NESTING PERIOD AND BROOD SIZE OF CRESTED CARACARAS IN ARIZONA

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ABSTRACT: Between 2014 and 2025, Richard Glinski and I located 25 Crested Caracara (*Caracara plancus*) nests in Pima and Pinal counties in Arizona. We monitored 13 nests and obtained data from 3 nests discovered and observed by others. We collected data on 37 broods. This article records what we found regarding the nesting period, brood size, and number of broods. We also found that nesting patterns may have some association with precipitation.

The Crested Caracara is the only North American member of the Falconidae that collects materials and constructs a nest, rather than laying eggs on appropriate substrate or usurping nests of other species (Morrison and Dwyer 2023). It is a nonmigratory species distributed throughout South and Central America, Mexico, and Cuba. It is the only caracara with a distribution that extends into the southern United States, where it has resident breeding populations centered in southern Arizona, Texas, and south-central Florida (Morrison and Dwyer 2023). Although caracaras were likely nesting in Arizona in the early 20th century and probably earlier (Bent 1938, Rea 1983), the first documented nest was reported in 1960 on the Tohono O'odham Nation in the south-central part of the state (Levy 1961). Levy (1988) discovered a total of 4 nests between 1960 and 1964 on Tohono O'odham lands and 1 in Altar Valley, east of the tribal lands between the Baboquivari Mountains and the Sierrita Mountains. Ellis et al. (1988) reported 6 nests on Tohono O'odham lands between 1976 and 1982.

In 1986, the Arizona Game and Fish Department contracted Seymour Levy to conduct a 3-year statewide status survey of the Crested Caracara, including a description of nesting phenology (Levy 1988). He found 14 breeding pairs and confirmed successful fledging from 20 broods. All nests were on the Tohono O'odham lands in south-central Pima County, with 1 exception ±110 km northeast at Olsen Wash near AZ 79 north of Oracle Junction in Pinal County. Levy estimated the statewide distribution at that time to be 25 to 30 breeding pairs, most located in the south-central districts of the Tohono O'odham Nation.

In the 1990s, Arizona Breeding Bird Atlas teams confirmed nesting in 2 priority survey blocks on Tohono O'odham lands and reported the presence of caracaras in northern districts of the nation in Pinal County where Levy had not observed them (Corman 2005). Between 2000 and 2013, observers documented caracara nests in Altar Valley (n=3) and Avra Valley (n=1), west of the Tucson Mountains (Jenness 2015). Given that the caracara breeding range appeared to be expanding northward over the past 60 years, we set out to 1) locate and monitor caracara nests, focusing on areas outside the previously identified population on Tohono O'odham Nation, 2) characterize nest substrate, timing of breeding, nest success, and the number of fledged young, and 3) identify potential drivers of reproductive success in caracaras in Arizona.

CARACARA NEST LOCATIONS AND SUBSTRATES

To locate nests, we searched relatively flat areas of Sonoran Desert Scrub and remnant Sonoran grassland savanna dominated by large stands of saguaros (*Carnegiea gigantea*; Brown et al. 1980). We focused our surveys in the Altar Valley, Avra Valley, Santa Cruz Flats, and Coolidge area. Most were on public lands, and we received permission for access to those that were on private land. Between February and April, we drove more than 200 km on many back roads looking for caracaras, either perched or flying, and if we saw one, we searched the adjacent areas for nests. We often sat on small hills or rises for several hours scanning the surrounding countryside for caracaras that might be flying to or from nests. We looked for saguaros with whitewash on the top branches. Caracaras do not eject fecal

