Nature-based Community Resilience Planning in the Coastal Carolinas Region

Preliminary engineering design package for Pledger Landing in Alligator, North Carolina, and Tibwin and the Ten Mile Community in South Carolina.

Prepared in June 2026



Spartina alterniflora
Smooth Cordgrass

Audubon



A Prothonotary Warbler tending to its young, a priority bird species identified within both the Tibwin Creek & Jeremy Creek Canal and Pledger Landing project areas. Photography credited to Don Wuori.

Acknowledgments

This document was prepared in June of 2026 by Robinson Design Engineers for Audubon North Carolina and Audubon South Carolina with support from the Community Engagement and Design Teams. We extend our sincere gratitude to the many project partners, technical advisors, and community members whose guidance, local knowledge, and collaboration informed the development of this work. Your willingness to share your time, experiences, and expertise helped shape a report that is both locally grounded and broadly applicable. This document would not have been possible without your contributions.

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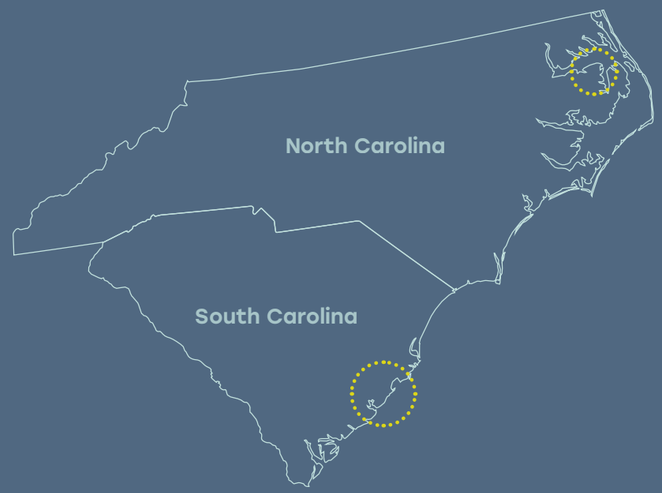
A Vulnerability Assessment Phase

B Concept Design Phase

Executive Summary

As sea levels rise, coastal bird habitat dwindles and frontline communities in the Carolinas face increasing threats from changing conditions. Increasingly high tides and intense storms flood community roads, yards, houses, and businesses. These issues affect many aspects of community life, including jobs and local economies, housing and infrastructure, recreation opportunities, and the natural wonders and wildlife of the region. Audubon works with local partners and community members to advance coastal habitat restoration, promote nature-based solutions, and increase community capacity to engage in resilience planning.

This document contains preliminary engineering designs for nature-based solutions to flooding in Alligator, NC; Tibwin, SC; and Ten Mile, SC. These designs are the result of more than two years of community conversations and the dedicated efforts of a team of resource managers, facilitators, environmental scientists, community organizers, landscape architects, hydrologists, engineers, ecologists, urban designers, ornithologists, planners, and hundreds of community members who shared their time, knowledge, expertise, memories, concerns, and hopes for the future.



Chapter One
Project Background

1.1 Introduction

The National Audubon Society, Inc., through its Audubon South Carolina and Audubon North Carolina state offices, received grant funding for nature-based resilience planning in two similar geographies in their respective states. Priority geographies in the coastal Carolinas were chosen using a regional conservation blueprint mapping tool created by Audubon's National Science Division. The project has been supported with funding from the National Oceanic and Atmospheric Administration (NOAA), National Fish and Wildlife Foundation (NFWF), South Atlantic Salt Marsh Initiative (SASMI), the North Carolina Coastal Federation (NCCF), and the Donnelley Foundation.

In early 2025, Audubon selected an engineering and design team to build upon the partnerships with local communities, and to co-create project concepts using Nature-based Solutions (NbS) that support community goals and enhance habitat for fisheries, birds, and other wildlife. Led by Robinson Design Engineers (RDE), the team includes Surculus, Weston & Sampson, the NC State Coastal Dynamics Design Lab (CDDL), and Anchor QEA. The RDE team has worked closely with community engagement contractors: SCWA Environmental Consultants in North Carolina, and the team of Surculus, The Asiko Group, Catalyst Design, and RDE in South Carolina.

1.2 Project Areas

1.2.1 North Carolina

The geographic scope for North Carolina includes northern Tyrrell County with a focus on the unincorporated community of Alligator. Maps of the NC project area are included in the Appendix. The NC project area is approximately 47 square miles (30,000 acres) in size and is bounded to the north by the Albemarle Sound, to the east by the Alligator River, and to the south by US Highway 64. The western project area boundary is not well defined because of extensive forestry parcels, but is approximately bounded by New Road. Major geographic features of the NC project area include the Little Alligator River, extensive gamelands managed by the NC Wildlife Resources Commission as part of the Palmetto Peartree Preserve, and community crossroads including Newfoundland, Goat Neck, and Fort Landing.

1.2.2 South Carolina

The geographic scope for South Carolina includes Cape Romain National Wildlife Refuge (CRNWR) and the adjacent towns of Awendaw and McClellanville, along with the eight (8) self-identified, unincorporated communities of Ten-Mile Community, Woodville, Tibwin, Pineland, Buckhall, Moss Swamp, Germantown, and South Santee. A map of the SC project area is included in the Appendix.

The SC project area is approximately 379 square miles (242,348 acres) in size and is bounded to the northeast by the Santee River (which also forms the Georgetown County Line), to the southeast by Cape Romain, to the southwest by the northern limits of the Town of Mount Pleasant and the northern end of Capers Island, and to the northwest by a series of creeks and wetlands that form a natural separation between historic settlement communities in the area. Major geographic features of the SC project area include US Highway 17, the Intracoastal Waterway, the Francis Marion National Forest, and the Cape Romain National Wildlife Refuge.

