Louisiana Case Study: Bridging the Gap Between Coastal Resiliency and Corporate Sustainability - Kristen Keene

Where stands of bald cypress once gave definition to the lower Mississippi Delta, the Terrebonne Biodiversity and Resiliency Projects provide ecological and economic benefits for a vulnerable Louisiana community. The projects are comprised of two sites, located alongside a local levee system, where saltwater intrusion destroyed the original bald cypress forest. Envisioned and implemented by Resource Environmental Solutions (RES), in partnership with America's WETLAND Foundation, the project components included coastal marsh restoration, funded by global energy producer BHP as part of their corporate sustainability program, as well as the protection and stabilization of the levee systems.

The coastal marsh restoration effort included cypress swamp plantings and marsh terrace creation – both proven ecological restoration approaches that improve the quality of ecosystems at the land-water interface, especially along Louisiana's fast-eroding coastline. Louisiana's coastal wetlands are essential to sustain renewable fishery resources integral to the local, state, and national economies while maintaining a rich and unique culture.

The Terrebonne Biodiversity and Resiliency Projects illustrate how the private sector can proactively address climate change via local projects. The BHP investment enabled the restoration of 125 wetland acres, including the creation of 2.25 miles of marsh terraces, planting 35,000 bald cypress trees, and conducting invasive species management; the natural infrastructure enhancement provides critical flooding protection from hurricanes, storm surges and rising tides among vulnerable communities in the Terrebonne Parish. The protection and stabilization of the levee systems also provides resiliency to Parish citizens. Overall, the project boasts an estimated annual economic value of $1.2M.

Battleship NORTH CAROLINA: Living with Water; A story of history meeting the future - Dawn York

The Battleship North Carolina is at the forefront of climate change. Resting on Eagles Island, North Carolina in the Cape Fear River, the Battleship is threatened by rising seas. Living with Water® is a climate adaptation and resilience project that aims to preserve access to a National Historic Landmark. The Living with Water project will:

- Restore approximately 800 linear feet of hardened berth with a living shoreline
- Create 2 acres of tidal wetlands in the existing parking area
- Rehabilitate and elevate visitor parking lot with improved design
- Install bioretention swale to improve stormwater management
- Provide a Center of Education to model resiliency practices

The Battleship is berthed on the Cape Fear River approximately 28 miles upstream of the river's confluence with the Atlantic Ocean. Resting on the west bank of the river directly across from downtown Wilmington, it is surrounded by 65-acres of State-owned property on Eagles Island designated as ecologically significant coastal habitats.

Living with Water uses nature-based infrastructure to capture, hold, infiltrate, and direct flood waters to the river. The living shoreline, tidal marsh, and parking lot improvements work in tandem to mitigate flood risk, improve water quality and provide ecosystem and educational benefits.

Living with Water comprises multiple components. One will restore more than 800 linear feet (approximately 1/5 of an acre) of hardened shoreline with an intertidal estuarine living shoreline. The living shoreline area, located at an actively eroding portion of the berth, will restore native habitat and mitigate wave and tidal action.

The second component is restoration of approximately 2-acres of flood-prone parking. Existing impervious travel lanes and parking spaces will be removed and the area restored to a newly created intertidal and subtidal estuarine wetland and tidal creek habitat. This portion of the design provides area for natural expansion of the intertidal wetland, if sea levels continue to rise and tidal flooding increases.

The third component is redesign of the remaining parking lot and elevation of its base above measured tide flood levels. This component includes a bioswale to capture and infiltrate water onsite. It will also improve traffic flow and pedestrian safety.

As a State Historic Site and a National Historic Landmark, the Battleship is institutionally positioned to make a long-term commitment to achieve and sustain the goals and benefits of Living with Water.

