Session IV-Room A1

TEXAS ESTUARINE RESOURCE NETWORK: CITIZEN SCIENCE IN CONSRVATION

Kari Howard, Coastal Program Associate, Audubon Texas

In 1923, Audubon established a system of island sanctuaries along the Texas coast, which are home to more than 20 species of colonial waterbirds. Audubon Texas Coastal Program protects with these species with a few biologists, wardens, and partners. The enormous territory with natural and human threats to the birds and their habitats require much more attention and care than professionals alone can provide. However, with this enormous territory having natural and human threats, we needed a way to engage coastal communities in the on the ground conservation efforts. In 2014, the Texas Estuarine Resource Network (TERN) was created in response to the enormous task of monitoring these birds and the island management required to maintain nesting habitat. Since its inception, the TERN program has utilized volunteers who have contributed 23,190 hours of service work throughout the Texas Coast. These trained community scientists are helping us count more birds, conduct more workdays on islands, and share our message to more of the general public than we could ever accomplish with staff alone. They simply needed to be given the right tools. Many of these tools are the same we would offer a part time staff member, but the ownership and longevity benefits of utilizing someone who calls this area home are far greater.

In the traditional model of conservation, researchers and statisticians uncover facts while educators teach the resulting messages to the general public. Therefore, there is a disconnection between conservation and the public simply because the public is not part of the process or solution. Also, any messages that imply that the general public is contributing to the problem, make it challenging to motivate the masses to make dramatic behavior changes. In order for many of our conservation issues to be resolved we needed some behavior changes to occur within the communities that share these natural resources. The solution to bridging the gap between science practitioners and the public lies in the power of connecting people to nature in a deep, meaningful way; which can be done through community science.

These community scientists have helped with many efforts to protect waterbirds including surveillance of rookery islands and nest monitoring after habitat restoration, monitoring foraging habitats, educating youth and adults, monitoring island vegetation and ground truthing, preventing plastic pollution, and removing trash in waterbird foraging habitat. Also, there will also be examples of champion community members assisting with Audubon conservation and research completed resulting from the data collected by citizen scientists.

Session IV-Room A1

COMMUNITY BENEFITS OF A CITIZIEN SCIENCE WATER MONITORING PROGRAM

Nicholas Ellis, Advocacy Team, Galveston Bay Foundation, Houston, TX

Water quality of our local waterways is an increasing concern for residents of the Galveston Bay area and those who use it for commercial, recreational, and industrial purposes. Galveston Bay Foundation's Water Monitoring Team that has been operating since 2012, fosters more engagement in water quality data collection and water quality issues with volunteers being stewards of their local communities. Galveston Bay Foundation has 66 trained water quality monitors collecting data at 64 nearshore sites around Galveston Bay and its sub-bays each month. These water quality monitors collect basic water quality data at every site, as well as *Enterococcus* bacteria samples at about half of the sites. This unique position enables Galveston Bay Foundation to supplement existing local water quality data, allowing Galveston Bay Foundation to better understand the health of Galveston Bay waters; to help screen for potential problems early on; and to illustrate water quality patterns and trends at popular recreation areas around the Bay. The data collected and the citizen volunteers collecting it enable Galveston Bay Foundation to engage and educate the public on current water quality issues facing the Bay, and this in turn has helped to influence community behavior and local management practices.

As an organization that has collected publicly-available water quality data for over seven years, two of the most common questions we get at Galveston Bay Foundation are: "Is it safe to swim in X area?", and "What is the bacteria like at X location?". With water quality data and *Enterococcus* bacteria samples being collected and analyzed for so many years, many people, including residents and tourists, view Galveston Bay Foundation as a resource for this information at commonly used recreational and nearshore areas around the Bay system. Galveston Bay Foundation regularly posts all data findings on several public-facing platforms including Swim Guide, a global platform for reporting fecal bacteria levels in relation to recreational safety. From time to time, issues do arise and Galveston Bay Foundation, along with its dedicated group of volunteers, has been able to utilize this information to inform citizens of potential threats in their areas and successfully guide local decision-making by community leaders in order to promote the health of the Bay and encourage better stewardship of these areas.