1.3 Stakeholders

A variety of stakeholders have supported this project. The primary stakeholder group for each project area has been the community members themselves. By sharing concerns and offering historical perspectives, the goals of the overall project were shaped by community voices. The work in each state was led by a Steering Committee of community leaders and representatives of partner organizations. Steering committee members did the important work of listening to and understanding community voices, interpreting problem areas in the communities, developing criteria for project concepts, and choosing projects to advance through preliminary engineering design.

In addition to the primary stakeholders–the community members and steering committees–separate lists of stakeholder organizations for the North Carolina and South Carolina project areas are included in the Appendix.

1.4 Project Approach & Design Criteria

The underlying philosophy that has guided the project team's work is summarized by three key characteristics:

1. **Past, Present, and Future:** The team has approached our work with curiosity and humility, seeking to understand and interpret the data with sufficient depth and clarity. The concepts seek to be responsive to the communities' histories, to birds and the places they need, and to the active, natural processes that will continue to shape the landscapes into the future.
2. **Each Community is Unique:** Traditional engineering tends to impose "one size fits all" solutions upon communities. We have endeavored to draw out, and then to understand, the unique qualities and challenges of each community and the ecosystems they inhabit.
3. **Real Solutions for the Real World:** A main challenge of this project has been to identify, assess, and document design concepts that are feasible in terms of permitting, cost, funding availability, and the culture and ecology of the communities. The project team has designed, permitted, funded, and constructed nature-based projects in the Carolinas for more than twenty years, and is proud to present the concept designs that the intentional process has generated.

1.4.1 Shared Community Themes Across the Carolinas

Through community engagement events and Steering Committee meetings in both North Carolina and South Carolina, several recurring themes consistently emerged across the project areas:

- **Community Connection:** A deep appreciation for friends, family, neighbors, and shared history was voiced in every session. These bonds and the desire to preserve them are clearly central to life in these communities.
- **Rural Character and Quality of Life:** Many residents expressed how much their communities value the quiet, rural environment – from the ability to hear birds and see the stars at night, to the benefits it brings to their everyday well-being.
- **Flooding and Infrastructure:** Community members expressed many concerns about flooding –from individual properties to key roadways. A common issue raised was inadequate maintenance of drainage ditches, contributing to water challenges in various areas.

1.4.1 Shared Community Themes Across the Carolinas Cont.

- **Living with Water:** Stories of fishing, crabbing, shrimping, and boating in Cape Romain (SC) and Albemarle Sound (NC) and their connected waterways were powerful. These were balanced by memories of hurricanes, a decline in local marine life, loss of access to familiar waterways, and growing concerns about more frequent flooding and privatization of waterfront areas.

To support evaluation of problem areas and conceptual projects, a set of design criteria was developed through collaboration with community members and Steering Committees in both North Carolina and South Carolina. While many priorities overlapped across the project areas, the criteria also reflect distinct local values, environmental conditions, and implementation considerations identified within each state.

FIGURE 1 Criteria List for NC & SC Project Areas

North Carolina	South Carolina
Community	
Reduces flood risk / damage	Reduces flood risk / damage
Protects infrastructure	Protects **or improves** infrastructure
Protects cultural sites	**Respects local values & culture**
Benefits beyond private land	**Access to nature & natural resources**
Expands recreation & learning opportunities	Benefits multiple communities
Environmental	
Buffers storm surge / waves	Buffers storm surge / waves
Reduces stormwater flooding	Reduces stormwater flooding
Stabilizes shorelines / banks	Stabilizes shorelines / banks
Improves water quality	**Filters stormwater runoff**
Restores habitat	Restores habitat
Feasibility	
Quick to design & implement	Quick to design & implement
Simple permitting process	Simple permitting process
Could also apply elsewhere	**Scalable design**
Local material use	**Uses local knowledge & resources**
Minimal maintenance	Minimal maintenance

1.5 Problem Definition & Scope

Coastal communities in the Carolinas face compounding threats from sea level rise, increased flooding frequency, and the degradation of the coastal marshes and wetlands that have historically buffered shorelines and provided critical habitat. In the project areas in North Carolina and South Carolina, these threats fall disproportionately on rural, underserved communities with limited resources to plan for or respond to accelerating coastal change. The challenge is not only ecological but social: meaningful resilience solutions must be co-developed with the communities most affected, grounded in local knowledge and priorities, and designed to deliver tangible benefits for both people and wildlife.

The scope of this project covers three integrated tasks: a data-driven and community-informed Vulnerability Assessment for each project area that maps community exposure to flooding and related threats. Due to significant data gaps and limited availability of localized flood information within the project communities, the assessment relied heavily on community knowledge and lived experience gathered through the engagement process. Community members provided critical insight into where flooding occurs, its frequency and timing, and how these impacts affect daily life, helping to fill gaps where existing datasets were limited, inconsistent, or conflicting. This process also helped establish a shared understanding of local flooding conditions while identifying a broader need for additional data and resources to better understand the underlying drivers of flooding and climate-related impacts. The project also includes co-development with community Steering Committees of a prioritized list of conceptual nature-based solution (NBS) project ideas, including at least one marsh-centric concept for the South Carolina area; and preparation of 10% preliminary engineering designs for the top-priority projects (one in NC, two in SC) to position them for the next stage of funding.



At the bend of Seafood Road and Bee Hive Road, stormwater drainage ditches remain full of water despite the tides being low. (Photo Credit: Weston & Sampson)



Two adult Royal Terns, a priority bird species identified for the Pledger Landing project area in North Carolina. Photography credited to Kyle Fritz.

Chapter Two
Vulnerability Assessment

The Vulnerability Assessment for this project was unique in that the primary source of information came from community voices. Whereas traditional assessments tend to rely heavily on long-term field measurements and computer based modeling, hydrology data and mapping information in these rural project areas is scarce. In response, local knowledge informed by long family histories and generations of lived observation provided critical insight into patterns of flooding, environmental change, and community vulnerability. Major tropical events have flooded or devastated portions of the project areas, shaping both individual experiences and collective understanding of risk over time.

