Background

The proposed project will build upon ongoing Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) research in Louisiana and across the Gulf Coast to address knowledge gaps critical for developing restoration recommendations to recover populations. Specifically, the proposed project will fill critical data and research gaps by measuring key metrics of coastal high marsh habitat to inform restoration project engineering and design that could ensure the future persistence of this endangered species. Therefore, the proposed project objectives would meet both Louisiana Coastal Master Plan goals of land loss reduction and storm surge risk reduction (CPRA 2023).

The Eastern Black Rail (hereafter "Black Rail") was added to the Endangered Species List as threatened in November 2020 because of rapid population declines where it has been well studied along the Atlantic Coast (Watts 2016, USFWS 2018). It also has a very small population estimate of fewer than 3,000 individuals and without immediate conservation action, it is projected to go extinct by 2068 (USFWS 2018). Its current distribution is heavily disjointed, with isolated populations primarily found in the mid-Atlantic, Florida, Texas, and western Great Plains (Eddleman et al. 2020). Before 2017, it was not known as a year-round resident or breeder in Louisiana with only 13 confirmed records cataloged by the Louisiana Ornithological Society. However, efforts initiated by the National Audubon Society in 2017, supported by state and federal funding in advance of the ESA listing decision, discovered year-round populations in Cameron Parish high marsh habitats similar to those along the mid- and upper-Texas Coast (Tolliver et al. 2019, Johnson and Lehman 2021). Since then, breeding has been confirmed via trail cameras documenting flightless young with adults (Monopoli et al. 2024). Even so, the current Louisiana population estimate likely no greater than 70 pairs, which are highly vulnerable to sea level rise, tropical storms, and coastal development.

High marsh, which is characterized by infrequent tidal inundation, high salinity soils, and a unique suite of wetland plant species (Texas Parks and Wildlife Department 2012, Watts 2016, Eddleman et al. 2020) is of the most vulnerable habitats in coastal Louisiana. It is found primarily along the Chenier Plain in Cameron and Vermilion Parishes, at the interface between higher chenier ridges and lower tidal wetlands (Enwright et al. 2023). There is no room for this habitat to shift up slope with sea level rise as it immediately abuts the tree-dominated chenier ridges, not suitable for rails (Townend et al. 2011).

There is a growing recognition in the wildlife and natural resource community that we must expand the availability (i.e., quantity) of high marsh habitat because it nearly exclusively supports Eastern Black Rail populations in the region (Tolliver et al. 2019, Johnson and Lehman 2021). High marsh is also an important storm surge barrier that protects human

communities and other wetlands. With the massive investment in estuarine emergent marsh creation guided by Louisiana's Coastal Master Plan (CPRA 2023), including in areas around Lake Calcasieu adjacent to the core of the Louisiana Black Rail distribution (Johnson and Lehman 2021), there is an opportunity to incorporate high marsh designs into some projects, which may be the only opportunity to sustain Black Rail populations in the region. This is currently limited, however, by uncertainty in specific design features, such as the optimal soil composition, elevation, and tidal inundation frequency to maximize benefits to Black Rails.

Black Rails along the western Gulf Coast depend on high marsh dominated by Gulf cordgrass (*Spartina spartinae*), which is often intermixed with groundsel bush (*Baccharis halimifolia*), sea oxeye daisy (*Borrichia frutescens*), and other forbs (Tolliver et al. 2019, Johnson and Lehman 2021). Shrub encroachment and a grass-dominated cover can be maintained with prescribed fire, or possibly even rotational cattle grazing, to create a structure of a dense grassy canopy with a heterogeneous mix of openings at ground level (Beilke et al. In Review). However, key details in how to create this habitat through dredging remain largely unknown and untested. Grain size, soil salinity, elevation, and topographic heterogeneity are all expected to be important factors that drive plant community types and inundation rates that are suitable for Black Rails (Eddleman et al. 2020, Beilke et al. In Review). This project will utilize and build upon Black Rail and high marsh habitat data collected in Louisiana since 2017 to evaluate these edaphic and topographic conditions that create habitat conditions suitable for this threatened habitat specialist.

Methodology

Over 150 point survey locations in and adjacent to high marsh habitat have been surveyed nearly annually since 2017 in southwestern Louisiana to determine the presence or absence of Black Rails and characterize the vegetation community and structure. High accuracy (RTK) elevation data and soil samples have been collected sporadically at some, but not all points. Starting in fall 2026, we will build on those datasets to fully inventory the edaphic, topographic, and water inundation characteristics at these sites to generate predictive models of Black Rail occupancy. Approximately 100 of these survey points will continue to be surveyed for the presence of Black Rails from March to July 2026, 2027, and 2028, concordant with this study, through Project Firebird, a Gulf-wide collaborative seeking to reveal bird-habitat relationships to prescribed fire frequency. Therefore, the proposed project will build upon and leverage that ongoing long-term research on this threatened species.

At each breeding season point survey, we will establish a standardized array of measurements across a 100-m radius circle around each point (approximately the

maximum auditory detection distance of Black Rails). At these study plots, we will develop digital elevation models using a combination of high-accuracy RTK GPS and LiDAR. Additionally, we will collect soil samples for grain size and soil salinity analyses and install water gauges to assess inundation frequencies and depths. At points where Black Rails have been detected, we will collect and compare used versus unused within-plot locations to more strongly determine the specific features that Black Rails utilize.

The Black Rail point count bird data will be used in a statistical information theoretic framework that ranks competing models to identify variables that best explain variation in avian occupancy, accounting for imperfect detection. Using these models, we will explicitly evaluate elevation, topographic heterogeneity, and soil characteristics that would inform for the first time marsh creation project features that could support Black Rails. The PI and graduate assistant will work with CPRA, CWPPRA restoration personnel (e.g., NRCS and USFWS), The Water Institute Avian Guidance in Restoration document team, and the Project Firebird team to translate research outputs into recommendations that can be used by restoration practitioners to develop high marsh features suitable for Black Rails in marsh creation project designs.

Dissemination

The project will result in an M.S. thesis made digitally available through the Louisiana State University Electronic Thesis and Dissertation library, and we will publish at least one scientific manuscript in a peer-reviewed indexed journal. The graduate assistant will also present the results of their research at one or more professional scientific conferences. Importantly, throughout the project, we will coordinate with CPRA and CWPPRA agency staff to discuss each step of the project, including finalizing the study design, sharing initial findings, and result dissemination. This particular funding opportunity and its ties with Louisiana Sea Grant and CPRA provides an exceptionally unique framework to facilitate and formalize these collaborative intentions. As part of this collaboration, it is important that we commit not only to engage with restoration project managers, but also with project design and engineering experts to ensure that biologically meaningful findings can be translated effectively to restoration project engineering needs and specifications.