This presentation will highlight some of the success stories of community engagement and local decision-making that Galveston Bay Foundation and its volunteers have been involved in. These successes include ongoing data sharing efforts as well as response to specific issues that have been detected through Galveston Bay Foundation's volunteer sharing network. Specific cases include having local municipalities post swimming advisory signs for high bacteria concentrations at popular local swimming areas; engaging marinas for better management practices to improve water quality by installing pump-out stations and pet waste disposal stations; engaging and working with local city councils about problems they face and their options for resolving them; and considering building a culvert to increase tidal exchange in an impaired area. Additionally, this presentation will highlight the value of citizen scientists for

both data collection as well as community engagement and response to local water quality issues.

Session IV-Room A1

CHASING FLOOD WATERS ON THE LOWER TRINITY RIVER

Tom Douglas, Ph.D., paddler and water guy, Houston, Texas

In addition to providing more than half of the fresh water inflows into the Galveston Bay system, the Trinity River also delivers sediments and nutrients that have a large impact on the health of the estuary. During the 10th State of the Bay Symposium in January 2016, the Trinity River was above flood stage and, to the north of Interstate 10, the river had spread to more than 100 times its width at base flow. Paradoxically, some 65% of the water coming down the river, as reported by several gauges, was never reaching the most downstream gauge at Wallisville. The area's topography suggested that most of this unmeasured flow must be bypassing the Wallisville gauge by flowing overland to the west side of the basin. From there, it could continue on into Galveston Bay, both by sheet flow and via several distributary channels. The importance of these flows is underscored by the extensive deposition of sediments that can be seen in satellite imagery at the mouth of the largest of the distributaries: Long Island Bayou.

Overland flows to the west of the Trinity River's main stem had been observed from the air, but not directly "on the ground." This gap in available data was challenging to address, because the flooded area could only be accessed by water, and navigation could be difficult. Rising to the challenge, a group of experienced kayakers set out just 4 days after the Symposium to measure the water's depth and velocity at multiple points across the floodplain. At that time, water overtopped the river's natural levees by roughly one foot, and the floodplain was inundated to a depth of 3 to 8 feet. As expected, the overland flow was mostly to the southwest over into the Old River, then down to its confluence with the Lost River, and on to Hugo Point, which is about one mile south of Interstate 10.

To explore flood flows farther to the north, two additional transits of the basin were undertaken during floods that occurred in March and June of 2016. Taken together, observations made during these three transits spanned an area extending from near the boundary between Chambers County and Liberty County (about 3 miles north of I-10) down to Hugo Point. Satellite images, especially those made during times of drought, were critical for planning routes that would be as safe and efficient as possible.

Negotiating areas where the current was fast required particular care. This happened where low spots in the river's natural levee directed distributary channels out through the forest, and also at an artificial levee near the community of Old River-Winfree that funneled water from a swath over a mile in width down through a narrow gap. Farther to the south, flood waters were diverted around the ring levee that surrounds the Lost Lake Oil Field. Although the general direction of overland flow during these floods was to the southwest, particular features of the floodplain caused it to vary anywhere from northwest to south to northeast. It became clear that virtually all of the flow in the lower part of the Old River was coming in from the Trinity, since there was no detectable flow of water entering the west side of the Trinity River basin from the upland reach of the Old River.

This presentation will include still photos and short video clips to illustrate conditions, both challenging and beautiful, that the paddlers encountered. The project, which we view as a productive example of the intersection between recreation and citizen science, would not have been possible without the participation of fellow paddlers Joe Coker, Dave Kitson, David Portz,

and Natalie Wiest. We would like to dedicate this presentation to Dave Kitson, who passed away in 2018.

Session IV-Room A2

HAPPY HOMES FOR NESTING WATERBIRDS

Spencer Schnier, Freese and Nichols, Inc., Austin, Texas

Tam Tran, Freese and Nichols, Inc., Austin, Texas

David Buzan, Freese and Nichols, Inc., Austin, Texas

Romey Swanson, Audubon Texas, Austin, Texas

Identification of the primary features responsible for the success of rookery islands has considerable practical value in the preservation and restoration of islands with high numbers of colonial waterbirds. Audubon Texas and its technical advisory committee of experts worked with Freese and Nichols, Inc. biologists in 2018 to characterize features of coastal islands that maximize their utilization by colonial nesting waterbirds.