As a result, the Vulnerability Assessment began with these community voices. Computer-based mapping and analyses followed to document shared experiences, compare observations across project areas, and supplement the limited hydrologic information currently available. Community members and stakeholders then reviewed the findings to further refine and validate the assessment for each project area.

While community perspectives are essential to understanding how environmental change is experienced on the ground, establishing a shared understanding of the underlying drivers of change remains an ongoing challenge. Continued data collection, monitoring, and analysis will be critical to improving understanding of flood vulnerability and supporting long-term planning efforts that strengthen community resilience.

2.1 North Carolina Project Area

Natural & Cultural History

The project area is contained within the lower Coastal Plain Ecoregion of North Carolina. Tyrrell County is part of the Pamlico Terrace, a broad, flat plain that was an ocean floor during the Pleistocene. The landscape is characterized by flat topography composed of marine sediments–sandy soils underlain by clay–most of which are hydric. Shallow, braided creeks convey surface water and groundwater from a network of pocosin wetlands to Albemarle Sound to the north and east, and Alligator Creek to the south. Ancient forests of Atlantic White Cedar, Longleaf Pine, and Cypress were clearcut in the last century, converting the landscape to a patchwork of early successional forest, agricultural fields and silviculture, and managed pine wetlands checkered by a network of ditches and elevated logging roads.

Ecology & Habitats

The project area includes a variety of ecosystems and unique habitats. **Estuarine wetlands** including brackish marshes, inlets, and embayments of Albemarle Sound and the Alligator River surround the project area. **Palustrine wetlands** including pocosins, open water creeks, oxbows, canals, and managed pine wetlands dominate the landscape of the project area. **Upland** areas include longleaf pine forests, loblolly pine silviculture, mixed hardwood and cutover forests, agricultural fields, and residential areas. The diversity of habitats, land cover types, and land uses creates a variety of rich ecotones across the project area.

Landscape Hydrology

The current hydrology and road infrastructure of the project area are the direct result of a century of logging and farming. Ditches intended to drain wetlands and facilitate logging have permanently altered the landscape. Surrounding water levels have increased–primarily due to hydrodynamic changes brought about by the Alligator River / Pungo River Canal segment of the Intercoastal Waterway–and the ditches that carry wind-driven tides and surges deep into the upland areas of the community. Roadside ditches that were once dry except during rainfall are now constantly full. The sandy topsoil is often saturated, killing trees, ruining septic systems, and threatening the entire community.

For several generations the ditches were maintained by logging operators and local farmers. Presently, in areas without active logging or farming activities, the primary form of land management is for hunting large game and waterfowl. However, the challenges facing the Alligator community are complex and interconnected. Low-lying topography, limited hydrologic and groundwater data, and the increasing impacts of major storm events all contribute to

Landscape Hydrology Cont.

ongoing flood vulnerability and landscape change. Within this broader context, the condition and function of the ditch network remains an important factor influencing both the natural landscape and the infrastructure that supports the Alligator community.

Problem Areas Mapping





(Top and Bottom Images) Residents of the Alligator community in Tyrrell County gathered for a community meeting in June of 2025 to share their concerns and insights about flooding, landscape changes over time, and areas experiencing recurring issues.

Problem areas were first identified by community members. Members of the project team toured the project area to observe many of these problem areas and to hear from community members about specific flooding events, flooding trends, and changes in the landscape over time. Problem areas were identified and marked on aerial photos and topographic maps. The project team used Geographic Information System (GIS) software (ArcGIS and QGIS) to orthoreference and label each problem area.

Field Reconnaissance



(Image) Nolan Williams of Robinson Design Engineers taking elevation measurements of roadside canals during a site visit in November 2025. (Photo credited to Cat Bowler)

Members of the project team visited the project area on several occasions between spring 2025 and spring 2026 to assess problem areas, observe flooding, meet with community members, collect elevation measurements of key features, and collect photos of the project area and the surrounding context.

Hydrologic Analyses

The project team reviewed and analyzed water level data collected by the NC Flood Inundation Mapping and Alert Network (FIMAN), US National Weather Service (NWS), and US Geological Survey (USGS) to assess current water level statistics. The project team also reviewed Flood Insurance Rate Maps and various regional studies of water level statistics and sea level rise projections to assess possible future conditions and risks associated with these scenarios. In late 2025, a new FIMAN gauge was installed at the Old Hwy 64 crossing of Little Alligator River (Site ID 30263) within the project area.

In a recent survey, several dozen drainage channels across the study area were recorded. These data were digitized into an ArcGIS feature class to identify which of these channels were most vulnerable to backflow during tidal flooding. To understand which of these ditches would be inundated by various levels of storm surge/tidal flooding, the project team developed a series of simplified bathtub models at 0.5 ft. increments.

Stressors & Vulnerabilities

A major outcome of the Vulnerability Assessment was understanding that there is a key threshold between 6-12 inches of additional water - whether from rainfall, storm surge, sea level rise, etc. - at which point there will be widespread flooding throughout the community with exact water level depths varying depending on the elevation of each specific location.

Notably, the NOAA Sea Level Rise viewer “High Tide Flooding” tool

Stressors & Vulnerabilities Cont.

portrays extreme flooding during regular high tides. These estimates seem to be based on tidal data collected along the Outer Banks, where tide fluctuations and ocean currents are much larger than those experienced as far inland as Alligator. As a result, one of the psychological stressors and vulnerabilities for the community is the lack of long-term water level data, and without this data it is difficult to accurately predict flood scenarios in the project area.

The flood vulnerability mapping revealed that the arterial ditches present a unique challenge: in addition to providing conveyance of stormwater runoff from the uplands out to the receiving waters, the ditches also serve as conduits for wind-driven water and storm surge backflow from the receiving waters into upland areas and communities. This insight also lends itself to concerns of groundwater intrusion and saltwater intrusion into agricultural fields, septic drainfield areas, and low-lying areas connected to roadside ditches.

