AVIAN CONSERVATION & ECOLOGY

VOLUME 20, ISSUE 1, ARTICLE 15

Todaro, H. M., E. R. Donahue, A. J. Harman, and C. J. Duchardt. 2025. Use of anthropogenic structures for nesting by Loggerhead Shrikes. Avian Conservation and Ecology 20(1):15. https://doi.org/10.5751/ACE-02825-200115

Short Communication

Use of anthropogenic structures for nesting by Loggerhead Shrikes

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ABSTRACT. As human activities continue to reshape ecosystems, reports of anthropogenic nest site use by birds are increasing. Although many of these reports focus on cavity nesting species using artificial nest boxes, many species also use buildings and other anthropogenic structures as nesting sites. Loggerhead Shrikes (*Lanius ludovicianus*) are one species for which this behavior has received limited attention in both the literature and community science databases. Here we document and compile our own observations and additional reports of shrikes using anthropogenic structures as nesting sites from a review of existing community science-based databases. Together, the six reports of nesting attempts presented here demonstrate that anthropogenic nest site use by shrikes is a repeated behavior throughout their range. Notably, the success of at least two of these anthropogenic nesting attempts suggests that these sites may offer suitable nest sites in areas where natural nesting sites are limited. Compiling information on anthropogenic nest site use by bird species may help inform the frequency, effects, and potential conservation benefits of this behavior.

L'utilisation de structures anthropiques dans la nidification de la Pie-grièche migratrice

RÉSUMÉ. À mesure que les activités humaines continuent de remodeler les écosystèmes, de plus en plus de rapports font état de l'utilisation par les oiseaux de sites anthropiques pour leur nidification. Si la grande majorité de ces rapports se concentre sur les espèces nichant dans des cavités ou des nichoirs artificiels, un certain nombre d'espèces utilise également des bâtiments et des structures anthropiques. À ce titre, le comportement de la Pie-grièche migratrice (*Lanius ludovicianus*) n'a fait l'objet que d'une attention limitée, tant dans la littérature que dans les bases de données scientifiques. Nous documentons et compilons ici nos propres observations ainsi que des rapports concernant l'utilisation par la Pie-grièche de structures anthropiques pour la nidification à partir d'un examen des bases de données scientifiques existantes. Les six rapports sur les tentatives de nidification présentés ci-après démontrent que l'utilisation de sites anthropiques est un comportement récurrent chez la Pie-grièche, sur l'ensemble de son aire de répartition. Le succès d'au moins deux de ces tentatives de nidification dans des structures anthropiques suggère que ces sites offrent une alternative appropriée dans les zones qui manquent de sites naturels de nidification. La compilation d'informations sur l'utilisation de sites anthropiques de nidification par les oiseaux peut aider à déterminer la fréquence, les effets et les avantages potentiels de ce comportement pour leur conservation.

Key Words: *grassland bird; human-made structure; man-made structure; nest site selection; urbanization*

INTRODUCTION

Nest site selection plays an important role in determining the fitness of individual birds, directly influencing their survival and reproductive success (Martin 1988, Miller et al. 2007). The choice of nesting site can influence an individual's overall reproductive output and long-term population dynamics by affecting various nest metrics, including predation risk, resource availability, and thermoregulation efficiency (Martin and Roper 1988, McCafferty et al. 2001, Forstmeier and Weiss 2004). As natural nesting sites (e.g., trees, shrubs) diminish because of land development and habitat degradation, many species such as Wood Duck (*Aix sponsa*) have adapted by utilizing anthropogenic structures as alternative nesting sites (Lacki et al. 1987). In some cases, species such as Barn Owls (*Tyto alba*) may preferentially select anthropogenic structures as nest sites even when suitable natural nest sites are available (Martínez and Zuberogoitia 2004).

The use of anthropogenic nesting sites presents benefits and risks that may differ from natural nesting sites (Mainwaring 2015). Potential benefits include reduced competition for nesting sites (Robertson and Rendell 1990), protection from certain natural predators (Møller 2010), and proximity to resources (Evans and Gawlik 2020); however, these sites can also expose birds to unique risks, such as increased predation from urban-adapted predators, higher mortality from collisions with buildings, and disturbances (both intentional and unintentional) from human activities (Fuller et al. 2012, Loss et al. 2012). Additionally, anthropogenic sites may also indirectly impact adult and nestling mortality by increasing the use of anthropogenic materials in nest construction, increasing the risk of entanglement or ingestion of these materials (Wang et al. 2009). These risks, already present in natural nests (Hudecki et al. 2021), could be amplified in anthropogenic environments. In such instances, anthropogenic nest sites may function as ecological traps (Shipley et al. 2013, Reynolds et al. 2019). Moreover, the trade-offs between the benefits and risks associated with nesting on anthropogenic structures may vary depending on factors such as location, nest material composition, and exposure to environmental conditions (Mainwaring et al. 2014, Reynolds et al. 2019, Evans and Gawlik 2023).