waste at an angle when defecating but more vertically downward, often covering their perch. Thus, perch sites and nest saguaros would be marked by considerable whitewash (Levy 1988, pers. obs.). We also looked for nests in saguaros. Caracara nests are constructed of fine stems of weeds and twigs with an average diameter of 3 mm (Ellis et al. 1988). Triangle-leafed bursage (*Ambrosia deltoidea*), burroweed (*Isocoma tenuisecta*), wolfberry (*Lycium* spp.), snakeweed (*Gutierrezia sarothrae*), and the smaller twigs of creosote bush (*Larrea tridentata*) are commonly used (Levy 1988, pers. obs.). The nests are distinguished from those of Common Raven (*Corvus corax*), Red-tailed Hawk (*Buteo jamaicensis*), and Harris's Hawk (*Parabuteo unicinctus*), which are built with much coarser twigs (Ellis et al. 1988, Levy 1988, pers. obs.). We conducted most of our searches between 2014 and 2019, with more than a dozen in some years. Fewer were conducted between 2020 and 2025. We also followed up on reports of nests provided to us by others.

Figure 1. Caracara nest at Santa Cruz Flats. Nest depth is more than 3 m, indicating accumulated add-on of nesting material and many years of use, 26 October 2022. Photo by Doug Jenness

We discovered 25 nests located outside the Tohono O'odham lands, with 10 in Altar Valley (Pima County), 4 in Avra Valley (Pima County), 9 in the Santa Cruz Flats (Pinal County), and 2 in the Coolidge-Florence area (Pinal County). The data discussed below are from 13 nests where we could establish the dates for fledging and the number of nestlings fledged. The data also includes reports by other observers from 3 nests in the Organ Pipe Cactus National Monument (OPCNM) and Saguaro National Park West (both Pima County). For 1 nest in Avra Valley, we also incorporated data of other observers from eBird (eBird 2021-2025). The elevation for the nests ranged from 520 m to 911 m (mean=655 m). All but 2 of the nests we found were in saguaros, which aligns with the finding of Levy and others, who all reported nests in the lower swirl of saguaro arms (Figure 1). We observed 2 nests in Altar Valley that were near the tops of blue palo verde trees (*Parkinsonia florida*). One of those nests was inactive, the other fledged 2 young in 2017. A map is not included here to reduce the potential of disturbance to this small and sensitive population.

We detected nest-building activity as early as 2 February and throughout the month during the years 2014 to 2025. The range for egg laying of first clutches (n=34) was the half-month period beginning on 1 March to the half-month period beginning on 16 April (Figure 2). The median was the half-month period beginning on 16 March. Fledging ranged from the half month beginning 16 May to the half month beginning 1 July. The median was the half month beginning June 1. For all second broods (n=3), egg laying was the half month beginning 16 July, and fledging was the half-month beginning 1 October. We determined the approximate date for egg laying by subtracting (in number of weeks) the estimated age of young in the nest (J. Morrison pers. comm.) or from the date of fledging. Although Levy reported that fledging occurred 5 to 6 weeks after hatching in Arizona (Levy 1988), he did not monitor nests often enough to ensure the accuracy of this finding. In Texas and Florida, fledging occurred 7 to 8 weeks after hatching (Dickinson and Arnold 1996, Morrison 1999), which aligns with our observations (Figure 3). The incubation period for caracaras is 30 to 33 days (Dickinson and Arnold 1996, Morrison 1999).

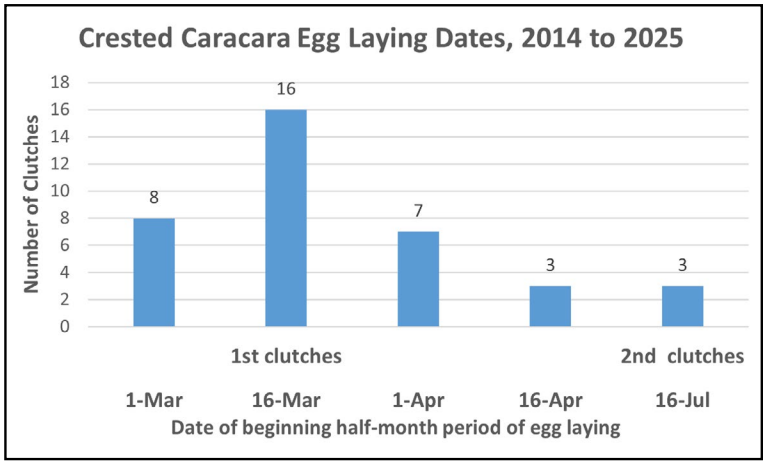

Figure 2. Beginning half-month periods for egg laying by caracaras in Arizona, 2014 to 2025. The March and April dates are for 34 first clutches, and the July date is for 3 second clutches.