Roads connect the community, but roadside ditches are sometimes a source of flooding. Where roadside ditches drain to arterial ditches, wind-driven water and storm surge flood roads by way of roadside ditches. Furthermore, roadside ditches can cause long-term saturation of upland soils, causing ground subsidence, septic drainage problems, ponding, and drowning of landscapes and kitchen gardens.

Waterfowl impoundments in the project area rely on pumps to flood the fields during the hunting season. At the end of the season, when the pumps are used to drain the fields, the surge of water overwhelms the ditch network and can flood large portions of the project area for weeks at a time.

Because the project area is a peninsula criss-crossed with ditches, water levels in the surrounding water bodies increase shallow groundwater in the project area. Clay subsoils hold water, saturating the surface soils. While the ditch network can drain the groundwater table during dry, still weather, heavy rain or heavy winds fill the ditches with water and maintain elevated groundwater levels.

Land clearing of pine forests radically alters the rainfall-runoff hydrology of a landscape. Whereas large trees use water and continually draw down the local water table, when these trees are removed, areas previously dry can become a source of runoff, exacerbating local drainage problems.

Sea level rise and increasing rainfall threaten to exacerbate all the stressors and vulnerabilities described above.

2.2 South Carolina Project Area

Natural & Cultural History

The project area is contained within the Coastal Zone and Outer Coastal Plain regions of South Carolina. This portion of the state is characterized by Pliocene to Holocene deposits, including sands and clays shaped by seven distinct ancient ocean levels. The project area includes portions of the Santee River Delta and the Sea Island Complex, and is characterized by extensive marshes, wetlands, estuaries, and rivers. The Santee River Delta was formed by deposits from the immense Santee River system, and the Sea Island Complex formed as glacial ice melted and sea levels began to rise about 15,000 years ago. The Sea Islands are relics of these drowned river valleys–ancient dunes now cut off from the mainland.

The rich soils, flat topography, and the dense network of rivers, creeks, and wetlands of the Outer Coastal Plain were ideal conditions for growing inland rice. Beginning in the late 1600s, the project area was transformed by plantation rice agriculture at a commodity scale. Enslaved West Africans were forced to ditch and drain the landscape, creating extensive rice fields and a vast network of dikes and water control structures. The Gullah Geechee people are descendants of these enslaved West Africans. Isolated on coastal plantations, enslaved communities developed a distinctive culture that retains strong African influences in language, foodways, arts, music, and spirituality. Their language, cultural practices, and community traditions represent one of the most significant and enduring African American cultural heritages in the country (Gullah Geechee Heritage Corridor Commission, 2025).

After the collapse of rice culture in the 1800s and early 1900s, inland rice farm infrastructure fell into disrepair while others became private recreational tracts for local and northern families. Throughout the 20th century, much of the project area was converted to pine silviculture in areas that were originally coniferous forest–including longleaf pine flatwoods, or hardwoods. A portion of the project area is within the Francis Marion National Forest, which was established nearly a century ago and now contains nearly 400 square miles of forested land.

Around the same time, two major infrastructure projects dramatically altered the hydrology of the project area: the construction of the Santee River Dam and the excavation of the Intracoastal Waterway (ICW). The Santee Dam dramatically altered the hydrology of the river and its floodplains, and communities moved into floodplain areas previously too wet to inhabit. As flows from the dam have increased over time, these settlement communities are facing new flooding threats. Similarly, the work of excavating and connecting tidal tributaries to create the ICW has altered the tidal regime of the salt marsh behind Bulls Bay and subjected the region to wave energy from boat traffic.

Natural & Cultural History Cont.

Ecology & Habitats

The project area includes a variety of ecosystems and unique habitats. **Tidal salt marshes** along the Coastal Zone dominate the eastern portion of the project area, including Cape Romain. These areas include unique ecosystems such as barrier islands, hummock islands, tidal creeks, and mudflats. **Estuarine wetlands**, including brackish marshes, inlets, and embayments of the Santee River fringe the northern portion of the project area. **Palustrine wetlands**, including swamps, pocosins, blackwater creeks, oxbows, Carolina Bays, canals, and managed pine wetlands, dominate the landscape of the central project area. **Upland** areas include longleaf pine forests, loblolly pine silviculture, mixed hardwood and cutover forests, agricultural fields, and residential areas. The diversity of habitats, land cover types, and land uses creates a variety of rich ecotones across the project area.

Landscape Hydrology

The project area is characterized by low-gradient riverine systems, freshwater wetlands, salt marshes, and a vast network of ditches and canals. Due to the low relief and flat valley gradients, stormwater runoff in these systems is conveyed slowly. Unlike higher-gradient rivers that flood every few years, Coastal Plain rivers overflow their banks annually, often for extended durations.

The ditches and canals constructed to grow rice, drain wetlands, abate mosquitos, or facilitate logging have permanently altered the landscape. In addition to lowering the shallow groundwater table in many areas, the ditches and canals have increased the velocity and flow of runoff, causing flooding of low-lying areas downstream and at road crossings constrained by culverts. Furthermore, the ditches designed to drain out into tidal creeks sometimes convey large tides and tropical storm surges deep into the upland areas and freshwater wetland systems.

Problem Areas Mapping



(Top and Bottom Images) Residents gathered at the Lincoln Regional Center to validate community-identified flooding concerns and problem areas documented during the Community Engagement Phase. (Photo credited to The Asiko Group)

Problem areas were first identified by community members. During the community listening sessions, community members were encouraged to mark specific problem areas on aerial maps, categorized by issue (tidal flooding, stormwater flooding, environmental degradation). More than fifteen community meetings were held.

The project team mapped the problem areas and floodprone roadways using Geographic Information System (GIS) software (ArcGIS and QGIS). Each location was orthoreferenced and labeled to create a composite database. The maps of problem areas were overlaid with various spatial data including topography, wetlands and waterways, soils, floodplains, roads and rights-of-way, and parcel boundaries to help identify trends and common causes among the problem areas.

Field Reconnaissance

Members of the project team visited the project area on many occasions between spring 2025 and spring 2026 to assess problem areas, observe flooding, meet with community members, collect elevation measurements of key features, and collect photos of the project area and the surrounding context.

