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Volume 9, 2022 **Urban Naturalist Notes** **No. 2**

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Cover Photograph: Black vulture chicks on a 3rd floor balcony in Houston, Texas in 2021. The parents of these chicks returned in February 2022 to the same location to prepare a nest for hatching and fledging another set of chicks. Photograph © Scott Johnston, Givens & Johnston, PLCC.

The ***Urban Naturalist*** (ISSN # 2328-8965) is published by the Eagle Hill Institute, PO Box 9, 59 Eagle Hill Road, Steuben, ME 04680-0009. Phone 207-546-2821 Ext. 4, FAX 207-546-3042. E-mail: office@eaglehill.us. Webpage: http://www.eaglehill.us/urna. Published on an article by article basis. **Special issue proposals are welcome**. The *Urban Naturalist* is an open access journal. **Authors**: Submission guidelines are available at http://www.eaglehill.us/urna. **Co-published journals:** The *Northeastern Naturalist*, *Southeastern Naturalist*, *Caribbean Naturalist*, and *Eastern Paleontologist*, each with a separate Board of Editors. The Eagle Hill Institute is a tax exempt 501(c)(3) nonprofit corporation of the State of Maine (Federal ID # 010379899).

Urban Nesting of Black Vultures in Houston, Texas, USA

L. Jen Shaffer[1*], James Garland Hurst[2], Scott Johnston[2], Trey Barron[3], William W. Bowerman[4], Sonja Krüger[5,6], Lindy J. Thompson[5,7], and Mary Ann Ottinger[8]

Abstract - Reports of Black Vultures in urban and suburban areas are increasing as populations grow and expand in North America. While Black Vultures perform a valuable service in removing roadkill and waste, their behavior also contributes to risks for air traffic and sensitive infrastructure. Research has focused on food availability and roosting behaviors in urban and suburban areas as drivers of conflict that require management strategies. However, nest site preferences in these human-dominated landscapes remain underexplored. In this short communication, we describe the successful nesting by a pair of Black Vultures on a third floor balcony in metropolitan Houston, Texas, United States.

Since the late 1970s, *Coragyps atratus* (Bechstein) (Black Vulture) has increased and expanded its range across the United States and Canada. Wildlife ecologists note that this scavenging raptor species adapts well to human-dominated landscapes despite a preference for less-disturbed areas, and that food availability is an important factor (e.g., Campbell 2014, Hill et al. 2021, Hill and Neto 1991, Holland et al. 2019, Kiff 2000, Kluever et al. 2020, Ruffino 2003). Previous explanations for use of urban and suburban areas by Black Vultures have focused on how food availability at dumpsters, landfills, and roadkill sites may encourage these birds to stay and roost on communication towers and electrical transmission infrastructure (Buckley 1999, Davis 2018, Telfair 2007). Enhanced flight conditions provided by urban infrastructure such as orographic and thermal updrafts, as well as elevated perches that offer protection from ground predators, could also draw Black Vultures to these highly-disturbed anthropogenic landscapes (Almeida Freire et al. 2015, Hill et al. 2021). As urbanization increasingly limits the availability of less-disturbed and natural nesting sites, Black Vultures may seek to nest in urban and suburban areas. State agencies, like Texas Parks and Wildlife, have recorded attempts to nest on occupied buildings in Houston and other urban areas (Davis 2018, T. Barron, Texas Parks and Wildlife, Victoria, TX, 2021 unpubl. data). Yet published descriptions of nest sites in North America are extremely rare. Furthermore, most Black Vulture management literature continues to emphasize nesting in rural and exurban areas on bare substrate in abandoned buildings, hollow trees, caves, and thickets, hindering the development of management considerations for this species in urban and suburban landscapes (Buckley 1999, Davis 2018, Telfair 2007). This note describes the successful nesting of a pair of Black Vultures on a third-story balcony in metropolitan Houston, Texas, United States, and suggests avenues for research on factors influencing nesting site choices to improve Black Vulture management plans for urban areas.

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Associate Editor: Julie Craves, University of Michigan-Dearborn.

In March 2021, a pair of Black Vultures chose to nest on a third-story concrete balcony in Houston, Texas, the largest city in Texas and fourth largest in the United States, home to an estimated 2.32 million people at a density of approximately 1,333 individuals per km^2 (US Census Bureau 2021). Houston's 1,732.7 km^2 metropolitan area provides a diverse range of continuous food resources, as well as attractive roosting habitat on residential and commercial buildings, numerous communications towers, electrical transmission infrastructure, and petrochemical facilities. Black Vulture populations are common in the eastern two-thirds of Texas where the city of Houston is located, and this species is listed as one of least concern (IUCN 2021, Telfair 2007).