We were unable to determine clutch size in Arizona, however, in Florida caracaras typically lay 1 to 3 eggs (Morrison 1999), and as many as 4 have been reported in Texas (Ellis et al. 1968). We observed the number of nestlings at different ages and the number fledged and assumed this was the same as brood size, although it is possible that the youngest nestlings expired due to starvation or some other reason (Actkinson et al. 2009). Of the broods we observed, 5 had 1 fledgling; 24 had 2; and 8 had 3. At 1 nest we observed 3 broods of 3 fledglings over a period of 4 years (2022 to 2025; Figure 4). Levy (1968) observed 2 broods of 3 nestlings each from 2 of the 5 nests he discovered in the 1960s, but no more than 2 nestlings from 20 broods during his 1966 to 1968 surveys.

Figure 3. Two 3- to 4-week-old caracara chicks at a Santa Cruz Flats nest, 3 June 2021. Counting backward the estimated date of egg laying was the half-month beginning, 16 April, one of the latest first broods we observed between 2014 and 2025. Photo by Doug Jenness

We observed second-brooding attempts at a single nest in southern Avra Valley in 2021 and 2022, with a failed second brooding attempt in 2023. This finding is noteworthy because although second broods have been reported in Texas (Dickinson and Arnold 1996), Baja California (Rivera-Rodriguez and Rodriguez-Estrella 1998), and Florida (Morrison 1998, 1999), until 2016 no second broods were reported in Arizona (Levy 1961, 1988, Ellis et al. 1988, Corman 2005). It is possible that this absence of observations of second-brooding attempts is due to limited monitoring after first fledging, and that more would have been reported if there had been a greater effort to monitor nests after fledging of first broods. The first account of a second brood in Arizona was at OPCNM in 2016 (Veverka and Coleman 2018). At this nest, the first brood of 2 young fledged in the first week of June. On 30 June adults were seen bringing food to a fledgling near the nest. Following this successful fledging, a second brood of 2 fledged in the first week of October, which placed the beginning of incubation around mid-July. This was the first confirmed caracara nesting at OPCNM and the most western nest known in the state (Levy 1988, Corman 2005, Jenness 2015).

Figure 4. Two adult caracaras feeding 3 chicks at nest in southern Avra Valley, 23 April 2025. Photo by Marty Herde, Macaulay Library at Cornell Lab (ML634403021)

At the Avra Valley nest where we observed second-brooding in 2021, 2 nestlings fledged from the first nesting attempt between 7 and 10 June. Incubation of the second clutch started the half month beginning on 16 July. On 16 September, I observed 2 nestlings estimated to be 5 to 6 weeks posthatching age in the nest. Three days later, only 1 nestling was in the nest. I continued to observe a single nestling at the nest through 10 October. On that date, the young bird mainly flew or hopped from 1 branch to another preparing for fledging. On my 12 October visit no young caracaras were in the nest. The adults, perched on a saguaro 100 yards from the nest, vigorously scolded me as I approached them, suggesting that the fledgling was nearby. The outcome of the other nestling is unknown.

At the same nest in 2022, I observed 3 nestlings about 6 weeks old on 19 May. On 3 June another observer reported 1 nestling in the nest and 1 fledgling on the ground near the nest. Three days later I observed a single nestling about 8 weeks old in the nest. Observers began reporting nestlings in the nest again on 30 August, and on 27 September, I saw 2 nestlings about 7 weeks posthatching age. They were flapping their wings and hopping from branch to branch, which is typical behavior about 1 week before fledging (Dickinson and Arnold 1996, Morrison 1999). In 2023, 2

young birds fledged the last week of May. Following this fledging, from 2 August through 5 October, many observers reported and photographed up to 2 adults at or near the nest, including 11 reports of an adult sitting on the nest as if incubating. The 15 checklists by month were August (4); September (10); and October (1). They were at different times of day, including a report of an adult at the nest at 20:56 on 19 September, though no nestlings were reported (eBird 2023). The attempt at a second brood likely failed.