Members of the project team also toured the project area with community members–including a boat tour and bus tours–to observe many of these problem areas together. These field tours also provided an opportunity for the project team to ground-truth the problem areas and learn more about specific flooding events, flooding trends, and changes in the landscape over time.

Field Reconnaissance Cont.



(Image right) The project team and community members take a boat tour through the Cape Romain National Wildlife Refuge in November 2025. (Photo credited to Audubon)

Additionally, because all listening sessions were held within the project area, most meetings were followed by informal field tours during which community members showed the project team the issues raised during community meetings.



(Image right) The project design team conducting a site visit in Ten Mile to assess marsh health, existing plant species, and infrastructure conditions. (Photo credited to Surculus)

Hydrologic Analyses

The project team reviewed and analyzed water level data collected by the US National Weather Service (NWS) and US Geological Survey (USGS) to assess current water level statistics. The project team also reviewed Flood Insurance Rate Maps and various regional studies of water level statistics and sea level rise projections to assess possible future conditions and risks associated with these scenarios.

Hydrologic Analyses Cont.

Hydrology data from USGS StreamStats and the National Wetlands Inventory were incorporated in the GIS, and numerous drainage channels across the study area were recorded. Streams and ditches were also digitized from historical USGS maps, both to understand the historic water flows and to validate flooding concerns shared by the chorus of Community Voices.

Stressors & Vulnerabilities



(Image right) Roadside ditch typology in the South Carolina project area. (Photo credited to Surculus)

The problem areas mapping and flood vulnerability assessment revealed that the arterial ditches present a unique challenge: in addition to providing conveyance of stormwater runoff from the uplands out to the receiving waters, the ditches also serve as conduits for storm surge backflow from the receiving waters into upland areas and communities. This insight also lends itself to concerns of groundwater intrusion and saltwater intrusion into agricultural fields, septic drainfield areas, and low-lying areas connected to roadside ditches.

Stressors & Vulnerabilities Cont.

Roads connect the community, but roadside ditches are sometimes a source of flooding. Where roadside ditches drain to arterial ditches, wind-driven water and storm surge flood roads by way of roadside ditches. Furthermore, roadside ditches can cause long-term saturation of upland soils, causing ground subsidence, septic drainage problems, ponding, and drowning of landscapes and kitchen gardens.

Land clearing of pine forests radically alters the rainfall-runoff hydrology of a landscape. Whereas large trees use water and continually draw down the local water table, when these trees are removed, areas previously dry can become a source of runoff, exacerbating local drainage problems.

Hurricane Hugo in 1989 altered the landscape. Community memory is unified in recalling that much of the storm debris was never removed from the ditches and canals. The debris clogged ditches and exacerbated sedimentation to the point that many of the ditches are completely filled in and no longer function. This stressor will continue to worsen until ditches are cleaned and improved.

Potential alterations to drainage infrastructure along US Highway 17–such as culverts, ditches, and canals–are a vulnerability throughout the project area. In some portions of the project area, the roadway corridor serves as a dam or dike, diverting water from its natural drainage course. Future changes to the road corridor could help to relieve flooding, or could cause further flooding in many parts of the project area.

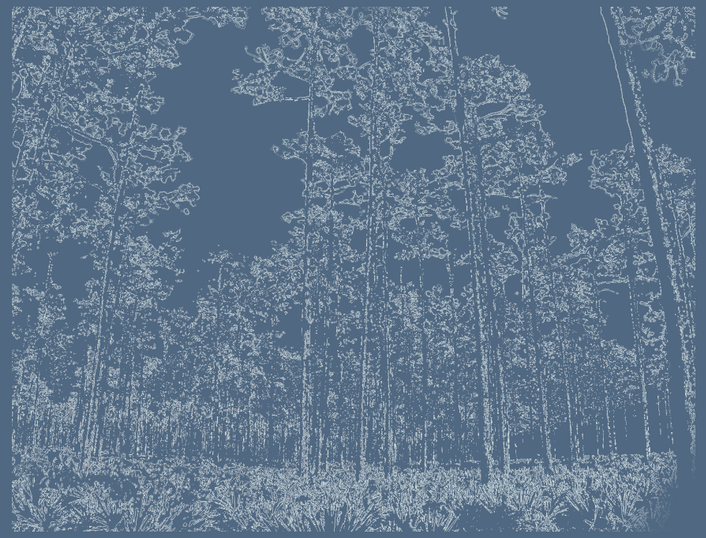
Land development is an ongoing threat, especially within and near the incorporated communities. New land clearing, road building, and real estate development is altering the landscape and further burdening stressed infrastructure.

Sea level rise and increasing rainfall threaten to exacerbate all the stressors and vulnerabilities described above.



The Red-cockaded Woodpecker, highlighted as one of the priority birds for the Pledger Landing project area. Photography credited to Rebecca Vassallo.

Chapter 3
Preliminary Engineering Designs



3.1 Pledger Landing Living Shoreline (NC)

3.2 Tibwin Creek & Jeremy Creek Canal (SC)

3.3 Ten Mile Saltmarsh & Seafood Road (SC)

3.4 *Ditchscapes*



A view of Pledger Landing at the end of Pledger Harbor Road, where the shoreline of the Albemarle Sound meets a striking ghost forest edge shaped by coastal changes and wind-driven tides. (Photo Credit: Robinson Design Engineers)

3.1 Pledger Landing Living Shoreline

Pledger Landing is an important place of water management and community gathering. Located at the end of Pledger Harbor Road within the Wildlife Resources Commission-owned Palmetto-Peartree Preserve, the site provides public access to Albemarle Sound. The preserve itself was established in part through mitigation efforts associated with habitat impacts to the endangered Red-cockaded woodpecker. In recent memory, the shoreline at Pledger Landing was a sandy and broad beach, offering ample place for gathering, sports, and swimming. Today, erosion and changing waters have diminished the beach and the dunes that protect the inland landscape, significantly diminishing recreational value and worsening longstanding flooding issues.

