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First reported case of a stacked sedge wren (Cistothorus stellaris) nest in northern Illinois

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Short Report

Keywords: Cistothorus stellaris, nest stacking, wet meadow, Illinois

Posted Date: August 19th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10102192/v1

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Additional Declarations: No competing interests reported.

Abstract

Nest stacking occurs when a bird builds one or more nests on top of an older nest. Possible drivers of nest stacking include competition for limited nest-sites, habitat quality, predator avoidance, stage of the breeding season, and reduced time and energy needed to build a new nest. On June 2, 2025, we discovered a double decker sedge wren (*Cistothorus stellaris*) nest at Goose Lake Prairie State Natural Area, Grundy County, northeastern Illinois. The male, a second-year bird breeding for the first time, constructed a complete, lined nest directly on top of another nest he had built that season. Upon discovery, the lower nest was unoccupied, and the upper nest contained a clutch of five eggs. The upper nest was subsequently depredated, likely by a snake. We suggest that habitat limitation potentially drove nest stacking behavior, given that the territory it occurred in was small, fragmented, and dominated by invasive reed canary grass (*Phalaris arundinacea*). To our knowledge, this is the first documented instance of nest stacking in sedge wrens.

Full Text

Nest stacking occurs when a bird builds a new nest on top of an older nest, resulting in a double, triple, or multi-decker structure (Gadek et al. 2022). Though seldom-reported, examples of nest stacking have been described predominantly in emergent wetland and wet meadow bird species. In central Washington, Verner and Engelsen (1970) found 39 pairs of stacked marsh wren *(Cistothorus palustris)* nests. Gadek et al. (2022) found a triple-decker nest in Peru consisting of a many-colored rush tyrant (*Tachuris rubrigastra*) nest constructed on top of a wren-like rushbird *(Phleocrptes melanops)* nest, which was constructed atop another wren-like rushbird nest. In Northwest Serbia, Mérő et al. found a stacked great reed warbler *(Acrocephalus arundinaceus)* nest in which the bottom nest was unoccupied, and the top nest contained four warbler eggs, one cuckoo nestling, and one cuckoo egg (2025). Additional examples of nest stacking in woodland and forest birds include the violet-chested hummingbird (*Sternoclyta cyanopectus*) and cerulean warbler (*Setophaga cerulea*) (Fierro-Calderón and Martin 2007; Nemes et al. 2015).

Birds may stack nests in response to reduced energy costs, habitat conditions, nesting site limitations, or predator avoidance (Gadek et al. 2022). Nest-building is energetically costly (Mainwaring and Hartley 2013; Taylor et al. 2024), and nest stacking may help birds conserve energy. Birds use the old nest as a base for the new nest, reducing time spent collecting materials and constructing the bottom of the nest (Gadek et al. 2022). Nest stacking may allow birds to renest faster and maintain fitness after clutch loss (Arnold et al. 2010). Where high-quality nesting habitat is limited, birds may reuse existing structures rather than nesting in low-quality locations. Stacked nests may also reduce predation risk, as multiple unused nests within a territory can function as decoys, luring predators away from active nests (Gadek et al. 2022).

Sedge wrens (*Cistothorus stellaris*) primarily breed in the northern regions of the midwestern United States (Illinois, Iowa, Wisconsin, Minnesota) and Canada (Saskatchewan) (Herkert et al. 2021). Their breeding habitat includes marsh edges, wet sedge meadows, and grasslands (Ramírez-Garofalo et al. 2021), all of which have declined substantially across North America due to agricultural land conversion and urban development, reducing the availability of suitable nesting sites (Dahl 1990; Herkert et al. 2021). Sedge wrens weave multiple, globe-shaped nests from grasses and sedges during the breeding season, lining active nests with fine grasses, feathers, and fur (Walkinshaw 1935; Burns 1982).

Several studies, including Walkinshaw (1935) in Michigan, Burns (1982) in Minnesota, and Bedell (1996) in Nebraska, collectively document hundreds of sedge wren nests with no reported instances of stacking. Here we describe the first recorded double decker sedge wren nest and discuss potential drivers of this behavior.

During May-July 2025, we conducted sedge wren nest searching surveys at Goose Lake Prairie State Natural Area (Goose Lake), Grundy County, northeastern Illinois. Goose Lake contains sedge meadows, remnant glacial wetlands, ponds, tallgrass prairie, and oak-hickory stands. Graminoids present in sedge wren territories at Goose Lake include native tussock sedge (*Carex stricta*), troublesome sedge (*Carex molesta*), indiangrass (*Sorghastrum nutans*), porcupine needlegrass (*Hesperostipa spartea*), and multiple invasive species: reed canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), and smooth brome *(Bromus inermis)*.