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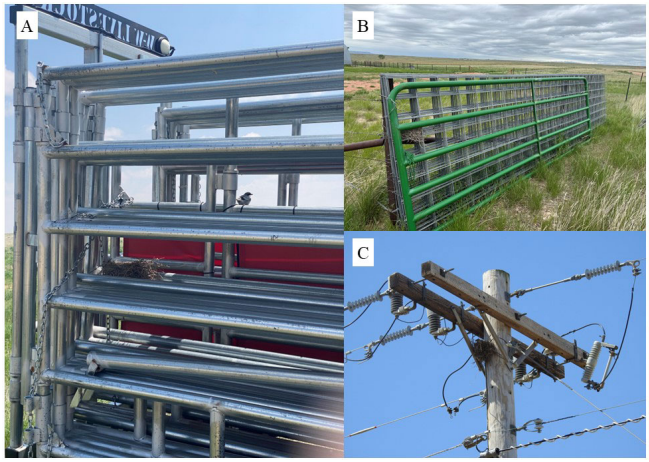
Although previous research on the use of anthropogenic nesting sites has predominantly focused on urban environments, many bird species in non-urban areas also use anthropogenic structures for nesting (Mainwaring 2015, Reynolds et al. 2019). For example, Ospreys (*Pandion haliaetus*) commonly nest on anthropogenic structures such as power distribution poles and transmission towers (Murphy et al. 2024), and Barn Swallows (*Hirundo rustica*) commonly nest in barns and on bridges (Snapp 1976, Tumlison 2007). Additionally, House Sparrows (*Passer domesticus*), which are often associated with human activities, regularly nest in a variety of anthropogenic sites, including building eaves and streetlights, across their range and have become reliant upon human-provided food resources, including food scraps in parking lots in urban areas and even seeds from horse dung in rural areas (Robbins 1973, Gavett and Wakeley 1986). In some instances, anthropogenic structures in rural areas have even facilitated range expansions for species, such as the Common Raven (*Corvus corax*), whose population has increased significantly in the western United States, likely because of human-provided resources like roadkill and tall structures for nesting (Howe et al. 2014). These behaviors highlight the ability of some species to exploit available resources in human-modified environments, even outside of urban settings.

Although the use of anthropogenic structures for nesting has been documented across a variety of habitats in many bird species (Soldatini et al. 2008, Mainwaring 2015, Moreira et al. 2018, Murphy et al. 2024), this behavior has not been thoroughly documented in Loggerhead Shrikes (*Lanius ludovicianus*; hereafter shrike). Shrikes are typically found in open landscapes, including grasslands, shrublands, deserts, agricultural areas, and urban areas across their North American range (Igl et al. 2023). These habitats provide the combination of vertical structures for perching and nesting and relatively open areas for hunting that are crucial for successful breeding shrike populations. Although the use of anthropogenic structures by shrikes for hunting and food caching is well documented (Leonard 1992, O'Brien and Ritchison 2011, Donahue et al. 2021, Maddox 2022), research specifically cataloging the types of structures used for nesting and their implications for nest success is lacking, despite prior reports of nesting on anthropogenic structures (Boal et al. 2003, Hathcock and Hill 2019). Here, we document three instances where shrikes used anthropogenic structures as nesting sites, report the fate of these nesting attempts where known, and discuss the specific types of anthropogenic substrates used for these nests. Additionally, we explored community science platforms to investigate whether similar nesting behaviors of shrikes have been observed and recorded by others across the species range. These observations demonstrate the shrike's adaptability to human-altered environments during the breeding season.