Existing Conditions





(Image 1) Ditch / creek system clogged and dammed by sediment. Photo looking inland.

(Image 2) Shoreline erosion and ghost forest. Photo looking east toward Pledger Landing.

Opportunities

The objective of the work is **a) to use nature-based features to reduce erosion and catalyze restoration of the shoreline along Pledger Landing**, and **b) to improve community access while celebrating and documenting the shared memory of this special place**.

A unique living shoreline system composed of wood, stone, and native plant materials will be designed and engineered to a) dampen wave energy, b) induce deposition of sediment in specific areas, and c) prevent sedimentation of two ditch outlets. The living shoreline system will be designed to respond to the challenges and physical processes that are specific to the landscape context of the Pledger Landing site and the Albemarle Sound.

The shoreline will extend approximately 2,000 linear feet. Roughly 500 feet of living shoreline is planned along the segment of shore extending east of Pledger Landing, and roughly 1,500 feet of living shoreline is planned along the segment of shore extending west of Pledger Landing towards Lewis Point.

Wooden components are conceptualized to mimic the form and structure of “pound nets”, a local, traditional method of fin-fishing. Wooden piles and logs will also blend with the ghost forests of trees along the shoreline. Stone will be used sparingly and only where necessary to resist erosion and to alter currents and flows along the shore at critical locations. These nature-based features are a stark contrast to the gray infrastructure of bulkheads, riprap armoring, and rock groynes commonly used along developed coastlines. The hybrid assemblages of natural materials–wood, stone, sediment, and native vegetation–will be designed to catalyze natural, restorative processes, thereby enhancing both resilience and ecological value.

The site is also a good opportunity for the beneficial use of dredged sediments. Creative living shoreline components such as tombolos could be designed to protect the shoreline by carefully placing and grading dredged sediments, and then planting them with native vegetation appropriate to the context. Such features would promote ecological diversity while restoring a shoreline that is similar to its historic form.

The project would create new pathways for partnership with the North Carolina Wildlife Resources Commission, the adjacent landowner and steward of the Palmetto Peartree Preserve.



Historical Context Photos

(Top) Traditional brushwood dams in the Wadden Sea, Netherlands. Historically used in Dutch coastal landscapes to reclaim and stabilize marshland, these structures consist of wooden poles and bundled brushwood arranged to slow water movement and capture suspended sediment. The system represents a long-standing example of working with tidal energy and natural material systems to encourage shoreline accretion. Although developed within a different environmental and cultural context than the project site in North Carolina, the technique informed precedent studies exploring sediment-based and nature-driven shoreline strategies.

(Middle) A 1899 photo Pound Net fishing structures in Chignik Bay, Alaska. (Source: Salmon and Salmon Fisheries of Alaska, Moser, Jefferson F.)

(Bottom) Example of a traditional pound net fishing structure used in coastal North Carolina. Pound nets were introduced to North Carolina in the late 1800s and became an important part of the region’s coastal economy and fishing culture, particularly throughout the Albemarle, Pamlico, and Croatan Sounds. This historic system served as a reference point





Constraints

- Most living shorelines are designed to attract oyster growth. The "living" biological components are oysters and vegetation. Pledger Landing is located in a brackish portion of Albemarle Sound which does not support oyster growth. Therefore, the "living" components will be limited to vegetation, requiring a creative solution that will be different from many other living shorelines. This will require additional engagement with the community and regulators to ensure the living shoreline mutually meets the expectations of both groups.
- Sediment supply and transport is difficult to measure and predict. The erosional trends along the shore are likely caused by a combination of factors including wind, wake, changing currents and tides, and recent storms.
- The "ghost forest" of standing dead trees will require careful consideration. Should the trees be removed and incorporated into wooden breakwaters, or should they remain undisturbed for habitat and community memory?
- Long-term maintenance and funding are challenges for any living shoreline project. Community members and stakeholders are especially concerned about these challenges in such a remote, rural, and underserved community in which local infrastructure already suffers from underfunding and neglect.
- Access to the site is by way of Pledger Harbor Road or by water.

Regulatory Considerations

State Regulatory Considerations

North Carolina Department of Environmental Quality (NCDEQ)
The project will require a Coastal Area Management Act (CAMA) Major Permit from the NC Division of Coastal Management (DCM). Based on the December 2024 NCDOT Combined AEC dataset, Pledger Landing is located within designated Areas of Environmental Concern (AEC), specifically the Estuarine and Ocean System. Because the 2,000-linear-foot scope exceeds the 500-foot limitation of the General Permit (GP) and involves complex structural elements, a Major Permit is necessary. This process involves a comprehensive review by 10 state and 4 federal agencies.

Regulatory Considerations Cont.

Federal Regulatory Considerations

U.S. Army Corps of Engineers (USACE) The USACE regulates the project under Section 404 of the Clean Water Act.