We observed sedge wrens for behavioral cues such as male song, male and female calls, males carrying nest building material or food, and adults flushing from nests. Upon finding a nest, we recorded its location, material components, height, status (building, complete, lined, containing eggs or chicks), and the number of eggs or chicks. We used target mist-netting to capture sedge wrens, and aged and sexed birds following Pyle (1997).

We monitored a total of nine nests in fifteen sedge wren territories at Goose Lake. We detected a second-year male sedge wren nest building on May 15, 2025. The nest was partially constructed and surrounded by invasive reed canary grass. When we checked the completed nest on May 22, we detected a female within 8 m of Nest A and additionally detected a second, unlined dummy nest (Nest B) which was not used as a breeding nest. We were unable to relocate Nest A on our May 29 visit; however, the male and female were observed within 10 m and 30 m of the nest, respectively.

On June 2, 2025, we discovered that the male had constructed an additional nest (Nest C) directly on top of Nest A, to create a double decker nest (Figure 1). The lower Nest A was constructed 16 cm above ground and was 13 cm tall, with the top of the nest at 29 cm. The second, upper Nest C was 14 cm tall with the top of the nest at 43 cm. The upper nest was lined, woven from invasive reed canary grass, and contained five eggs. We observed the male and female within 3 m of Nest C. When we checked Nest C on June 10, it had sagged, likely from heavy rain. However, the nest still contained 5 eggs, and the female was observed carrying lining to the nest, likely attempting to repair it after the storm. The male was not detected. When we checked Nest C on June 17, 2025, it was depredated and empty. The nest was intact, with the nest entrance hole unchanged, suggesting it may have been depredated by a snake.

Our documentation of nest stacking in sedge wrens adds to a small but growing body of literature describing this rare behavior predominantly in marsh and wet meadow passerines (Verner and Engelsen 1970; Gadek et al. 2022; Mérő et al. 2025). This observation occurred at Goose Lake Prairie State Natural Area, a rare wet meadow remnant embedded in the fragmented agricultural and urban landscape of northeastern Illinois. Since the 1800s, Illinois has lost over 90% of its historic wetlands (Dahl 1990), wet meadows (Ramírez-Garofalo et al. 2021), and prairies (Comer et al. 2018) due to urban development, agricultural conversion, and woody encroachment, reducing available sedge wren breeding habitat. The spread of invasive plants may additionally degrade songbird territory quality by altering the local invertebrate community and affecting food availability (Wigginton et al. 2022) or increasing predation risk (Maresh Nelson et al. 2018). We suggest that habitat limitations are the most probable driver of nest stacking in our observation, given the characteristics of the male and territory involved.

The territory surrounding the double-decker nest was dominated by invasive reed canary grass and was smaller than other sedge wren territories at Goose Lake Prairie, bordered on all sides by mowed footpaths. Sedge wrens prefer more contiguous tracts of wet meadow and grassland for their territories (Johnson and Igl 2001), and fragmentation and presence of invasive species likely constrained suitable nest building locations in the territory. The second-year male that built the double-decker nest was breeding for the first time and was potentially less competitive than older birds. After-second-year males with prior breeding experience often outcompete second-year males for high-quality territories in other polygynous species (Alatalo et al. 1986). The combination of degraded territory quality and competitive disadvantage of a first-time breeder may have rendered building on an existing nest structure the most viable option for renesting without abandoning the territory.

The double-decker nest was depredated, and its intact nest structure and unchanged entrance hole suggest the nest was likely depredated by a snake. Authors previously observed a North American racer (*Coluber constrictor*) depredating a sedge wren nest at Goose Lake. Additional snake species documented in Goose Lake that may prey on bird eggs include eastern fox snake (*Pantherophis vulpinus*), common garter snake (*Thamnophis sirtalis*), and common watersnake (*Nerodia sipedon*) (iNaturalist 2026). While multiple stacked nests may confuse predators searching for active nests within a territory (Gadek et al. 2022), for sedge wrens, a stacked nest may attract predators due to its greater overall size and visibility compared to a typical single, low-to-the-ground, concealed nest. Second-year males may also be less effective at nest defense compared to older individuals as has been found in other bird species (Pugesek 1983), which may have contributed to nest depredation at the double-decker nest.

Taken together, the degraded territory quality, potential competitive disadvantage of a first-time breeder, and apparent nest failure highlight the value of continued long-term sedge wren nest monitoring at sites like Goose Lake Prairie, where habitat fragmentation and invasive species may relegate less competitive individuals into marginal territories. Sedge wren nesting ecology remains relatively understudied (Herkert et al., 2021). Further observations of nest stacking across sites are needed to evaluate whether this behavior is associated with reduced habitat quality and whether it affects sedge wren reproductive success.