PERSONAL OBSERVATIONS

On 19 May 2023, we located a shrike nest on a portable cattle corral (Fig. 1A) approximately 1.5 m above the ground located on private residential property within Thunder Basin National Grassland, Converse County, Wyoming (43.1836°N, 105.4068° W). A breeding pair had been observed at this location consistently since 2015, with nests in natural substrates and with juveniles observed in some of these years, indicating successful breeding attempts at this site. The surrounding landscape of the property was characterized by a diverse mosaic of vegetation, including Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) and a variety of native grasses and forbs, such as blue grama (*Bouteloua gracilis*), western wheatgrass (*Pascopyrum smithii*), and needle-and-thread (*Hesperostipa comata*). Trees such as plains cottonwood (*Populus deltoides*) are interspersed throughout the surrounding landscape, including one located on the property. Upon discovery, a shrike was observed incubating a nest with six eggs. Unfortunately, the nest was destroyed on 22 May 2023 when the corral was moved. In the following year, on 31 May 2024, we located a shrike nest approximately 30 m from the previous year's nesting site. This nest was constructed on several fencing panels and an unattached gate leaning against a fence (Fig. 1B), also positioned about 1.5 m above the ground. This nest contained 7 eggs, all of which hatched and later fledged on 30 June. The proximity of these nests in consecutive years suggests that the same individual(s) may have returned to the area to breed; however, we cannot confirm that the same individual(s) constructed both nests.

Fig. 1. Personal observations of Loggerhead Shrike (*Lanius ludovicianus*) nests on anthropogenic structures. Nest located on a portable cattle corral (A) and on fencing panels (B), both at Thunder Basin National Grassland, Wyoming, USA (43°19′ 08.5″N, 105°11′13.1″W; 43°19′9.15″N, 105°11′11.43″W). Nest located on a utility pole (C) in Jonesboro, Arkansas, USA (35° 50′51.5″N, 90°33′11.6″W).



On 14 January 2022, we captured a second-year, female shrike in Poinsett County of Northeast Arkansas. We banded this individual with a federal silver band and a unique combination of three plastic, colored bands to allow tracking of the shrike during a separate long-term survival study. This study area is an intensive agricultural area of row-crop monocultures in the Arkansas Delta. The majority of the woody vegetation in this area is restricted to residential properties and consists of cultivated *Quercus, Juniperus, Pinus,* and *Pyrus* spp. Through regular resighting efforts, we know that this female moved 29 km to a new winter territory, an uncommon occurrence among the typically site-faithful shrikes in this study area (Donahue et al. 2024), and occupied this territory during the next two winter seasons. In 2024, we found the previously captured individual,

then a 4-year-old female, defending this new territory with an unbanded, male mate. Upon observation, the pair was found nesting ~9 m up on a utility pole (35.8476°N, -90.5532°W). The pair constructed their nest between two cross-arm brackets (Fig. 1C). We observed the female incubating eggs on 13 April 2024 and the pair feeding young in the nest on 17 April 2024. On 5 May 2024, we confirmed that the shrikes had a successful nesting attempt on this anthropogenic structure upon observing the pair feeding at least two fledged young in a shrub near the nest.

COMMUNITY SCIENCE RECORDS

Following the discovery of the shrike nests on anthropogenic structures in Wyoming and Arkansas, we extended our investigation by searching through shrike photos submitted to the community science platforms iNaturalist and eBird to identify additional instances of this behavior. On iNaturalist, we reviewed all observations submitted from March through August (n = 12,505 as of 8 August 2024; earliest record from 1974). From eBird's Macaulay Library, we examined all photos tagged with "feeding young" (n = 59), "nest building" (n = 32), "nest" (n = 102), and "eggs" (n = 17; earliest record from 1979). Our searches yielded three records of nests on anthropogenic structures from iNaturalist but no records from eBird.

The nests identified through iNaturalist were located in California (n = 2) and Alabama (n = 1). The first nest record from California (observation 214411828, 1 May 2024) was located north of Cantua Creek in Fresno County, an area dominated by solar farms and cropland. The nest was built on part of a collection cable line for a solar farm. The second nest record from California (observation 156692688, 24–25 May 2021) was located on San Clemente Island in Los Angeles County, constructed by an individual of the endangered subspecies *L. l. mearnsi*. This nest appears to have been constructed on the side of a building. The single record from Alabama (observation 209819845, 21 April 2024) was a nest found under a raised house on Dauphin Island, Mobile County, on a narrow barrier island strip consisting of sand dunes and beach houses. The observer noted that the nest was dislodged by strong winds; however, the chicks were old enough to survive the fall and continued to receive care from the adults.

DISCUSSION

We documented three personal observations of shrikes using anthropogenic structures as nesting sites and the resulting outcome of these nesting attempts, providing some of the first detailed observations of this behavior in this species. To further understand this behavior, we also leveraged community science data from eBird and iNaturalist, identifying three additional reports of shrikes nesting on anthropogenic structures. These findings highlight the shrike's adaptability to human-modified landscapes and offer a foundation for future research investigating the benefits and risks associated with anthropogenic structures as nesting sites. Understanding this trade-off is essential for evaluating how anthropogenic nesting sites contribute to the persistence of shrikes, a rapidly declining passerine (Sauer et al. 2019), in increasingly urbanized landscapes.