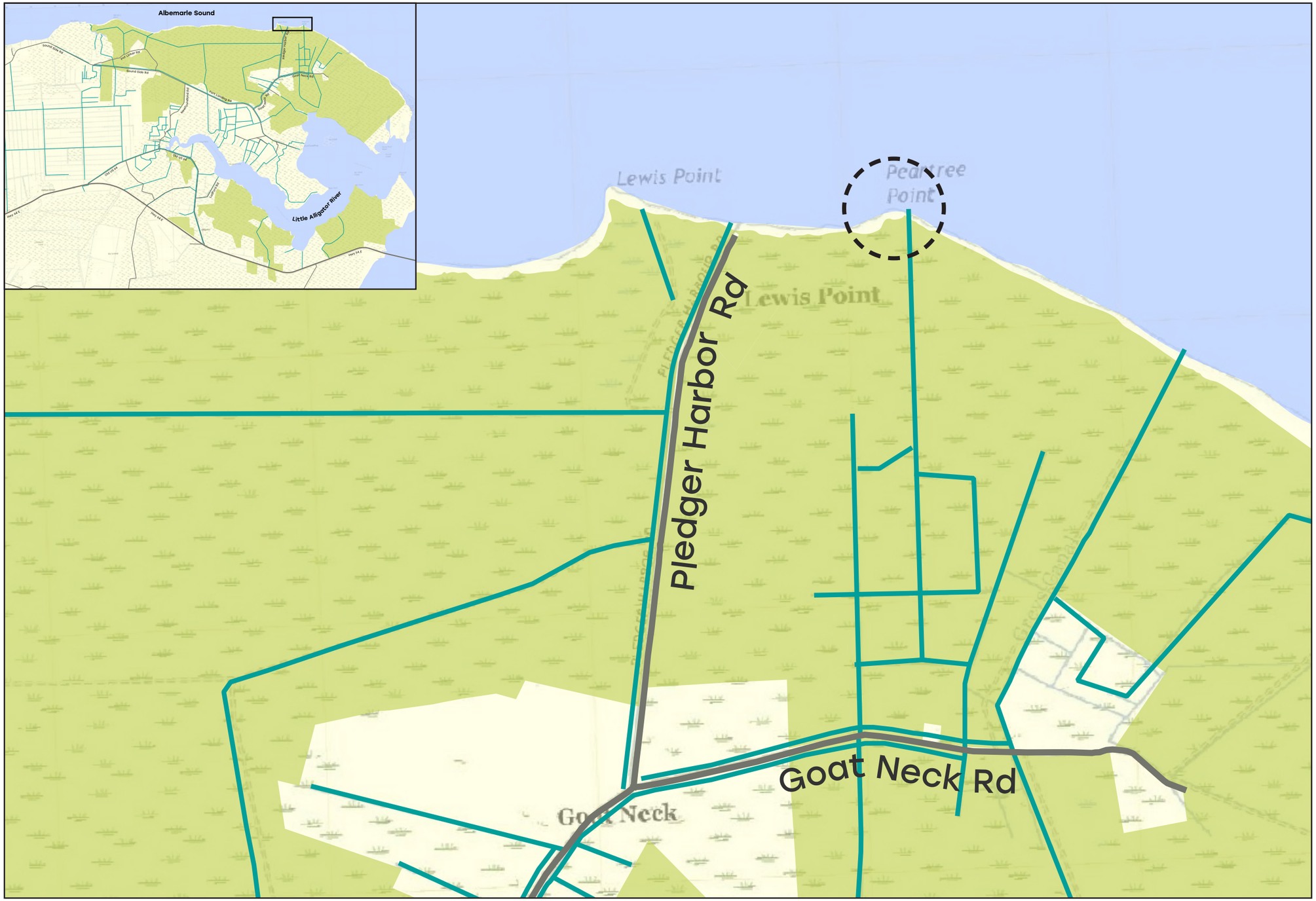
Nationwide Permit (NWP) 54 The project will likely be authorized under NWP 54 (Living Shorelines). This permit allows structures and work in navigable waters of the United States and discharges of dredged or fill material into waters of the United States to stabilize banks and shores in coastal waters along shores with small fetch and gentle slopes that are subject to low- to mid-energy waves. Living shorelines should maintain the natural continuity of the land-water interface, and retain or enhance shoreline ecological processes. Living shorelines must have a substantial biological component, either tidal or lacustrine fringe wetlands or oyster or mussel reef structures.

Estimates of Cost

Cost estimates are preliminary, based on available information and pricing as of June 2026, and are subject to change as design progresses and site conditions are confirmed.

Item	Quantity	Units	Unit Price Low	Unit Price High	Total Cost Low	Total Cost High
Wooden Breakwater	1,000	LF	$ 500	$ 1,000	$ 500,000	$1,000,000
Granite Sill	750	LF	$ 1,500	$ 1,800	$ 1,125,000	$ 1,350,000
Marsh Plants (Herbaceous Plugs)	10,000	EA	$ 3	$ 5	$ 30,000	$ 50,000
				Construction Subtotal	$ 1,655,000	$ 2,400,000
				Testing, design, permitting (15%)	$ 165,500	$ 240,000
				Grand Total	**$ 1,820,500**	**$ 2,640,000**


Albemarle Sound
Project Site
Columbia
Creswell
Tyrrell County
Washington County
Dare County
Phelps Lake
Hyde County
Alligator River
0
10,000
20,000 ft
1:200,000
N
Location Map
ROADS
PALMETTO-PEARTREE PRESERVE
MUNICIPAL BOUNDARY
COUNTY BOUNDARY
NATURAL HERITAGE AREAS


Albemarle Sound
Little Alligator River
Lewis Point
Peartree Point
Lewis Point
Pledger Harbor Rd
Goat Neck
Goat Neck Rd
Project Area Map
ROADS
DITCH / CANAL
PROJECT AREA
PALMETTO-PEARTREE PRESERVE