Declarations

Acknowledgements

We would like to thank Bryan Wagner, the Illinois State Toll Highway Authority (ISTHA), and the University of Illinois Population and Community Ecology (PaCE) laboratory for supporting fieldwork and research. We thank the private landowners, state, and government agencies that provided permits and land access.

Funding

This work was supported by the Illinois State Toll Highway Authority [ITHA RR–15–4228].

Author Contributions

All authors contributed to the study conception and design. B.J.D. and A.A.R. conducted all observations in the field, and both authors took photographs. The first draft of the manuscript was written by B.J.D., and all authors commented on subsequent versions of the manuscript. B.J.D. and A.A.R. read and approved the final manuscript.

Disclosure of Potential Conflicts of Interest

The authors have no competing interests to declare.

Research Involving Animals

All sedge wren captures and handling were approved by the University of Illinois IACUC protocol #24093 and USGS federal banding permit #24153. We received State Land and Research permits from the Illinois Department of Natural Resources.

Data Availability

All data that support the findings of this study are reported in the text.

References

1. Alatalo, R.V., Gustafsson, L., and Lundberg, A. 1986. Do females prefer older males in polygynous bird species? The American Naturalist 127(2):241-245.
2. Arnold, T.W., Devries, J.H., and Howerter, D.W. 2010. Factors that affect nesting in mallards *(Anas platyrhynchos)*. The Auk 127(1):212-221.
3. Bedell, P.A. 1996. Evidence of dual breeding ranges for the sedge wren in the central Great Plains. Wilson Bulletin 108:115–122.
4. Burns, J. T. 1982. Nests, Territories, and Reproduction of sedge wrens (*Cistothorus platensis*). Wilson Bulletin94(3):338-349.
5. Comer, P. J.,Hak, J. C., Kindscher, K., Muldavin, E., and Singhurst, J. 2018. Continent-Scale Landscape Conservation Design for Temperate Grasslands of the Great Plains and Chihuahuan Desert. Natural Areas Journal 38(2):196-211.
6. Dahl, T. E. 1990. Wetlands losses in the United States 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 21 pp.

7. Fierro-Calderón, K., and Martin, T.E. 2007. Reproductive biology of the violet-chested hummingbird in Venezuela and comparisons with other tropical and temperate hummingbirds. Ornithological Applications 109(3):680-685. https://doi.org/10.1093/condor/109.3.680
8. Gadek, C. R., Williamson, J. L., and Witt, C. C. 2022. Intra- and interspecific nest stacking in marsh-dwelling songbirds. Biotropica 54:1131–1136. https://doi-org/10.1111/btp.13154
9. Herkert, J. R., D. E. Kroodsma, and J. P. Gibbs. 2021. Sedge wren (*Cistothorus stellaris*), version 1.0. In Birds of the World (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. Accessed 28 October 2025. https://doi-org/10.2173/bow.sedwre1.01.
10. iNaturalist. 2026. "Goose Lake Prairie State Natural Area." Accessed 12 June 2026. URL: https://www.inaturalist.org/observations?place_id=168647&iconic_taxa=Reptilia
11. Johnson, D. H. and Igl, L. D. 2001. Area Requirements of Grassland Birds: A Regional Perspective. The Auk 118(1):24–34. https://doi.org/10.1093/auk/118.1.24
12. Illinois Department of Natural Resources (IDNR). 2026. North American racer. Accessed 5/1/2026. https://dnr.illinois.gov/education/wildaboutpages/wildaboutsnakes/wasnfamilycolubridae/wasnnorthamericanracer.html.
13. Mainwaring, M. C. and Hartley, I. R. 2013. The Energetic Costs of Nest Building in Birds. Avian Biology Research 6(1):12-17. https://doi.org/10.3184/175815512X13528994072997
14. Maresh Nelson, S.B., Coon, J.J., Duchardt, C.J., Miller, J. R., Debinski, D.M., and Schacht, W.H. 2018. Contrasting impacts of invasive plants and human-altered landscape context on nest survival and brood parasitism of a grassland bird. Landscape Ecology 33:1799–1813.
15. Mérő, T., Žuljević, A., Šećerov, I., and Malbaša, D. 2025. A case of nest stacking in the great reed warbler *Acrocephalus arundinaceus*. Natura Croatica 34:89-192.
16. Nemes, C., Islam, K., and & Pirtle, D. 2015. First Documentation of a "Double-Decker" cerulean warbler *(Setophaga cerulea*) Nest. The Wilson Journal of Ornithology 127:534-538.
17. Pugesek, B.H. 1983. The relationship between parental age and reproductive effort in the California gull (*Larus californicus*). Behavioral Ecology and Sociobiology 13:161-171.
18. Pyle, P. 1997. Identification Guide to North American Birds, Part I: Columbidae to Ploceidae. Slate Creek Press, Bolinas, California.
19. Ramírez-Garofalo, J., Curley, S., and Field, C. 2021. Breeding by sedge wrens at an Urban Reclaimed Landfill in New York. Urban Naturalist 46:1-10.
20. Taylor, C. J., Mainwaring, M. C., and Medina, I. 2024. The fecundity costs of building domed nests in birds. Journal of Evolutionary Biology 37(11):1378-1385. https://doi.org/10.1093/jeb/voae117
21. Verner, J., and Engelsen, G.H. 1970. Territories, multiple nest building, and polygyny in the long-billed marsh wren. The Auk 87(3):557–567.
22. Walkinshaw, L. R. 1935. Studies of the short-billed marsh wren (*Cistothorus stellaris*) in Michigan. Wilson Bulletin 52:361-368.
23. Wigginton, R. D., Van Grootheest, C., Spautz, H., Grenier, J. L., and Whitcraft, C. R. 2022. Stable isotope mixing models demonstrate the role of an invasive plant in wetland songbird food webs. Applications in Plant Sciences 10(4), e11486. https://doi.org/10.1002/aps3.11486