Several factors and potential trade-offs between costs and benefits may drive shrikes to nest on anthropogenic over natural structures (Mainwaring 2015). The main benefit and factor likely driving anthropogenic nest use by birds in most cases, at least initially, is increased nest site availability provided by anthropogenic structures. The scarcity of natural nesting sites in certain landscapes because of competition or a lack of woody vegetation may lead shrikes to choose an anthropogenic structure as an alternative option (Balmori 2005, Howe et al. 2014, Tryjanowski et al. 2014). Previous research has documented such behavior, with Boal et al. (2003) reporting a successful shrike nest on a utility pole in an urban area of Tucson, Arizona, and Hathcock and Hill (2019) identifying two additional nests on anthropogenic structures in New Mexico, though the success of these nests was not reported. Our personal observations and community science records indicate that the anthropogenic shrike nests reported above were often in areas with limited tree or shrub cover, and where the surrounding landscape consisted of croplands, open grasslands, sand dunes, or solar farms. In the Thunder Basin National Grassland of northeastern Wyoming, a shrub previously used as a shrike nesting site, and located within 100 m of the anthropogenic nests we observed in 2023 and 2024, was removed because of site development between 2018 and 2020. From year to year, natural nesting substrates are lost from the landscape across our study sites, forcing shrikes to use alternative, and often less optimal, nesting sites. In the Arkansas Delta, territories held by wintering shrikes are spaced more densely than those of the breeding population, possibly because the sparsity and steady decline of suitable natural nesting structures limits the number of breeding territories the area can sustain (Author's *personal observation*).

In addition to providing suitable nesting sites in areas where natural substrates are lacking, anthropogenic nest sites may also provide benefits that increase the chances of nesting as species adapt. For example, anthropogenic structures and more urbanized areas may offer shrikes enhanced protection from predators and harsh environmental conditions (Møller 2010, Morelli et al. 2014, Vincze et al. 2017). Although the nest ~9 m up on the utility pole bracket described previously was successful, another shrike nest in this same Arkansas study area in 2021 that was in natural substrate (a mix of *Parthenocissus* and *Vitis* spp.) wrapped around a utility pole and only 2.5 m off the ground quickly failed in the egg stage because of predation. Nests on utility pole brackets are higher (~7–10 m for standard utility poles and brackets) than an average shrike nest on natural structures in most habitats (0.8–2.3 m; Woods and Cade 1996, Chabot et al. 2001, Yosef 2001) and may provide similar protection from ground-based predators. For example, in agricultural areas such as our Arkansas study site and more urban areas, Scissor-tailed Flycatchers (*Tyrannus forficatus*) and Western Kingbirds (*Tyrannus verticalis*) regularly nest on utility pole brackets and electrical substation structures with relatively high rates of nest success (Ellis and Kannan 2004, Worm 2017). Moreover, the physical characteristics of these electrical structures and other anthropogenic nest sites, such as their location on or proximity to buildings, can provide thermal benefits or shelter from wind, potentially enhancing nest success (Mainwaring 2015). For example, Barn Owls nesting in abandoned buildings may experience energy savings from reduced thermoregulation needs (McCafferty et al. 2001) and may also benefit from abundant rodent prey also inhabiting these structures (Rowe et al. 1987). Similarly, anthropogenic structures may reduce the energy

required for nest construction and maintenance (Reynolds et al. 2019). For some species, the combined benefits afforded by these anthropogenic nest sites may make them important conservation tools that may facilitate population growth and colonization in new geographic areas and habitat types (Duckworth 2008, Lera et al. 2023).

Although nesting on anthropogenic structures may be beneficial to birds, including shrikes, there may also be associated costs (Mainwaring 2015). One risk is the increased likelihood of collisions with nearby structures, such as power lines and windows, and passing vehicles on nearby roads (Martin and Shaw 2010, Loss et al. 2012). Given that shrikes often perch on and hunt from power lines in certain habitats, they are already vulnerable to vehicle collisions, a factor hypothesized to contribute to their population declines (Gawlik and Bildstein 1990, Igl et al. 2023). Additionally, nesting on anthropogenic structures can influence predator access to both adult shrikes and their nests. These structures can be more isolated and offer less concealment than natural nest sites, which may increase vulnerability to predators such as feral cats (Batisteli and Pizo 2022, Loss and Marra 2017). Nests may also face risks of failure if constructed on temporary structures. For example, the first nest found in Wyoming in 2023 failed when the portable cattle trailer was moved by humans. Following this event, we then informed collaborators and local property owners in the area about the presence of the nest we located in the same area in 2024, which may have influenced its success. Although failure in this case was the result of interference from humans unaware of the nest's presence, nests may also be deliberately removed if they present a hazard to humans (Brown and Lawson 1989, Hatch 1996).

