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LOGGERHEAD SHRIKE (*LANIUS LUDOVICIANUS*) IN THE GULF COAST JOINT VENTURE REGION, USA: STATUS, HABITAT DELIVERY, AND MONITORING

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Abstract.

The United States Gulf of Mexico coastal region provides important habitat for resident and wintering Loggerhead Shrikes (Lanius ludovicianus); however, as in most of the species' range populations have declined since the 1970's. Possible factors in declines include loss and alteration of grassland habitat, changes in farming practices, contaminants, and introduced competitor species. The Gulf Coast Joint Venture (GCJV) is a regionally based, biologically driven, landscape-oriented volunteer partnership of private, state, and federal conservation organizations dedicated to the delivery of habitat important to priority bird species. Loggerhead Shrike is a priority species for the GCJV partnership. The GCJV partnership's Coastal Grassland Restoration Incentive Program (C-GRIP) provides financial incentives to private landowners for conducting habitat treatments that address the greatest limiting factors to provide suitable grassland bird habitat on their property. Implemented in 2018, the C-GRIP program is a way for the GCJV to deliver bird habitat to meet its planning objectives for Loggerhead Shrike and other grassland birds. GCJV staff have developed a monitoring protocol to assess the performance of the C-GRIP habitat delivery program. The monitoring objective is to evaluate whether or not the C-GRIP program is effective in providing a relative increase in the density (number/acre) of priority grassland bird species in focal delivery areas versus control areas over a 10-year period. Monitoring commenced in 2022. A total of 21 Loggerhead Shrikes were detected in 2022, 14 on treatment survey routes and 7 on control routes. In 2023, 16 Loggerhead Shrikes were detected, 10 on treatment survey routes and 6 on control routes. GCJV staff plan on conducting surveys on these routes through 2032.

Key words: *Loggerhead Shrike, Gulf Coat Joint Venture, habitat delivery, monitoring*

Introduction

North American grassland bird abundance has declined by greater than fifty percent between 1970-2017 (Rosenberg et al. 2019), and specifically, Loggerhead Shrikes (*Lanius ludovicianus*) have declined by 74 percent between 1970-2014 (Rosenberg et al. 2016). Loggerhead Shrike was formerly a common resident and wintering species along the northern United States (U.S.) Gulf of Mexico region (Lowery 1974, Imhof 1976, Remsen et al. 1991, Turcotte and Watts 1999). Remsen et al. (1991) estimated 4,366 resident Loggerhead Shrikes in a 1,191 square mile (~3,085 square kilometer) study area, and contrasted that relative abundance with declines in other parts of the United States noted by researcher in the 1980's. However, as early as 1960, Imhof (1976) noted declines in Alabama. Between 1966 – 2019, populations in the Gulf of Mexico coastal states of Texas, Louisiana, and Mississippi declined by approximately two percent per year (Sauer et al. 2020). As in other parts of the species' range, the possible reasons for declines are many, but it is not clear which ones are most significantly driving declines.

Loss or significant alteration of Loggerhead Shrike breeding, wintering, and migration habitat is probably an important factor linked to population declines along the U.S. Gulf of Mexico coast. Of an historic 12 million acres (~5 million hectares) of coastal prairie in the states of Texas and Louisiana, less than one percent remain, the majority converted to row-crop agriculture, exotic grass pasture or human development (NOAA 2023, TCPI 2023). Suppression of historic fire regimes have enabled invasive woody species to colonize grasslands and savannas, and intensive cattle (*Bos taurus*) grazing has resulted in reduced plant species and habitat structural diversity (Allain et al. 1999). The changes in farming practices that are believed to have contributed to declines in Northern Bobwhite (*Colinus virginianus*) have likely affected Loggerhead Shrikes as well. Farming practices that favor large patches of uniform crops often eliminate fence row habitat that provides perches and nesting habitat (Brennan et al. 2005). Use of agricultural habitat and position in the food chain potentially puts Loggerhead Shrikes at risk to exposure to pesticides (Fraser and Luukkonen 1986). The role

of contaminants in the species' decline remains uncertain, yet there are concerns that arthropod prey availability is significantly reduced through pesticide use (Yosef 1994, 2020).