Figures

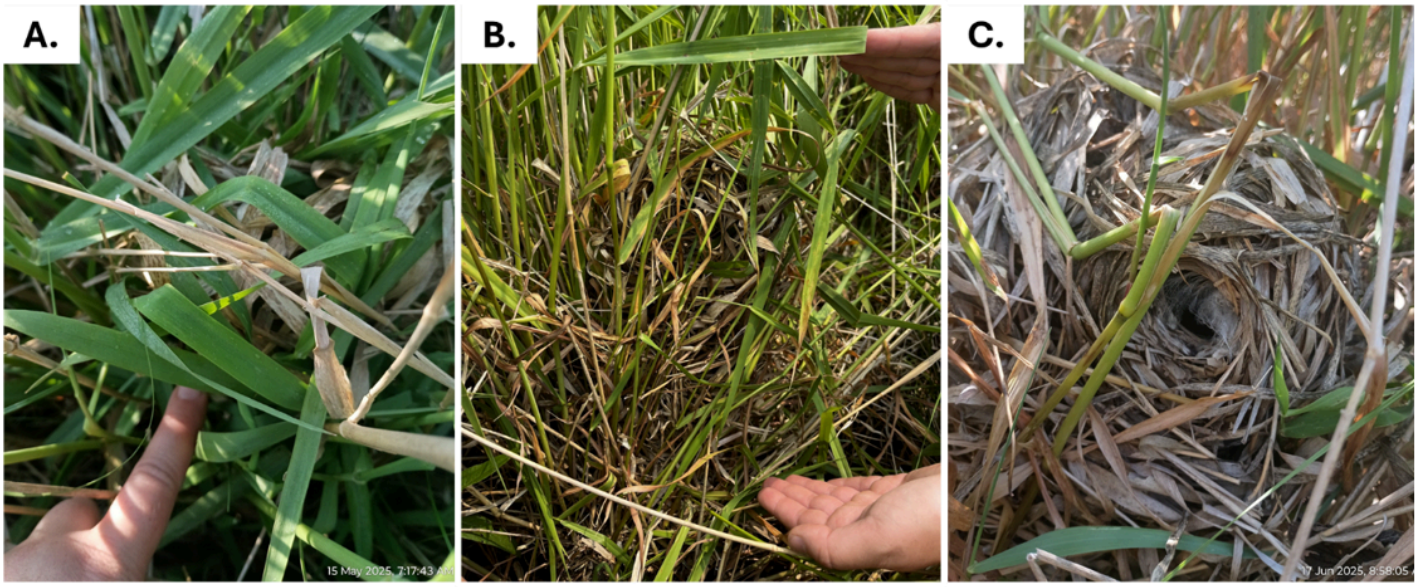


Figure 1

A. Original sedge wren nest (Nest A) found on May 15, 2025, in Goose Lake Prairie State Natural Area (Goose Lake), Grundy County, Illinois (N 41.36226°, E -88.31377°). B. Double decker sedge wren nest found on June 2, 2025, with the new nest (Nest C) built on top of Nest A. C. Upper double decker Nest C photographed on June 17, 2025. Both nests were constructed using invasive reed canary grass.