Given the small sample size of our personal observations (n = 3) and community science records (n = 3), it remains unclear whether the benefits of nesting on anthropogenic structures may outweigh any associated risks for shrikes. We observed two nests that fledged young and a third nest that may have been forced to fledge early because of strong winds. A fourth nest of known fate failed when the structure it was built on was moved by humans. The fates of the two remaining nests were unknown. These mixed outcomes highlight the complexity of the trade-offs involved in nesting on anthropogenic structures. The trade-offs may vary by context depending on the habitat and the type of anthropogenic structure. We observed this behavior repeatedly in the same territory over two consecutive years, potentially by the same individual(s). This repetition may suggest individual preferences for anthropogenic nest sites and highlights the role of nest site fidelity in driving such behaviors. Site fidelity, which can vary across sexes and regions (Igl et al. 2023), may contribute to the persistence and potential prevalence of anthropogenic nest use over time. For example, in the Thunder Basin National Grassland of northeastern Wyoming, the removal of a previously used natural nesting substrate underscores how habitat alterations and site fidelity (or a lack thereof) can influence nesting behaviors and site preferences in varying ways. Despite the removal of the natural substrate, a shrub, previously used for nesting in the shrikes' breeding territory, high breeding-site fidelity likely compelled the future breeding shrikes in this territory to instead use nearby anthropogenic structures, a corral and fencing, for nesting. Because urbanization of bird populations is known to have at least some genetic basis (Müller et al. 2013), tracking anthropogenic nest use within a population can also help reveal individual traits and potential genetic factors that may promote this behavior in some individuals and allow anthropogenic nest use to persist and become more prevalent over generations. Overall, anthropogenic nest use is seen in many bird species (Møller 2010) and may become more common for shrikes as well. More accounts of shrike nesting attempts on anthropogenic structures and their outcomes are needed to better assess their influence on shrike population persistence and monitor the frequency of anthropogenic nest site use in shrikes across time and contexts.

Given the increasing prevalence of anthropogenic structures in many landscapes, understanding their role in avian nesting behavior is important for effective conservation efforts. Although anthropogenic nest sites present ecological traps for some species, they can provide successful alternative nesting sites for others and potentially boost nest survival rates, increase nesting population densities, or even allow species to expand into novel habitat types or geographic regions (Mainwaring 2015). However, caution is warranted, because the efficacy of anthropogenic nesting structures as replacements for natural sites remains unproven in many cases. For example, newly constructed Barn Swallow nesting structures in Ontario, Canada have shown limited success, with social cues such as vocalizations and decoys failing to significantly increase nesting activity (Campomizzi et al. 2019). The personal observations and community science records presented above provide insights into the behavioral plasticity of shrikes, highlighting their ability to use a variety of anthropogenic structures for nesting across different regions of their range. Further studies are needed to assess how the use of anthropogenic nesting sites influences shrike juvenile survival and reproductive success. Understanding these dynamics will be important when developing targeted conservation strategies that account for the adaptability of shrikes in human-altered environments.

Acknowledgments:

We thank the Thunder Basin Research Initiative, the Dr. Fritz L. Knopf Doctoral Fellowship Program in Avian Conservation, the Butler Nongame Species Fund administered by the Wyoming Wildlife Foundation, the Delores and Jerry Etter Graduate Research Scholarship Program, the Arkansas Game and Fish Commission, the Department of Biological Sciences at Arkansas State University, and the Natural Resource Ecology and Management Department at Oklahoma State University for research funding. We also thank D. Pellatz, L. Porensky, B. Crick, G. Paff, and W. Noel for assistance monitoring the Wyoming nest in 2024 and A. Worm for assistance with monitoring the Arkansas nest. We also thank the iNaturalist users Michelle Reynolds, Justyn Stahl, and "yaesh" for submitting their observations.

Data Availability:

No data or code used.