While some research indicates that breeding habitat is not limited for Loggerhead Shrikes (Brooks and Temple 1990, Lymn and Temple 1991) the juxtaposition of habitat may have changed in a way that limits habitat suitability. In South Carolina, Froehly et al. (2018) found that Loggerhead Shrike occupancy was best predicted by the amount of pasture within a 1-km radius of survey points, with predicted occupancy ranging from two percent when there was no pasture within a 1-km radius to 98 percent when there was 43 percent or more pasture within that radius. Their results suggested that only eight percent of the South Carolina coastal plain was occupied by breeding Loggerhead Shrikes.

Wintering habitat along the Gulf of Mexico coast has changed as well. Crouch et al. (2019) examined habitat use by wintering Loggerhead Shrikes and found that medium-and high-intensity human development had increased by over 15 percent in their south Texas study area between 2001 – 2011. This decrease in winter habitat (and presumed overwinter mortality impacts) may be a factor in continental shrike declines (Temple 1988). With increased human development comes increased vehicular traffic, and shrikes are vulnerable to vehicle strikes due to habitat use and flight patterns (Yosef 2020). Flickinger (1995) found that shrikes were over-represented relative to their overall abundance in a Texas highway mortality study.

The impacts of fire ants (*Solenopsis invicta*) on Loggerhead Shrikes and other birds have been debated. Introduced into the Unites States in the 1930's, the ant has spread into at least 14 states and Puerto Rico and affects more than 367 million acres (148 million ha) of land (USDA 2023). Fire ants are aggressive predators and feed on most of the same food items preferred by shrikes, including grasshoppers, crickets, beetles, small mammals, and birds. Fire ant impacts on wildlife remains a controversial topic, and Yosef and Lohrer (1995) urged caution, as the impacts of broad-scale pesticide applications in an effort to control fire ants may be more damaging to Loggerhead Shrikes than the ants' impacts. However, Allen et al. (2001) found insect abundance, species richness and diversity, and Loggerhead Shrike abundance was greater on sites treated with fire ant baits than on control sites. Similarly, Morrow et al. (2015) found evidence that fire ants indirectly affected Attwater's Greater Prairie-Chicken (*Tympanuchus cupido attwateri*) survival by suppressing invertebrate abundance and posited that the same mechanism could be contributing to declines of other insectivorous species.

Due to the importance of the U.S. Gulf of Mexico coast to the species and because of the declines described above, Loggerhead Shrike was selected as a priority species for conservation planning and habitat delivery by the Gulf Coast Joint Venture partnership. The Gulf Coast Joint Venture (GCJV) is one of over twenty voluntary partnerships in North America dedicated to the conservation of priority bird species habitats. Identified in the North American Waterfowl Plan (U.S. Department of the Interior and Environment Canada, 1986) bird habitat Joint Ventures are coalitions of private and governmental organizations, able to pool resources and work across political boundaries to address priority avian research and habitat management projects. The GCJV region encompasses the coastal portion of the U.S. states of Texas, Louisiana, Mississippi, and Alabama (Figure 1). Staff use an adaptive management framework to step down the North American continental bird plans' population objectives to the GCJV region, develop population-habitat models to determine how much and what kind of habitat is needed to achieve the objectives, work with partner agencies to deliver habitat, monitor outcomes, and address key uncertainties identified in the forementioned population-habitat models.

Because the majority of the GCJV region is privately-owned, habitat objectives for Loggerhead Shrikes and other priority grassland bird species cannot be achieved solely on public wildlife refuges and management areas. In response to the need for improved grassland habitat on private lands, the GCJV partnership developed and began implementing the Coastal Grassland Restoration Incentive Program (C-GRIP) in 2018. C-GRIP provides financial incentives to private landowners for conducting habitat treatments that improve the suitability of grassland bird habitat on their property. C-GRIP is a voluntary program that reimburses private landowners a set payment rate for identified practices that generally fall into the categories of brush management, prescribed burning, native grass and forb planting, and prescribed grazing.

