposing invertebrates and killing or maiming rodents. Caracaras also feed in alfalfa fields, which have a different production

cycle and so provide foraging prospects more times during the year. Typically, farmers plant alfalfa in January or February and get 8-10 cuttings once a month throughout the year (Putnam et al. 2000). Caracaras feed in the fields when they are flooded and attract invertebrates and possibly small vertebrates and again immediately after the alfalfa is cut and piled in windrows in the field, often while farm workers are still mowing. Sometimes they forage in uncut alfalfa fields (pers. obs.; Fig. 7). Lambing on a large sheep farm in the area, primarily November-January, generates carcasses and placentas of birthing ewes. A cattle feedlot and a dairy farm with thousands of cows (Burggraf 2010) also dump dead animals in the area. Documentation of caracaras eating livestock placentas is based on personal discussion with farmers in the area. It has also been reported in Florida (Dwyer 2010). Even less is known about the diet of socially foraging caracaras than nesting pairs in Arizona. Pellets collected at a night roost of nonbreeding birds in December 2014 haven't been analyzed yet; however, two had rodent incisors. Small mollusk shells and even a few pieces of pecan shells were found alongside the pellets. A Texas study showed that caracaras eat pecans if the shells have been cracked (Skoruppa and Lee 2008); on one occasion I observed a caracara feeding on cracked pecans at the Santa Cruz Flats.



Figure 7: Adult caracara in mature uncut alfalfa field 26 March 2014. Photo by Doug Jenness

The above description of row crop cycles and livestock birthing suggest that the conditions generating the best foraging prospects for caracaras occur from November to March, which is when the greatest numbers of caracaras are observed in the area. Other extensive agricultural areas in western Pinal and Maricopa counties with similar crop cycles have attracted occasional wandering caracaras but apparently no foraging groups to date.

This behavior of wandering nonbreeding caracaras foraging together has also been observed in Florida, Texas, Sonora, and Baja California. As in Arizona, the Texas population appears to be growing. Caracaras reported in Christmas Bird Counts (CBC) in Texas have increased from 20 in seven count circles in 1960 to 2544 in 64 count circles in 2013. In 2013, nine count circles, each reported more than 100 caracaras (National Audubon Society 2010). As many as 85 caracaras have been reported at a roost (Lasley 1982). In southwestern Louisiana, where caracara pairs have been confirmed nesting (S. Cardiff pers. com.), a CBC count circle covering parts of Cameron and Calcasieu parishes has been reporting up to 41 caracaras the past five years, with more than 30 in one roost in 2012 (S. Cardiff pers. comm.).

In Florida, where habitat destruction threatens the caracara population (Morrison and Dwyer 2012), telemetry has indicated 13 communal roosts scattered regularly throughout the species' range (Dwyer 2010). These roosts routinely included more than 100 caracaras and one roost included over 300 caracaras during one week in 2008. These roosts usually also included Turkey and Black vultures, with vultures sometimes outnumbering caracaras (Dwyer 2010). Individual nonbreeding caracaras regularly moved throughout the species' range in Florida. If wandering caracaras in Arizona are seeking breeding territories, as has been hypothesized in Florida (Dwyer et al. 2013), then the groups reported here may indicate areas likely to be colonized by nesting caracaras in the future, and consequently, where managers should focus future nest surveys.

In addition to social foraging and roosting of nonbreeding caracaras, individuals occasionally stray much farther, leading to reports throughout the southern two-thirds of Arizona (Levy 1988, D. Jenness unpub. data). Although band returns have so far revealed no movement between the Texas, Florida, Arizona, and Baja California populations (Morrison and Dwyer 2012), sightings of individual caracaras have been reported in Alabama, Mississippi, New Mexico, and California, and appear to be increasingly frequent in some northern states, and even British Columbia, New Brunswick, and Ontario, Canada (Morrison and Dwyer 2012, Lehman and Brinkley 2009). Between 1987 and 2012, 12

caracara vagrants were confirmed at multiple locations in California. Evidence pointed to their arriving from Mexico or Arizona (Nelson and Pyle 2013). New Mexico, located between two states with breeding caracaras has only 16 documented records of Crested Caracaras, 13 of them since 1969 (pers. comm. S. Williams). There is one report of likely nesting in Valencia County, New Mexico in the summer of 1955 (Ligon 1961).

## Management

The range expansion of breeding pairs and wandering nonbreeding caracaras in Arizona has implications for management. Potential for inadvertent negative impact through harassment at nest sites by photographers, or for deliberate harm through persecution, should be monitored and preempted. Wildlife managers should recognize the potential for caracaras in areas not previously occupied by the species, and encourage nesting surveys prior to potentially deleterious habitat modification. The recently discovered nests and much of the potential new breeding area are on state and federal lands open to the public. Successful fledging was not confirmed in four of the nests occupied in 2013, 2014, and 2015; it is unknown whether human intrusion, predation, or other factors may have led to nest failures.