Interactions between bird species, both competing and symbiotic relationships, and the natural environment in and around the island influence nesting of colonial waterbirds in complex ways and make it difficult to determine the importance of single characteristics. This study combined "lessons learned" from experts practicing creation and restoration of nesting islands with detailed data review and statistical analysis to identify environmental and biological variables key to the success of rookery islands along the Texas coast. Freese and Nichols, Inc. research funds supported the data review and statistical analysis. Four statistical approaches were: Pearson correlations, Spearman correlations, an algorithm based on multiple linear regression, and a measure of variable importance built into the machine learning algorithm, Random Forest. The results are based on a dataset developed for this study, which uses nesting density of various colonial waterbird species as both response variables and potential explanatory variables in addition to a variety of climate, area and distance metrics characterizing the rookery islands.

The density of nesting gull-billed terns was found to have a strong positive relationship with black skimmer density, which is relevant for restoration efforts because black skimmer populations along the Texas Gulf Coast have declined dramatically since the 1970s. Laughing gulls numbers, on the other hand, were found to be negatively correlated with black skimmer populations. This study also provides insights useful in the design of rookery islands. For example, vegetated area and island size were found to have a negative relationship with black skimmer density. In other words, black skimmers seem to nest in higher densities on small islands with a greater portion of bare area. There also seem to be indications that colonial waterbirds in general nest in higher densities on islands further from the mainland, and that ground-nesting birds tend to prefer cooler February to August temperatures (less than 74°F on average).

Session IV-Room A2

PROTECTING PUBLIC BEACHES AND NATURE PRESERVES TO STABILIZE IMPERILED COASTAL BIRD POPULATIONS IN COASTAL TEXAS

Kristen Vale, American Bird Conservancy, The Plains, VA

Kacy L. Ray, American Bird Conservancy, The Plains, VA

Richard Gibbons, Houston Audubon Society, Houston, TX

Susan Heath, Gulf Coast Bird Observatory, Lake Jackson, TX

David Newstead, Coastal Bend Bays and Estuaries Program, Corpus Christi, TX

One of the greatest threats to successful breeding for coastal birds is human impacts associated with recreation both on public beaches and in protected areas, such as nature preserves, state parks, and other similar sites. American Bird Conservancy and our partners began a collaborative conservation program for beach-nesting birds in Texas in 2012. Through habitat protection and educational-based stewardship, we seek to stabilize and, ultimately, increase populations of imperiled species such as Least Tern (*Sternula antillarum)*, and Wilson's Plovers (*Charadrius wilsonia*) and Snowy Plovers (*Charadrius nivosus*), both of which are a Red Status on the US Watch List, and all of which are US Fish and Wildlife Service Species of Conservation Concern. We implement physical protection of breeding and foraging habitat for coastal birds through temporary and permanent barriers and further safeguard the land and birds through public education and stewardship. By implementing such measures, we can gain baseline reproductive data about these birds to successfully and adaptively manage for them, and build reproductive data sets that contribute to setting conservation goals for these species in Texas, along the Gulf of Mexico, and range-wide. In 2019, we monitored 3520 acres and protected 1311 acres of nesting habitat across 15 Texas coastal sites from the upper coast through the lower coast, including five sites surrounding Galveston Bay. We will present the methodologies used to protect habitat and birds, along with reproductive output metrics observed over the past 2 to 5 years at the sites where we implement protective measures. We will address novel and ongoing threats that coastal breeding birds face, how those challenges are mitigated, and how those impacts affect reproduction.

Session IV-Room A2

NEW TECHNOLOGIES FOR MONITORING BIRDS IN THE GALVESTON BAY WATERSHED

Anna C. Vallery, Houston Audubon, Houston, Texas

Richard E. Gibbons, Houston Audubon, Houston, Texas

Monitoring wildlife is necessary for not only learning more about a population's life-history, but for making well-informed conservation decisions to protect the species of interest. Unfortunately, this monitoring can be expensive and sometimes logistically difficult to conduct. New technologies are proving to not only simplify the monitoring of certain species and habitats, but to make the process less expensive and more accurate than before. Houston Audubon, with the help of partners, engages in and coordinates monitoring efforts of a variety of different bird species across our region. Several projects have directly benefitted from recent technological advances.