The vultures laid the first of two eggs on 23 March 2021, and the second egg was laid two days later. The eggs were laid directly on the bare concrete in a protected corner on the north-facing side of the building faced with a reflective glass wall. The nest site received about 20 minutes of direct sunlight each morning. This three-story office building is part of a strip mall complex in northwest Houston that is < 250 m from a major interstate highway. Concerns about the eggs getting damaged by rolling around on the bare concrete balcony led the office occupants to put out potting soil and a plant on the balcony. This material clogged the balcony drain, so office occupants took away what could be easily removed without disturbing the birds and replaced it with soft wood shavings and Spanish moss. The adult birds demonstrated protective behaviors like hissing and wing spreading when people occasionally stepped onto the balcony. However, the reflective surface of the balcony's glass wall likely increased the Black Vultures' tolerance of a constant human presence, as it prevented the birds from clearly seeing humans talking, working, and observing the nest only a few feet from the eggs and growing chicks.

The first egg started hatching on 1 May 2021, and this chick emerged completely by 9:30 am the following day. The second chick began hatching early on 3 May 2021 and was completely free of the shell by mid-afternoon. Both adults were attentive caretakers throughout the nesting and fledging process, taking turns on the nest and foraging, preening the chicks, and sheltering them from rain and cold. When returning from foraging trips, the adults ritualistically rubbed their heads and beaks together (Wachtmeister and Enquist 2000). The developing chicks seemed to show curiosity by poking a reflective security camera lens and the glass wall, and poking at and splashing around in a pan of water placed near the nest site. They also ran the length of the balcony, increasing the distance from the nest area as they got older, and flapped their growing wings. Both chicks fledged by 14 July 2021. Preference for nesting on bare substrate in this protected space, as well as the time to hatching of 38-39 days and approximately 75 days to fledging, follows published descriptions of Black Vulture behavior and ecology in rural and natural settings (Buckley 1999, McHargue 1981, Telfair 2007).

The office occupants occasionally put out beef organ meat and ground beef for the birds. The adults ate this food and pulled it away from the young chicks, showing a preference to regurgitate food for the chicks over allowing them to directly eat the raw meat. As the chicks aged, they were observed eating ground beef when their parents were absent. Supplementation can affect nesting and fledging success; however, food amounts provided by the office staff were minimal compared to the food regularly procured by the Black Vulture adults for their offspring from the many easily accessible food sources available in close proximity to the nest. These sources included roadkill from nearby highways and residential streets, and dumpsters located at nearby restaurants, schools, and a supermarket. The office building is also close to feeder creeks and drainage ditches in the upper Buffalo Bayou watershed that support a variety of wildlife, as well as three large undeveloped areas within city limits that host diverse wildlife, water bodies, and forested areas.

Adapting to an urban landscape presents both opportunities and challenges for Black Vultures. In South America, food availability, particularly in areas of poor waste manage-

ment and sanitation practices, drove Black Vulture presence and selection of communal roost sites (Novaes and Cintra 2013, 2015). Landscape features such as bodies of water, road infrastructure, landfills, and urban islands surrounded by natural and rural areas also attract these scavenging raptors (Hill et al. 2021, Novoselova 2016). One study assessing landscape features attractive to urban Black Vulture populations in Charlotte, North Carolina, USA, found a positive effect of developed land on bird population size, while availability of roadkill and developed-forest edge habitat negatively impacted population size (Partridge 2021). Regular observations of Black Vultures foraging at dumpsters near roost sites provided additional evidence that at larger scales these birds rely less on roadkill carrion and more on the city of Charlotte's trash for food. Partridge (2021) concluded that the evidence indicated a preference for more urban and suburban areas over exurban and rural landscapes. Other research in the same region showed that Black Vultures have no preference for roosting sites close to landfills or otherwise anthropogenic landscapes if less-disturbed habitat is available, and that these birds forage in landfills only in times of greatest need, such as breeding periods (Hill et al. 2021, Holland et al. 2019). Taken together, this suggests that the greater predictability of dumpster and landfill foraging success may encourage nesting in urban landscapes, particularly by resident populations.