LITERATURE CITED

Balmori, A. 2005. Possible effects of electromagnetic fields from phone masts on a population of White Stork (*Ciconia ciconia*). Electromagnetic Biology and Medicine 24:109-119. https://doi.org/10.1080/15368370500205472

Batisteli, A. F., and M. A. Pizo. 2022. The location of thrush nests on buildings affects the chance of cowbird parasitism. Ecosistemas 31:2196. https://doi.org/10.7818/ECOS.2196

Boal, C. W., T. S. Estabrook, and A. E. Duerr. 2003. Productivity and breeding habitat of Loggerhead Shrikes in a southwestern urban environment. Southwestern Naturalist 48:557-562. https://doi.org/10.1894/0038-4909(2003)048%3C0557:PABHOL%3E2.0.CO;2

Brown, C. J., and J. L. Lawson. 1989. Birds and electricity transmission lines in South West Africa/Namibia. Madoqua 16:59-67.

Campomizzi, A. J., Z. M. Lebrun-Southcott, and K. Richardson. 2019. Conspecific cues encourage Barn Swallow (*Hirundo rustica erythrogaster*) prospecting, but not nesting, at new nesting structures. Canadian Field-Naturalist 133:235-245. https://doi.org/10.22621/cfn.v133i3.2233

Chabot, A. A., D. M. Bird, and R. D. Titman. 2001. Breeding biology and nesting success of Loggerhead Shrikes in Ontario. Wilson Bulletin 113:285-289. https://doi.org/10.1676/0043-5643(2001)113[0285:BBANSO]2.0.CO;2

Donahue, E. R., K. J. Krajcir, L. C. Bryant, R. Raibley, J. L. Wessels, J. Youtz, and T. J. Boves. 2021. Non-breeding behavior and diet of Loggerhead Shrikes in an intensive agricultural region. Southeastern Naturalist 20:427-447. https://doi.org/10.1656/058.020.0304

Donahue, E. R., A. J. Worm, J. L. Wessels, J. Youtz, L. C. Bryant, A. E. Matthews, K. J. Krajcir, R. Raibley, and T. J. Boves. 2024. Evaluating demographic habitat partitioning and its consequences during the non-breeding season in Loggerhead Shrikes. Journal of Field Ornithology 95(2):1. https://doi.org/10.5751/JFO-00454-950201

Duckworth, R. A. 2008. Adaptive dispersal strategies and the dynamics of a range expansion. American Naturalist 172(S1): S4-17. https://doi.org/10.1086/588289

Ellis, E., and R. Kannan. 2004. Western Kingbird (*Tyrannus verticalis*): recently established breeding bird in Arkansas. Journal of the Arkansas Academy of Science 58:52-59. https://scholarworks.uark.edu/jaas/vol58/iss1/10

Evans, B. A., and D. E. Gawlik. 2020. Urban food subsidies reduce natural food limitations and reproductive costs for a wetland bird. Scientific Reports 10:14021. https://doi.org/10.1038/s41598-020-70934-x

Evans, J. D., and D. E. Gawlik. 2023. Productivity and nestling mortality for three species of herons at natural and anthropogenic islands. Waterbirds 45:371-382. https://doi.org/10.1675/063.045.0402

Forstmeier, W., and I. Weiss. 2004. Adaptive plasticity in nest-site selection in response to changing predation risk. Oikos 104:487-499. https://doi.org/10.1111/j.0030-1299.1999.12698.x

Fuller, R. A., K. N. Irvine, Z. G. Davies, P. R. Armsworth, and K. J. Gaston. 2012. Interactions between people and birds in urban landscapes. Studies in Avian Biology 45:249-266. https://doi.org/10.1525/california/9780520273092.003.0016

Gavett, A. P., and J. S. Wakeley. 1986. Diets of House Sparrows in urban and rural habitats. Wilson Bulletin 98:137-144.

Gawlik, D. E., and K. L. Bildstein. 1990. Reproductive success and nesting habitat of Loggerhead Shrikes in north-central South Carolina. Wilson Bulletin 102:37-48. https://hdl.handle.net/1969.6/95554

Hatch, J. J. 1996. Threats to public health from gulls (*Laridae*). International Journal of Environmental Health Research 6:5-16. https://doi.org/10.1080/09603129609356867

Hathcock, C. D., and M. T. Hill. 2019. Loggerhead Shrike predation on dune-dwelling lizards and nesting success in southeastern New Mexico. Southwestern Naturalist 63:220-224. https://doi.org/10.1894/0038-4909-63-4-220

Howe, K. B., P. S. Coates, and D. J. Delehanty. 2014. Selection of anthropogenic features and vegetation characteristics by nesting Common Ravens in the sagebrush ecosystem. Condor 116:35-49. https://doi.org/10.1650/CONDOR-13-115-R2.1

Hudecki, J., H. Wheeler, and A. Chabot. 2021. Evidence and impact of plastic use by the Loggerhead Shrike (*Lanius ludovicianus*). Wilson Journal of Ornithology 132:729-733. https://doi.org/10.1676/19-83