The time between the fledging of the first broods and the egg laying of the second broods was 6 to 7 weeks for the OPCNM nest and the 2021 Avra Valley nest and 5 to 6 weeks for the 2022 Avra Valley nest. Morrison (1998) reported that in Florida, the gap between fledging of the first brood and egg laying for the second brood ranged from 2 to 13 weeks (n=16; mean=7.6). In all cases, postfledging care of first-brood young overlapped incubation of the second clutch. Dickinson and Arnold (1996) reported a 9- to 10-week gap between the fledging of first broods and egg laying for second broods at 2 nests in Texas. Both of those second broods failed when newly hatched chicks were killed by fire ants (*Solenopsis invicta*). The 3 successful second broods were at the same nest at both OPCNM and Avra Valley. Prior to each second nesting, the adults added new nest material. In Florida, however, all second broods were in nests located in different trees or structures (J. Morrison pers. comm.).

In Florida, Morrison (1998, 1999) found that pairs that attempted second broods most often made their first nest attempt relatively early in the season. Of the second broods in Arizona, all were preceded by a first brood with egg laying dates that were not the earliest but at the median half month of egg laying, which began 16 March. Of the 4 attempted second broods, 3 were at the Avra Valley nest over a period of 4 years. This is also the same nest with 3 of the 8 broods that resulted in 3 fledglings each. As none of the adults were tagged, we do not know if the same pair was present for all the second broods or accounted for all the broods of 3. Of all the nests we observed or knew about, this was the most productive.

DRIVERS OF CARACARA REPRODUCTION AND NEST SUCCESS

Precipitation and other variable environmental conditions have been associated with caracara reproduction in Florida (Morrison 1999). To address the potential for precipitation to influence caracara reproduction in Arizona, I reviewed precipitation levels to determine if they were associated with the dates of egg laying and years when pairs fledged 3 young and attempted second broods. I used the precipitation levels from Casa Grande (Weather History Casa Grande 2025) for nests at nearby Coolidge and the Santa Cruz Flats and from the Tucson International Airport (Weather History Tucson 2025) for Avra Valley and Altar Valley. I calculated the mean precipitation for the 8 months (July to March) prior to most egg laying, which includes the July to mid-September monsoon season and the October to March period of Pacific frontal storms. I hypothesized that more rainfall would create more favorable conditions for potential caracara prey, including reptiles, small rodents, quail chicks, and nestling birds (Heffelfinger et al. 1999, Hatten et al. 2016). The mean precipitation for these 8-month periods in the 12 years between July 2013 and March 2025 was 15.2 cm for Casa Grande and 24.3 cm for Tucson. In 2019, when 4 of 8 nests had the earliest egg laying dates (1 to 15 March) the mean precipitation for the 8-month period was 47% higher than the 12-year mean in the Casa Grande area and 30% higher in the Tucson area. In that same year, 3 nests fledged 3 young each. In 2022, 2 nests in Avra Valley and Altar Valley raised 3 young each, and precipitation in Tucson was 32% above the 12-year mean. In 2024, when the Avra Valley nest fledged 3 young, the precipitation was 3% higher than the 12-year mean. However, in 2025, when the nest again had 3 fledglings, precipitation was 43% lower than the 12-year mean (Table 1).