Reliance on trash food sources could negatively impact hatchling growth and development, and reproductive fitness of adults and nestlings. Black Vultures primarily consume carrion, although they will readily ingest vegetable matter, plastics, and other non-food materials (Ballejo et al. 2021, Elías 1987, Plaza and Lambertucci 2018). McHargue (1981) notes that slow growth rates and precocity of Black Vultures compared to other raptor species may serve as an adaptive response to the spatial and temporal unpredictability of carrion and the lower nutrient value of vegetable foods. However, the impact of ingesting plastics and other non-food materials should not be underestimated. A comparison of adult Black Vultures foraging in garbage dumps versus the Patagonian steppe, documented the trade-off of higher body mass in dump foragers combined with higher blood levels of glycaemia, uric acid, and globulins that indicate possible issues with nutrition, kidney damage, and infections (Plaza and Lambertucci 2018). A post-mortem study of California Condor (*Gymnogyps californianus*, Shaw) nestlings, another New World vulture, documented consumption of non-food materials including metal, glass, and plastic as a significant cause of mortality. The junk-clogged digestive system prevented food intake in some chicks which slowed growth, while others showed harmful elevated levels of zinc and copper (Mee et al. 2007). Although the Houston Black Vulture chicks may have consumed some non-food items, adult foraging on nearby food sources provided sufficient nutrition needed for successful growth and development, with no evidence for adverse effects from non-food contamination.

South American researchers have documented Black Vultures nesting and successfully fledging chicks on high building ledges in Curitiba and São Paolo, Brazil and Lima, Peru since the late 1960s (Hill and Neto 1991). Unpublished reports from Victoria and a documented case in San Antonio suggest that nesting on occupied, multi-story office buildings is not uncommon behavior for Black Vultures in Texas urban and suburban areas (Davis 2018, T. Barron, Texas Parks and Wildlife, Victoria, TX, 2021 unpubl. data). In South America, Hill and Neto (1991) concluded that as natural nesting sites became more limited, Black Vultures increasingly used skyscraper ledges due to their similarities with preferred natural spaces. However, demonstrated preferences for natural and less-disturbed areas suggest that limitations on nest sites in combination with other factors related to infrastructure may be more important in choosing high ledges (Hill et al. 2021, Novoselova 2016). Studies in the United States and Brazil show that the presence and roosting preferences of adult Black Vultures are correlated to thermal currents

generated by paved surfaces and orographic updrafts in built urban environments which offer additional flight support to these heavy-bodied birds (Almeida Freire et al. 2015, Hill et al. 2021). This may also benefit fledging chicks as they learn to fly. In addition, the use of elevated ledges and balconies in occupied buildings likely reduces wildlife predation on eggs and chicks. Nesting behaviors and preferences for caves and hollow trees leave Black Vulture eggs and chicks exposed to known predators like raccoons and foxes, as well as other likely nest raiders, including rats, feral cats, coyotes, and snakes (Novoselova 2016, T. Barron, Texas Parks and Wildlife, Victoria, TX, 2021 unpubl. data). The choice of a third-floor, protected balcony by the adults in the case described here likely contributed to their success in raising chicks.

Human disturbance presents another challenge to Black Vulture nesting success in human-dominated landscapes. Texas Parks and Wildlife's Urban Wildlife Program receives multiple complaints in Houston and other urban areas each year regarding Black Vultures, including requests to remove nests and disrupt roosting sites, due to concerns with smell, sanitary conditions, and damage to commercial and residential structures (Davis 2018, Ruffino 2003). The positive interest shown by the office occupants prevented extensive nest disturbance and possible removal of the birds in this case. Other potential risks associated with Black Vulture co-existence in Houston include roosting on sensitive communications and utilities infrastructure, at petrochemical facilities, and risks from air traffic collisions at any of the 33 public, private, and military airstrips in the greater metropolitan area (Kluever et al. 2020, Ruffino 2003).

In summary, there is mounting evidence for the adaptation of Black Vultures to increasingly urban and suburban habitats throughout this species' range in North and South America. Reports of increasing roosting and feeding in urban and suburban landscapes across North America, with increased associated risks for human-vulture conflict, make a strong argument for inclusion of Black Vultures in urban ecology studies. In particular, additional research examining how food availability, amount and type of anthropogenic landscape disturbance, built environment characteristics, flight support factors, and wildlife predation influence Black Vulture nest site preferences in urban and suburban areas would be valuable. Black Vulture feeding and roosting behaviors may warrant additional study as they provide opportunities for the possibility of spillover incidents of pathogens from vultures to humans as well as to domestic and wild species (Ottinger et al. 2021, Santiago-Alarcon and MacGregor-Fors 2020). This information will improve Black Vulture management plans as this species continues to expand its range. This report adds to the information available on nesting activities in urban areas and echoes other researchers in highlighting the need for more research on Black Vulture nesting activities in human-dominated landscapes.

Acknowledgements

We thank the law firm of Givens & Johnston, PLLC for sharing their observations and documenting the nesting success. Thanks also go to anonymous reviewers for their comments on this manuscript.

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