Observations reported in several other areas suggest possible nesting. These include the regular presence of adult caracaras during the breeding season in a locality greater than 10 km from the known nest in Altar Valley (R. Shantz pers. comm.); along AZ 79, where seven sightings of single adults since March 2012, including in the breeding season, have been reported; and along the Santa Cruz River south of Tucson where wandering caracaras continue to be regularly reported (Jenness, unpub. data).

## Further Studies

This study indicates that the Sonora-Arizona population of caracaras is expanding northward in Arizona. Many questions merit further research.

Determining where the wandering congregations of caracaras at Santa Cruz Flats are coming from and where they disperse to would contribute much to our understanding of the current range of the Sonora-Arizona population. It could also illuminate the reasons for the northward expansion of caracaras, including the possibility of population increases or habitat loss to the south. The use of radio telemetry or Global Positioning System/Global System for Mobile Communications (GPS/GSM) trackers would be effective in such a study. A related study could be made of the relationship between the caracaras' social foraging sites and their diet.

Researching the reproductive success of nesting pairs of caracaras, especially in the recently discovered areas north of their previously known population on Tohono O'odham lands, could help determine the impact of natural dangers, including weather and predation, and human intrusion. These are key factors for determining whether any management safeguards need to be instituted. No census or study of caracaras has been made on the Tohono O'odham Nation since the 1990s, and their status there is uncertain. Recent sightings of caracaras in the northern part of the Nation, such as near Lake St. Clair (Tat Momoquilot), indicate this might be an area to prioritize for future study coordinated with the Nation.

## ACKNOWLEDGMENTS

This work would not have been possible without the assistance of Richard Glinski at every stage. I'm most grateful to Joan Morrison, James Dwyer, and an anonymous reviewer for making many helpful suggestions to early drafts. David Brown, John Durham, John Higgins, Eric Hough, John Levy, Larry Norris, Robert Shantz, and Brian Walsh provided information about caracara sightings and possible nest locations, nest identification, and notes from monitoring nests.




Special thanks to Aletris Marie Neils and Jennifer Merems at the University of Arizona for analyzing pellets, and to Aaron Soggs for facilitating access to roads at Picacho Peak State Park not open to the public. Special gratitude goes to the 29 volunteers who participated in the 2013 and 2014 surveys in the Santa Cruz Flats.