First, the Lights Out for Birds program is aimed at engaging residents and building managers across the region to turn their lights off during migrations. Recent advances in radar technology have been utilized by The Cornell Lab of Ornithology to create BirdCast, an online migration-prediction tool. This tool has allowed Houston Audubon to better predict when to focus efforts on reducing light pollution and prevent nighttime bird collisions in our region.

Second, Houston Audubon monitors a man-made colonial waterbird nesting island for the Port of Houston. Boat-based counts have historically been conducted monthly using binoculars and scopes to estimate the number of nesting birds. The addition of two remotely-accessible, solar-powered cameras to the island has allowed for a better understanding of the temporal changes during nesting season that can't be monitored with only monthly surveys. Use of an unmanned aerial vehicle, or drone, during the boat-based counts has allowed for more accurate estimates of nesting birds during the regularly scheduled surveys. By combining both types of newly available technology to previous methods, Houston Audubon can gain a better understanding nesting success and behavior.

By continuing to implement new technologies across the various monitoring efforts, Houston Audubon will be better able to make well-informed conservation decisions to protect our region's resident and migratory birds.

Session IV-Room A2

HIGH ISLAND ROOKERY RESILIENCY AND ENHANCEMENT

Peter Deichmann, Houston Audubon, Houston, Texas

Richard E. Gibbons, Houston Audubon, Houston, Texas

Houston Audubon's Smith Oaks Bird Sanctuary is located in High Island, Texas less than a mile from the Gulf of Mexico in the Gulf prairies and marshes ecoregion. It is comprised of approximately 70 acres of oak mottes and tall woodlands, 23 acres of freshwater ponds, 20 acres of coastal prairie, and 65 acres of salt marsh habitat. These habitats are critical for many species of resident and Nearctic-Neotropical migrant birds. Within the sanctuary are three man-made freshwater ponds. Claybottom Pond is the site of an existing colonial waterbird rookery monitored yearly since 1994 by the Texas Colonial Waterbird Society coast-wide census, as well as weekly surveys conducted by Houston Audubon staff. The core species for the colony include Great Egrets, Snowy Egrets, Roseate Spoonbills, and Neotropic Cormorants. Integral to the success of this rookery has been predator protection afforded by a healthy population of American Alligators. The water levels in these ponds are influenced almost exclusively by rainfall falling inside a man-made levy system. During drought years, water levels have fallen to the extent that canals regularly patrolled by Alligators have become so shallow that Alligator patrols had ceased in some areas allowing predators easy access to the rookery island requiring predator trapping and removal efforts by staff. Conversely, in years with higher than normal rainfall amounts, a portion of the Claybottom pond peninsula would flood and increase the amount of suitable nesting areas.

In February 2018, in collaboration with Ducks unlimited, and using a grant awarded by the National Fish and Wildlife Foundation, Houston Audubon created two additional islands, one in Claybottom Pond (0.22 acres), and one in Smith Pond (0.54 acres) using in-situ dredge material. The existing rookery island was also secured by dredging the existing channels deeper and depositing the dredge material at the foot of the existing island. To secure freshwater resources for Claybottom pond, a water conveyance ditch and control structures were tied into an existing drainage ditch on the property allowing the capture of the rainwater run-off and diversion into Claybottom Pond to help maintain water levels. More than 400 ft^2 of artificial nesting structures were installed on the two new islands to support nesting birds while transplanted and volunteer vegetation become established. To date, water levels in Claybottom pond are at historically high levels. This higher water level has flooded adjacent forest creating new nesting area and increasing the number of nesting colonial waterbirds.