C-GRIP is currently being implemented in ten focal areas in Texas and Louisiana (Figure 2). To be eligible for the program, treatment areas must be at least partially in a focal area, privately-owned, and at least 25 acres in size (approximately 10 hectares). The landowner is required to work with a project manager representing one of the GCJV partner agencies to identify the appropriate management actions for improving grassland bird habitat on the treatment area. Eligible treatments are determined by a committee of GCJV staff and partner agency representatives, selected from a list of practices developed for the U.S. Department of Agriculture's (USDA) Environmental Quality Incentives Program (USDA 2023). The participating landowner must be committed to maintaining the improved habitat state for at least 5 years following project completion.

As of December 2023, 68,351 acres (27,661 hectares) and 625 acres (253 hectares) had been enrolled in C-GRIP in Texas and Louisiana, respectively. To assess the effectiveness of C-GRIP in providing habitat for priority grass-

land bird species, GCJV staff developed and implemented a monitoring methodology, the C-GRIP Species Programmatic Survey. The monitoring objective of the C-GRIP Species Programmatic Survey (C-GRIP Survey) is to evaluate if the C-GRIP program is effective in providing a relative (versus controls) increase in the density (number/acre) of grassland priority bird species over a 10-year period. If the population trend is more positive on the focal treatment areas (relative to controls) or if the focal area trend line is flat or slightly negative, and the control area trend line is significantly more negative over a 10-year period, the C-GRIP program would be considered successful. In addition to Loggerhead Shrike, priority species for the C-GRIP Survey are Mottled Duck (*Anas fulvigula*) and Northern Bobwhite. An additional 5 species of grassland birds are also monitored: Scissor-tailed Flycatcher (*Tyrannus forficatus*), Lark Sparrow (*Chondestes grammacus*), Eastern Meadowlark (*Sturnella magna*), Painted Bunting (*Passerina ciris*), and Dickcissel (*Spiza americana*). The monitoring metric for the C-GRIP Survey is the density estimate for the bird species listed above in focal and control areas. To date, all C-GRIP Survey monitoring has been conducted in Texas. Monitoring is anticipated to begin in Louisiana in the next few years.

Figure 1. Gulf Coast Joint Venture Region

Methodology

The C-GRIP Survey employs point-transects, a form of distance sampling that account for imperfect detectability in density estimates (Buckland et al. 2001). Point count stations are located along a designated route or transect. Twenty survey routes, 2 within each of 5 focal areas (treatment) and 2 outside each area (control) were established on secondary and tertiary roads in or adjacent to the GCJV's Texas Mid-Coast Initiative Area. Each route measures at least 14.5 miles (23.3 kilometers) and contains 30 survey points separated by at least 0.5 miles (0.8 kilometers).

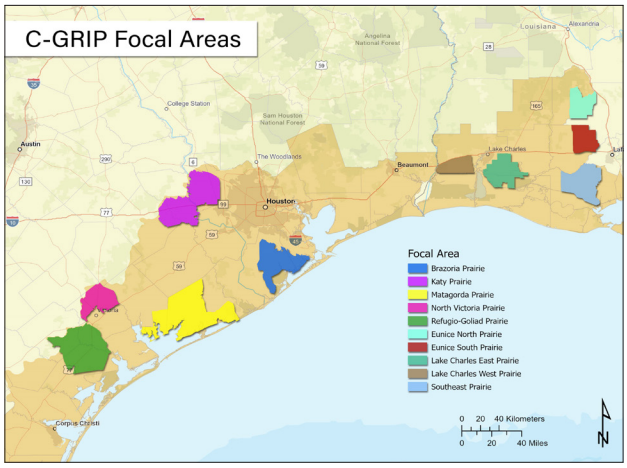

Figure 2. C-GRIP Focal Areas

The surveys are conducted between May 15 and June 10 of each year to coincide with the breeding season of the priority grassland bird species. Survey methodology is similar to the North American Breeding Bird Survey (BBS, U.S. Geological Survey 2023). Surveys began one half hour prior to sunrise. A vehicle Global Positioning System unit with a preloaded route and points is used to navigate. At each survey point, surveyors record aural and visual detections of priority species and record the minute (1,2,3,4, or 5) the bird was detected, whether the detection was by sound, sight or both, and the distance from the surveyor to the detected individual. Detection distances are estimated using binoculars with built-in rangefinders. Individual birds are only recorded once. If an adult bird is attending juveniles, only the adult bird is counted.