Exploring Non-invasive Sampling Techniques to Assess Habitat Enhancement in Hudson River Park - Carrie Roble

The Lower Hudson River Estuary (LHRE) is a critical finfish migration and nursery ecosystem, and an historic habitat of the Eastern oyster (Crassostrea virginica). After centuries of development and overharvesting, the estuary is considered limited in both substrate and larvae, though overall ecological health has significantly improved in recent decades. Hudson River Park (the Park) has undertaken various efforts to enhance its 400 acres of Estuarine Sanctuary waters along a 4-mile stretch of the West Side of Manhattan, New York City. After initial structure deployment in the Tribeca region in 2021, the Park installed a small salt marsh and 300 submerged enhancement structures as part of Gansevoort Peninsula's refurbishment in 2022. Formal monitoring for the Gansevoort Habitat Enhancement Project is set to commence in the summer of 2024 after some pilot sampling in 2023.

The habitat enhancement structures are a mixture of seeded and unseeded reef balls and gabions. These structures are designed to provide varied habitat options for diverse species and hard substrate for encrusting organisms such as oysters. The monitoring will include sampling for oyster health and performance, estuarine community utilization, salt marsh condition, and water conditions. To avoid traditional and destructive sampling techniques (e.g., lifting structures out of water) this project pilots novel, non-invasive methods such as videography,

sonar, and the use of proxy structures that engage the community. This project will assess the efficacy of such techniques for their use in urban estuarine systems.

Restoring a Barrier Spit with Atlantic Canada's first "Sand Engine" - Jennie Graham

Located in North-Eastern Canada near Shippagan, New Brunswick, the Shippagan project is leveraging salt marsh creation and sand engine (aka sand motor) techniques to increase resiliency for the Chaisson Office spit and surrounding communities. The barrier spit has been altered and degraded by more than a century of human activity and is being increasingly impacted by climate change and sea-level rise. To address these habitats loses and to improve the climate resiliency of the overall site, the project utilized a holistic approach to integrate coastal protection, habitat restoration, and improved regional understanding. Restoration techniques used included: the removal of old seawalls to restore tidal flow and aeolian sand transport pathways; beach creation by way of Atlantic Canada's first sand engine; dune and wetland restoration through road reduction/removal; and installation of a salt marsh with sill. The project includes a number of complimentary multi-year monitoring and research programs to document and quantify the efficacy of the restoration program. The first three years of monitoring have showed that the sand engine is functioning quicker than predicted; that elevations are stable and plant survivorship over the first growing season are high in the created marsh; diversity and health of the restored marsh has improved; and that overall there has been a shift in habitat conditions to those more closely matching a nearby control site. Most promisingly, in both 2022 and 2023 the site saw the successful nesting and fledging of Piping Plover - for the first time in nearly 20 years.

Fishing for food: diverse motivations impact subsistence fishing across a coastal Alabama landscape - Savannah Swinea

Fishing is an economically and culturally important practice in Alabama that faces threats from anthropogenic fish contamination, and the characterization of subsistence fishing in combination with social and environmental drivers of this practice constitutes a major research gap in the Alabama coastal system. The goal of this study was to conduct intercept surveys of shore-based fishermen to characterize their subsistence fishing practice. Survey instruments were deployed in-person at public access, shore-based fishing sites along Mobile Bay from May 2023 to February 2024 (N = 264 responses). The survey instrument measured fishing behaviors, landscape values, subsistence fishing practices (including sociocultural facets), and demographic characteristics. Consumption of local seafood, values attributed to the landscape, and the community with which fishermen share their catch were tested for differences across social, environmental, and demographic variables. Consumption of local seafood was better predicted by fishing behavior than demographic variables, and the landscape values reported by respondents varied by site, but not in relation to any demographic characteristics. However, the communities with which fishermen share their catch were significantly different only by race, with people of color sharing their catch outside of their household more than white people. Thus, it is important to investigate the complex impacts of subsistence fishing on the

social networks of these fishermen. Because fishing for food is not only a means for survival, but reinforces social networks and contributes to cultural identity, research products from this effort stand to benefit citizens across the Mobile Bay system.