Igl, L. D., J. A. Shaffer, D. H. Johnson, M. L. Sondreal, C. M. Goldade, M. P. Nenneman, A. L. Zimmerman, J. P. Thiele, and B. R. Euliss. 2023. The effects of management practices on grassland birds—Loggerhead Shrike (*Lanius ludovicianus*). No. 1842-T. U.S. Geological Survey, Northern Prairie Wildlife Research Center, North Dakota, USA. https://doi.org/10.3133/pp1842T

Lacki, M. J., S. P. George, and P. J. Viscosi. 1987. Evaluation of site variables affecting nest box use by wood ducks. Wildlife Society Bulletin 15:196-200.

Leonard, D. L. 1992. Monthly variation in a Loggerhead Shrike cache in central Florida. Florida Field Naturalist 20(4):3. https://digitalcommons.usf.edu/ffn/vol20/iss4/3

Lera, D. N., N. Cozzani, J. L. Tella, and S. Zalba. 2023. Anthropogenic nesting sites and density of Burrowing Parrot (*Cyanoliseus patagonus*) in northern Argentinian Patagonia. Revista Chilena de Historia Natural 96:10. https://revchilhistnat.biomedcentral.com/articles/10.1186/s40693-023-00123-3

Loss, S. R., and P. P. Marra. 2017. Population impacts of free-ranging domestic cats on mainland vertebrates. Frontiers in Ecology and the Environment 15:502-509. https://doi.org/10.1002/fee.1633

Loss, S. R., T. Will, and P. P. Marra. 2012. Direct human-caused mortality of birds: improving quantification of magnitude and assessment of population impact. Frontiers in Ecology and the Environment 10:357-364. https://doi.org/10.1890/110251

Maddox, K. A. 2022. Use of space and foraging behavior of Loggerhead Shrikes in urban areas. Thesis. Coastal Carolina University, Conway, South Carolina, USA.

Mainwaring, M. C. 2015. The use of man-made structures as nesting sites by birds: a review of the costs and benefits. Journal for Nature Conservation 25:17-22. https://doi.org/10.1016/j.jnc.2015.02.007

Mainwaring, M. C., I. R. Hartley, M. Lambrechts, and D. C. Deeming. 2014. The design and function of birds' nests. Ecology and Evolution 4:3909-3928. https://doi.org/10.1002/ece3.1054

Martin, G. R., and J. M. Shaw. 2010. Bird collisions with power lines: failing to see the way ahead? Biological Conservation 143:2695-2702. https://doi.org/10.1016/j.biocon.2010.07.014

Martin, T. E. 1988. Processes organizing open-nesting bird assemblages: competition or nest predation? Evolutionary Ecology 2:37-50. https://doi.org/10.1007/BF02071587

Martin, T. E., and J. J. Roper. 1988. Nest predation and nest-site selection of a western population of the Hermit Thrush. Condor 90:51-57. https://doi.org/10.2307/1368432

Martínez, J. A., and I. Zuberogoitia. 2004. Habitat preferences and causes of population decline for Barn Owls Tyto alba: a multi-scale approach. Ardeola 51:303-317.

McCafferty, D. J., J. B. Moncrieff, and I. R. Taylor. 2001. How much energy do Barn Owls (*Tyto alba*) save by roosting? Journal of Thermal Biology 26:193-203. https://doi.org/10.1016/S0306-4565(00)00042-5

Miller, D. A., J. B. Grand, T. F. Fondell, and R. M. Anthony. 2007. Optimizing nest survival and female survival: consequences of nest site selection for Canada Geese. Condor 109:769-780. https://doi.org/10.1093/condor/109.4.769

Møller, A. P. 2010. The fitness benefit of association with humans: elevated success of birds breeding indoors. Behavioral Ecology 21:913-918. https://doi.org/10.1093/beheco/arq079

Moreira, F., R. C. Martins, I. Catry, and M. D'Amico. 2018. Drivers of power line use by White Storks: a case study of birds nesting on anthropogenic structures. Journal of Applied Ecology 55:2263-2273. https://doi.org/10.1111/1365-2664.13149

Morelli, F., M. Beim, L. Jerzak, D. Jones, and P. Tryjanowski. 2014. Can roads, railways and related structures have positive effects on birds? A review. Transportation Research Part D: Transport and Environment 30:21-31. https://doi.org/10.1016/j.trd.2014.05.006