Additional variables are recorded at each point. These include date, survey start and end times, type of road, ambient temperature, percent cloud cover, estimated Beaufort scale wind speed (National Weather Service 2023), and the amount of noise (besides bird songs or wind) at the point, ranging from 0, silent to 3, constant noise. Cardinal directions (i.e., compass bearings) are recorded on the left and right sides of the vehicle, along with type and percentages of vegetation cover. If grass or non-crop herbaceous vegetation is present, surveyors estimate whether the majority is equal to or greater than 8 inches (20.3 centimeters) in height. This height is estimated to be a minimum to provide sufficient cover for ground-nesting grassland birds. A photograph is taken of vegetation conditions on both sides of the vehicle.

Point data is recorded on iPads (Apple, Incorporated) using the ArcGIS Survey123 (Environmental Systems Research Incorporated, ESRI) platform. This platform allows users to develop custom forms for data collection. Data can be collected in the field and uploaded to databases in real time, or if no internet connection is available, data can be stored on the device and then uploaded later. To date,

surveys have been implemented by GCJV staff, USFWS biologists, and staff of the non-profit conservation group Pheasant Forever/Quails Forever, Incorporated. GCJV staff provide a one-day workshop annually for surveyors that includes information on safety, survey methodology, equipment, and species identification.

Results

Two years of data have been collected. GCJV staff intend to conduct surveys through 2032. No formal analyses have been conducted to date, but some general observations can be made. A total of 37 shrikes have been observed during the 2022 and 2023 surveys. Twenty-four (65%) shrikes were detected on treatment routes, and 13 (35%) on control routes. Fifty-seven percent of all shrikes were detected visually, 24% by their calls, and 19% by both visual and by calls. Thirty-eight percent of birds were observed during the first minute (minute 0-1) of the five-minute observation period, followed by 19% during minute 3-4, 16% during minute 1-2, and 13.5% during minutes 2-3 and 4-5, respectively.

The average percent of grass cover at survey points where shrikes were detected was 42%, average shrub cover (≤ 2 meters tall) was 8% and average woody cover (> 2 meters tall) was approximately 4%. At 54% of survey points where shrikes were detected, half or more of grass and herbaceous vegetation present was ≥8 inches tall (~20 cm), and at 46% of sites with shrikes detected all grass or herbaceous vegetation present was < 8 inches tall. Fifty-one percent of points with detected shrikes included some sort of agricultural crop field; 49% of points had no agricultural crop fields.

Discussion

After two years of data collection, detections on control versus treatment routes are comparable. Because habitat on treatment and control routes are similar and C-GRIP practices have only been implemented since 2018, these results are not surprising.

Loggerhead Shrike numbers were the third lowest of monitored species. Relative abundance indices generated from BBS routes in the same region suggest that from 0 – 5 birds are observed per 25-mile survey route (Sauer et al. 2020), so C-GRIP results are similar. While there are potential sources of bias from sampling avian populations only from roadsides (Bart et al. 1995, Hanowski and Niemi, 1995, Keller and Scanlan 1999), there is little evidence that Loggerhead Shrikes select for habitat away from roadsides. Studies have shown that the species commonly uses powerlines, fences, and other man-made structures along roads (Crouch et al. 2019, Donahue et al. 2021).

Meaningful results will require more years of data. GCJV staff and partners intend to monitor these routes and points through 2032, but it is possible that some routes will have to be modified due to safety concerns or increases in noise that significantly impact aural detections.

As a group, grassland birds have declined more so than any other group of birds in North America since 1970 (Rosenberg et al. 2019). Because a large proportion of grassland habitat in North America is on private or tribal lands (JV8 Central Grasslands Conservation Initiative, 2023) it is imperative that programs such as C-GRIP provide incentives that enable sustainable ranching and grazing while improving habitat for declining grassland bird species.

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