Beyond the potential impacts of precipitation on food availability, metrics of direct availability of food may also inform nest success or the number of nesting attempts by a given pair. Morrison (1998) noted that in Florida only a small percentage of breeding pairs repeat attempts at second broods, which may be due to higher fitness. We are unable to definitively determine why the Avra Valley nest has more clutches of 3 and more broods than other Arizona nests. However, we note that the nest is located near a busy state highway and has been seen and photographed by dozens of observers since 2020. Although the nest is in a saguaro in Sonoran Desert habitat similar to other Arizona caracara nests, the nesting adults have become more habituated to humans and interference. In addition to observations

Table 1. Association of half-month egg laying date and brood size with precipitation (percent above/ below mean for 8 months before egg laying).

Nest	Year	Half-month egg-laying date	Brood size	Precipitation above/ below mean
1	2014	1-Apr	2	-47%
	2016	16-Mar	1	18%
	2017	16-Mar	2	-15%
	2019	16-Mar	2	47%
	2021	16-Mar	1	-76%
2	2016	16-Mar	2	18%
	2018	16-Mar	2	5%
	2019	1-Mar	3	47%
	2021	16-Apr	2	-76%
	2022	1-Mar	2	34%
3	2017	16-Mar	2	-15%
	2019	1-Apr	2	47%
4	2019	1-Apr	1	47%
5	2024	1-Mar	2	-8%
6	2018	16-Mar	2	5%
	2019	1-Mar	2	47%
	2022	1-Mar	2	34%
7	2018	1-Apr	2	5%
8	2015	16-Mar	2	23%
9	2016	16-Apr	3	18%
10	2016	16-Apr	2	18%
11	2017	16-Mar	2	-5%
12	2018	16-Mar	2	20%
	2019	1-Mar	2	30%
	2021	1-Apr	1	-71%
	2022	1-Mar	3	32%
13	2019	16-Mar	3	30%
14	2019	1-Mar	3	30%
15	2023	16-Mar	2	-7%
16	2021	16-Mar	2	-71%
	2022	16-Mar	3	32%
	2023	16-Mar	3	-7%
	2024	1-Apr	2	3%
	2025	1-Apr	3	-43%

of adult caracaras bringing snakes, lizards, and nestling birds that were likely captured to the nest, observers have also reported caracaras feeding on roadkill within 6 km of the nest. It is possible that this roadkill subsidy is a factor allowing for multiple nesting attempts, but this hypothesis requires further study.

It is unclear to what degree predation of nestlings or fledglings plays a role in reproductive success for caracaras, as predation has generally not been studied or reported for caracaras (Morrison and Dwyer 2023). Situated in spine-bearing cacti 3.5 m to 6 m above the ground, caracara nests are not accessible to many predators such as gray fox

(*Urocyon cinereoargenteus*), kit fox (*Vulpes macrotis*), and coyote (*Canis latrans*), which are common in their nesting areas. Young caracaras are most vulnerable immediately after fledging when they are not capable of sustained flight (Morrison and Poli 2024). In 2020 we found 2 recently fledged birds dead on the ground about 100 m from the nest saguaro at the Santa Cruz Flats. A more mysterious case was the death of 1 of the 3 fledglings at the Avra Valley nest in 2025. The nestlings fledged between 1 and 3 June. On 9 June an observer photographed 2 immature birds on branches of the nest saguaro both above and below the nest (KV 2025). This was not surprising as young birds hang around the natal territory for a couple of months and occasionally return to the nest, even to roost at night (Morrison and Poli 2024). On 3 visits between 23 June and 18 July, I photographed a dead fledgling in the same position in the nest, although cause of death was unknown. We also note that other researchers and community scientists have observed dead nestlings, including a 7-week-old posthatching nestling found in a nest and the remains of another nestling on the ground near the nest at Saguaro National Park in 2016 (L. Norris pers. comm.). Again, the cause of death was unknown. Clearly, more research is needed as to drivers of nestling and fledgling survival, which could include use of game cameras in areas where birds have fledged, as well as close examination of potential signs of predation or poisoning from rodenticides on fledgling carcasses.

Our observations at caracara nests in Pima and Pinal counties contribute to knowledge of caracara nesting behavior in Arizona and provide a foundation for further research.

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