Müller, J. C., J. Partecke, B. J. Hatchwell, K. J. Gaston, and K. L. Evans. 2013. Candidate gene polymorphisms for behavioural adaptations during urbanization in blackbirds. Molecular Ecology 22:3629-3637. https://doi.org/10.1111/mec.12288

Murphy, N. K., M. R. Boudreau, B. S. Dorr, K. Slankard, and S. A. Rush. 2024. Identifying priority mitigation areas for human-Osprey conflict. Journal of Wildlife Management 88: e22540. https://doi.org/10.1002/jwmg.22540

O'Brien, E., and G. Ritchison. 2011. Non-breeding ecology of Loggerhead Shrikes in Kentucky. Wilson Journal of Ornithology 123:360-366. https://doi.org/10.1676/10-146.1

Reynolds, S. J., J. D. Ibáñez-Álamo, P. Sumasgutner, and M. C. Mainwaring. 2019. Urbanisation and nest building in birds: a review of threats and opportunities. Journal of Ornithology 160:841-860. https://doi.org/10.1007/s10336-019-01657-8

Robbins, C. S. 1973. Introduction, spread, and present abundance of the House Sparrow in North America. Ornithological Monographs 14:3-9. https://doi.org/10.2307/40168051

Robertson, R. J., and W. B. Rendell. 1990. A comparison of the breeding ecology of a secondary cavity nesting bird, the Tree Swallow (*Tachycineta bicolor*), in nest boxes and natural cavities. Canadian Journal of Zoology 68:1046-1052. https://doi.org/10.1139/z90-152

Rowe, F. P., R. J. Quy, and T. Swinney. 1987. Recolonization of the buildings on a farm by house mice. Acta Theriologica 32 (1):3-19. https://doi.org/10.4098/AT.arch.87-1

Sauer, J. R., D. K. Niven, J. E. Hines, D. J. Ziolkowski Jr., K. L. Pardieck, J. E. Fallon, and W. A. Link. 2019. The North American Breeding Bird Survey, results and analysis 1966 -2019. Version 2.07.2019. USGS Patuxent Wildlife Research Center, Laurel, Maryland, USA.

Shipley, A. A., M. T. Murphy, and A. H. Elzinga. 2013. Residential edges as ecological traps: postfledging survival of a ground-nesting passerine in a forested urban park. Auk 130:501-511. https://doi.org/10.1525/auk.2013.12139

Snapp, B. D. 1976. Colonial breeding in the Barn Swallow (*Hirundo rustica*) and its adaptive significance. Condor 78:471-480. https://doi.org/10.2307/1367096

Soldatini, C., Y. V. Albores-Barajas, D. Mainardi, and P. Monaghan. 2008. Roof nesting by gulls for better or worse? Italian Journal of Zoology 75:295-303. https://doi.org/10.1080/11250000701884805

Tryjanowski, P., T. H. Sparks, L. Jerzak, Z. M. Rosin, and P. Skórka. 2014. A paradox for conservation: electricity pylons may benefit avian diversity in intensive farmland. Conservation Letters 7:34-40. https://doi.org/10.1111/conl.12022

Tumlison, C. R. 2007. Survey of nesting by Cliff Swallows (*Petrochelidon pyrrhonota*) and Barn Swallows (*Hirundo rustica*) at highway bridges in southern Arkansas. Journal of the Arkansas Academy of Science 61:104-108. https://scholarworks.uark.edu/jaas/vol61/iss1/18

Vincze, E., G. Seress, M. Lagisz, S. Nakagawa, N. J. Dingemanse, and P. Sprau. 2017. Does urbanization affect predation of bird nests? A meta-analysis. Frontiers in Ecology and Evolution 5:29. https://doi.org/10.3389/fevo.2017.00029

Wang, Y., S. Chen, R. B. Blair, P. Jiang, and P. Ding. 2009. Nest composition adjustments by Chinese Bulbuls *Pycnonotus sinensis* in an urbanized landscape of Hangzhou (E China). Acta Ornithologica 44:185-192. https://doi.org/10.3161/000164509X482768

Woods, C. P., and T. J. Cade. 1996. Nesting habits of the Loggerhead Shrike in sagebrush. Condor 98:75-81. https://doi.org/10.2307/1369510

Worm, A. J. 2017. Causes and consequences of range expansion in the genus Tyrannus. Thesis. Arkansas State University, Jonesboro, Arkansas, USA.

Yosef, R. 2001. Nesting ecology of resident Loggerhead Shrikes in southcentral Florida. Wilson Bulletin 113:279-284. https://doi.org/10.1676/0043-5643(2001)113[0279:NEORLS]2.0.CO;2

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