## LITERATURE CITED

- Arizona Field Ornithologists (AZFO) Seasonal Reports. 2008- 14. <http://www.azfo.org/reports.html> [Accessed 31 December 2014]
- AZNMbirds archives. <https://list.arizona.edu/sympa/arc/aznmbirds/2013-01/> [Accessed 31 December 31, 2014]
- Bent, A. C. 1938. Life Histories of North American Birds of Prey. pt. 2. US Nat. Mus. Bull. 170:127-135.
- birdwg05 archives. <http://listserv.arizona.edu/cgi-bin/wa?S1> [Accessed October 2013. No longer accessible.]
- Brown, D. E., C. H. Lowe, and C. P. Pase. 1980. A digitized systematic classification for ecosystems : with an illustrated summary of the natural vegetation of North America. U.S. Dep. Agric., For. Serv. Gen. Tech. Rep. RM-73.
- Burggraf, J. 2010. Dairying in the Desert. Dairy Star online edition. Sept. 27, 2010. <http://www.dairystar.com/main.asp>.
- Corman, T. E. 2005. Crested Caracara (*Caracara cheriway*) in Arizona Breeding Bird Atlas. T. Corman and C. Wise-Gervais, eds.). University of New Mexico Press, Albuquerque.
- Dwyer, J. F. 2010. Ecology of Nonbreeding and Breeding Crested Caracaras (*Caracara cheriway*) in Florida [dissertation]. Virginia Polytechnic Institute and State Univ. of Virginia.
- . J. D. Fraser, and J. L. Morrison. 2013. Range sizes and habitat use of non-breeding Crested Caracaras in Florida. J. Field Ornithol. 84:223–233.
- . J. P. Dalla Rosa. 2015. Use of anthropogenic nest substrates by Crested Caracaras. Southeastern Naturalist 14:N10-N15.
- eBird. 2012. eBird: An online database of bird distribution and abundance [web application]. eBird, Ithaca, New York. Available: <http://www.ebird.org>. [Accessed: 1 January 2015].
- Ellis, D. H., D.G. Smith, W. H. Whaley, and C. H. Ellis. 1988. Crested Caracara, in R.L. Glinski, B.G. Pendleton, M. B. Moss, M. N. Le Franc, Jr., B. A. Millsap, and S. W. Hoffman (eds.), Proceedings of the Southwest Raptor Management Symposium and Workshop. National Wildlife Federation Scientific and Technical Series 11:119-126.
- Ferguson-Lees, J., and D. A. Christie. 2001. Raptors of the World. Houghton Mifflin Co. Boston.
- Ganley, S. 1997. Arizona Birds Database: 1970-1997. [http://www.azfo.org/AZHistoricalDB/AZhistorical\\_list.aspx](http://www.azfo.org/AZHistoricalDB/AZhistorical_list.aspx)
- Jenness, D., and R. L. Glinski. 2013. Survey for Crested Caracara (*Caracara cheriway*) Nests on Santa Cruz Flats, Pinal County. <http://www.azfo.org/events/documents/CrestedCararaSantaCruzFlats.html>
- , and R. L. Glinski. 2014 Second Survey for Crested Caracara (*Caracara cheriway*) Nests on Santa Cruz Flats, Pinal County. <http://www.azfo.org/events/documents/CrestedCararaSantaCruzFlats2014.html>
- Lasley, G. W. 1982. High Numbers of Caracara Found at Temporary Roost. Bull. Texas Ornith. Soc. 15:18-20.
- Lehman, P., and E. S. Brinkley. 2009. The Changing Seasons: Cornucopia. N. Am. Birds 63:26.
- Levy, S. H. 1961, The Caracara Nesting in Arizona. Auk 78:99.
- . 1988. Status and Distribution of the Crested Caracara in Arizona. Unpub. report to Arizona Game and Fish Department, Phoenix, AZ.
- . 1998. Crested Caracara in *The Raptors of Arizona*, ed. Glinski, R. L. Univ. of Arizona Press, Tucson and AGFD, Phoenix.
- Ligon, J. S. 1961. New Mexico Birds and Where to Find Them. University of New Mexico Press, Albuquerque.
- Monson, G. 1942. Notes on Some Birds of South-Eastern Arizona. Condor 44:222.

- , A. Phillips. 1981. Annotated Checklist of the Birds of Arizona, 2nd edition. Univ. of Arizona Press, Tucson, AZ.
- , and S. M. Russell. 1998. The Birds of Sonora. Univ. of Arizona Press. Tucson, AZ.
- Morrison, J. L., and S. R. Humphrey. 2001. Conservation Value of Private Lands for Crested Caracaras in Florida. *Conservation Biology* 15:675-684.
- , and J. Dwyer. 2012. Crested Caracara (*Caracara cheriway*), The Birds of North America Online A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology. <http://bna.birds.cornell.edu/bna/species/249>
- National Audubon Society (2010). The Christmas Bird Count Historical Results [Online]. Available <http://www.christmasbirdcount.org> [accessed 28 August 2014].
- Nelson, K. N. and P. Pyle. 2013. Distribution and Movement Patterns of Individual Crested Caracaras in California. *Western Birds* 44: 45-55.
- Oberholser, H.C. 1974. The Bird Life of Texas, Vol. 1. Univ. of Texas Press. Austin, TX.
- Phillips, A., J. Marshall, and G. Monson. 1964. The Birds of Arizona. Univ. of Arizona Press. Tucson, AZ.
- Putnam, D., J. Brummer, D. Cash, A. Gray, T. Griggs, M. Ottman, I. Ray, W. Riggs, M. Smith, G. Shewmaker, R. Todd. 2000. The Importance of Western Alfalfa Production. 29th National Alfalfa Symposium proceedings. <https://cals.arizona.edu/.../fn1101alfalfaprod.pdf>
- Rhoads, S. N. 1892. The Birds of Southeastern Texas and Southern Arizona Observed During May, June, and July 1891. *Proc. Acad. Nat. Sciences of Philadelphia*, p.115.
- Rivera-Rodriguez, L. B. and R. Rodriguez-Estrella. 1998. Breeding Biology of the Crested Caracara in the Cape Region of Baja California, Mexico. *J. Field Ornithology* 69:160-168.
- Santa Cruz Flats Raptor Count. 2006-15. <http://www.azfo.org/namc/IndexsantaCruzRaptor.html>. [Accessed 31 December 2014]
- Skoruppa, M. A. and M. C. Lee. 2008. Crested Caracaras Feed on Pecans in South-Central Texas. *J. Raptor Research* 42:299-300.
- Wheeler, B. K. 2003. Raptors of Western North America. Princeton University Press. Princeton, NJ.

 Accepted 1 August 2015