Session IV-Room A3

HOUSTON PARKS AND RECREATION DEPARTMENT'S RIPARIAN RESTORATION INITIATIVE

Kelli Ondracek, City of Houston Parks and Recreation Department

The Houston Parks and Recreation Department's Natural Resources Management Program is targeting all parks adjacent to bayous and tributaries for the restoration of forested riparian buffers. Historically, much of the Houston area was coastal prairie habitat with forested riparian habitat lining the bayous. Many of the riparian buffers have been removed or degraded due to development or stream channelization. Riparian zones that have not been developed are heavily impacted by invasive species. The restoration involves enhancing currently forested sites through the removal of invasive species and installation of a diverse mix of native trees and shrubs. Additionally, creation of riparian habitat is underway in parks where the entire forested zone has been cleared.

This project will help the department reach a broader goal of increasing nature-based infrastructure within parks for the purpose of mitigating flooding, improving water quality, reducing erosion, creating wildlife habitat, and establishing areas for passive recreation. Four ongoing riparian pilot projects are guiding best management practices for this larger initiative. A total of 70 parks have been identified as having an area adjacent to a bayou or tributary where a riparian buffer could be enhanced or created. This will ultimately result in the restoration of over 1,000 acres of habitat in city parks, with an installation of 200,000 native trees.

Session IV-Room A3

DON'T THROW IT AWAY: BENEFICIAL USE OF VEGETATIVE DEBRIS AFTER A STORM

Tara K. Whittle, Texas General Land Office, La Porte, TX

Texas General Land Office (GLO) staff began emergency operation storm response a few days after Hurricane Harvey passed and identified public beaches which had debris washed up that posed a risk to human health and safety. The majority of debris was removed and disposed of in permitted landfills, but one area on the upper Texas coast, Sargent Beach, posed access limitations due to soft sand and clay, as well as strong tides. This beach is narrow and highly dynamic, and has been identified as critical wintering habitat for threatened and endangered piping plover (*Charadrius melodus*) and red knot (*Calidris canutus*) shorebirds, which made it an ideal candidate for a stabilization project. 456.5 cubic yards of vegetative and woody storm debris was placed at specific intervals along a 5,100 linear foot area adjacent to the surf line, at the landward extent of the public beach easement. A great deal of interagency cooperation occurred in a short amount of time at the state and federal level, including stabilization design and approval, and the stabilization project was completed, start to finish, in less than one month. The project has been monitored since its completion and is considered a success.

Session IV-Room A3

SHOULD GALVESTON BAY WETLAND MANAGEMENT PRIORITIES AND STRATEGIES CHANGE IN RESPONSE TO INCREASING MANGROVE COVER?

Anna R. Armitage, Dept. of Marine Biology, Texas A&M University at Galveston, Galveston, TX

Rachael Glazner, Dept. of Marine Biology, Texas A&M University at Galveston, Galveston, TX

Janelle A. Goeke, Dept. of Marine Biology, Texas A&M University at Galveston, Galveston, TX

Jamie E. Thompson, Dept. of Marine Biology, Texas A&M University at Galveston, Galveston, TX

Climate change and land-use alterations can drive landscape-level shifts in plant species distribution and abundance, subsequently altering ecosystem structure and function. Such shifts are occurring on the Texas Gulf Coast, where warmer winters have led to black mangrove (*Avicennia germinans*) encroachment into some areas occupied by salt marsh plants (e.g., *Spartina alterniflora*, *Batis maritima*). A freeze event in January 2018 caused localized mortality but only temporarily slowed mangrove expansion rate. Will this ongoing change in foundation plant species necessitate the alteration of management priorities or strategies in Galveston Bay wetlands? Here, we synthesize results from a series of surveys and field experiments that quantified some ecological consequences of mangrove restoration or establishment in novel areas, and discuss the management implications of those changes in ecosystem functions. Marsh and mangrove stands generally had similar benthic epifauna and nekton densities, but trophic dynamics were markedly different. Mesocosm and field studies revealed that mangrove leaves were less palatable to basal consumers such as fiddler crabs and periwinkles. Mangrove aerial root structures decreased blue crab predation success on grass shrimp and snails. Blue crabs captured fewer prey in mangroves, but exerted a similar amount of foraging effort, suggesting that there may be higher metabolic costs to foraging in mangroves, relative to salt marshes. Citizen science data records indicated that shorebird and wading bird species richness and diversity were higher in marshes than in mangrove areas, and that fewer birdwatchers reported sightings in areas with mangroves. Generally, marsh plant cover and diversity were inversely related to mangrove cover, but mangroves contributed more carbon to the soil. These alterations to the plant community and carbon sources may alter the relative availability of autochothonous and allochthonous carbon to basal consumers. Overall, this uniquely synthetic body of work revealed that salt marshes and mangroves support different plant and animal assemblages, and that the establishment of mangroves in novel areas is likely to cause complex changes in ecosystem processes. These results indicate that key functions of coastal wetlands – including basal trophic support for fishery species – are not equivalent between marshes and mangroves. In addition, there is a need for careful monitoring of early life stages of key wetland-dependent fishery species to assess potential population-level implications of mangrove expansion and subsequent displacement of salt marsh vegetation. However, in many locations around Galveston Bay, individual mangroves and mangrove patches are relatively small, and their effects on the surrounding flora and fauna are highly localized. Therefore, although mangroves should not be

transplanted into novel areas, there is no apparently urgent need to avoid planting them in wetland restoration projects near areas where they already occur.

Session IV-Room A3

THE AGE OF RESTORATION: IMPACTS ON FRESHWATER WETLAND SPECIES COMPOSITION & RICHNESS

Colleen Ulibarri, Texas Community Watershed Program, Texas A&M AgriLife Extension Service, Houston, Texas

Natural, undeveloped landscapes are being degraded, converted or fragmented at alarming rates. We are at risk of losing valuable associated ecosystem services. Restoration is a key strategy to regain these lost services by restoring areas to ecologically-productive land uses such as wetlands.

Recognizing that restoration methods vary greatly, monitoring regimes should be used to increase success, detail progression, prompt revision and adaptation, and inform future practices. We developed a quality-assured protocol to monitor plant community changes in a restored freshwater wetland in Sheldon Lake State Park to understand the effectiveness of the methodology.

The project restored over 400 acres of coastal prairie-wetlands in five separate phases from 2004-2019. Ponds were engineered and excavated to their original boundaries and then hand planted. Historic locations of ponds were identified using soil signatures from 1930's aerial photography. One pond from each phase was selected to be monitored based on size relative to others in the phase and depth. We visually estimated percent cover by species within one meter square plots – stratified by depth and then randomly chosen for each pond. Monitoring occurred quarterly through the end of 2019.

Given the difference in time since restoration between the five phases, results can be used to compare plant species cover, richness and composition in recently restored ponds versus more established ponds. This study will inform future restoration efforts by demonstrating expected temporal changes in the vegetation community as well as influence by other environmental variables on species dominance and frequency.

Session IV-Room A4

FINANCE AND FUNDING PANEL

Justin Bower, Community and Environmental Planning, Houston-Galveston Area Council, Houston, Texas

Kathy Janhsen, Community and Environmental Planning, Houston-Galveston Area Council, Houston, Texas

Maintaining sustained funding for water quality efforts makes the difference between a plan on a shelf and successfully achieving project outcomes. With traditional sources of funding becoming increasingly competitive and finite, guiding a successful project to completion requires creative and opportunistic planning for identifying, acquiring, leveraging, and sustaining funding sources. These considerations include evaluating the needs for a specific project, creating and maintaining relationships with a wider circle of potential funders, leveraging resources for the greatest potential benefit, and maintaining funding for implementation when the planning phase is complete. Lessons learned from similar projects in the Galveston Bay Watershed and can provide insight and leads for project planners engaged in the shared work of protecting Galveston Bay, its water resources, and the services we derive from them.

This panel will focus on identifying non-traditional or emerging funding sources, leveraging efforts with related programs, and examining success stories in sustained funding. Three to four panelists who will be selected by GBEP and H-GAC will give short introductions to their efforts and a case study of a unique funding challenge or achievement. The panel will then discuss questions related to funding as raised by the moderators or audience. The panelists will represent local government, regional planners, NGOs, and/or other related participants.

H-GAC staff would moderate the panel discussion and facilitate the question and answer session.

The goal of this panel is to provide participants an opportunity to explore new funding sources, approaches to maximizing existing funding, or discuss potential partnership opportunities.