Site Plan Map

PROPOSED LIVING SHORELINE

PROPERTY BOUNDARY

DOT ROAD







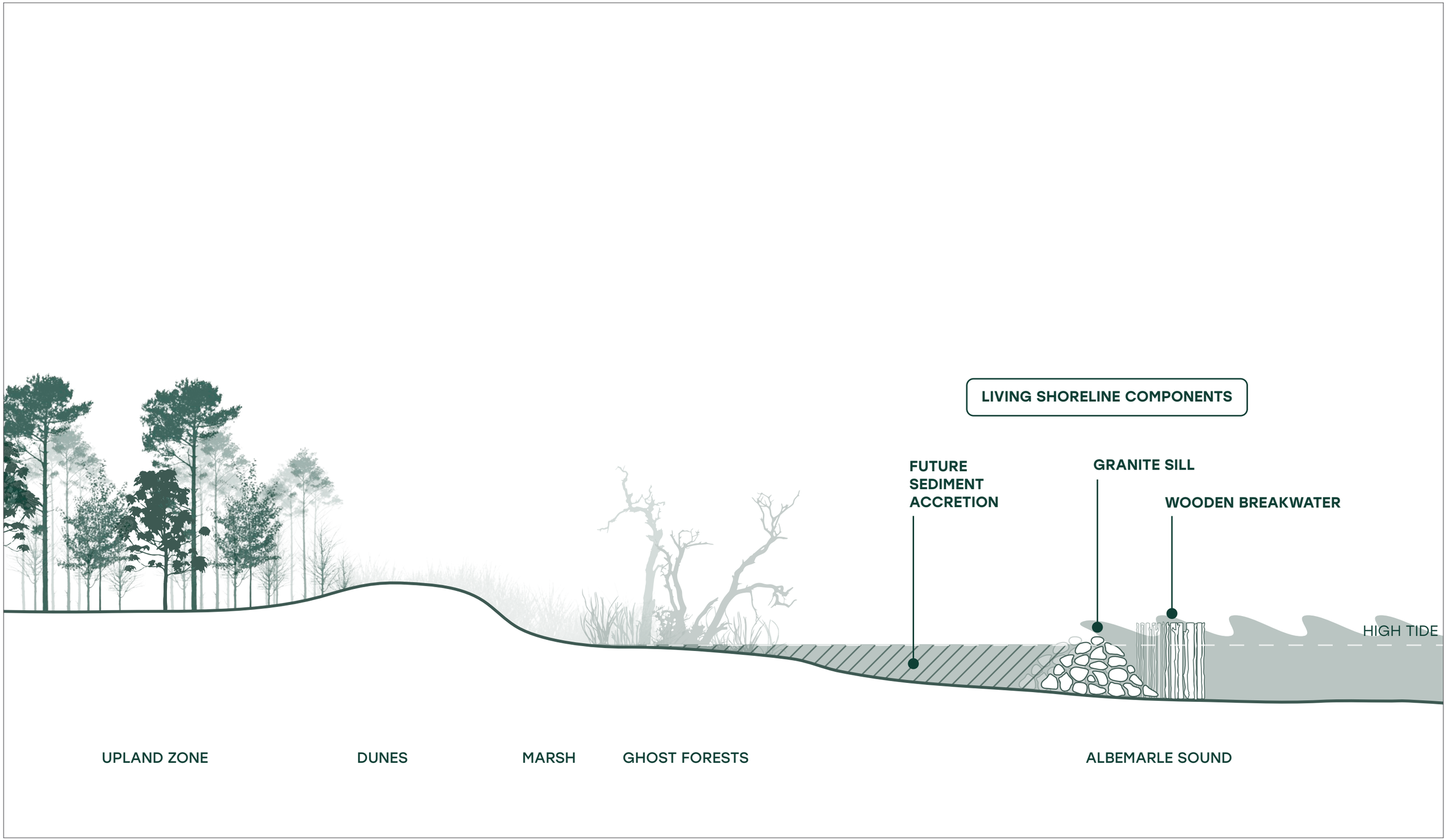
(Images 1-3) Aerial Photography of Pledger Harbor Road, canals, and shoreline provided by NC State's Coastal Dynamics Design Lab.

(A) Accumulated sediment at the mouth of the canal alongside Pledger Harbor Road from wind-driven tides.

(B) A nearby large canal also exhibits sediment buildup at the canal mouth, restricting drainage flow.

(C) Shoreline erosion over time has created visible "ghost forests," or remnants of dead trees, seen from a aerial view.

FIGURE 2 Proposed Cross Section of Living Shoreline Components for Pledger Landing



Wet Zone



Nyssa biflora
Swamp Tupelo
Native



Ilex glabra
Inkberry
Native



Aronia arbutifolia
Red Chokeberry
Native



Eupatorium perfoliatum
Boneset
Native



Eutrochium dubium
Coastal Joe Pye Weed
Native



Kosteletzkya pentacarpos
Seashore Mallow
Native

Riparian Zone



Morella cerifera
Wax Myrtle
Native



Clethra alnifolia
Sweet Pepperbush
Native



Helianthus angustifolius
Swamp Sunflower
Native



Conoclinium coelestinum
Blue Mistflower
Native



Panicum virgatum
Switchgrass
Native



Sabal minor
Dwarf Palmetto
Native

Upland Zone



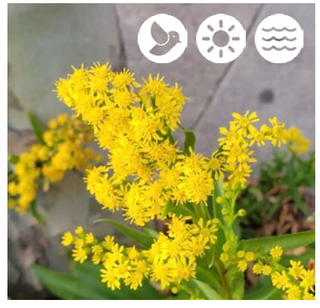
Ilex opaca
American Holly
Native



Ilex vomitoria
Yaupon Holly
Native



Callicarpa americana
Beautyberry
Native



Solidago sempervirens
Seaside Goldenrod
Native



Monarda punctata
Spotted Beebalm
Native



Coreopsis lanceolata
Lanceleaf Coreopsis
Native

Proposed Plant Species for Project Area

Bird Friendly

Full Sun

Part Sun

Salt Tolerant

Photos provided iNaturalist.

This figure was prepared by N.C. State's CDDL.







FIGURE 3 Precedent Project:
Photos of Morgan Park Living Shoreline, Georgetown, SC, along Winyah Bay. This living shoreline approach incorporated both wooden breakwaters and manufactured wire reefs (MWRs).







FIGURE 4 Precedent Project:
Carteret Community Center Tombolo Living Shoreline (Photo Credit: NC Coastal Federation)

FIGURE 5 Precedent Project:
These three photos are of Roanoke Island Granite Sill (Photo Credit: NC Coastal Federation)











FIGURE 6 Precedent Project: Jockeys Ridge State Park (Top image) An offshore granite sill installed and newly planted marsh grasses along the shoreline at Jockey's Ridge State Park, August 2023. (Bottom image) After sill installation, sediment is captured and salt marsh vegetation is seen reestablishing. (Photo Credit: NC Coastal Federation)



Aerial photography of the Tibwin Creek and Jeremy Creek Canal provided by Weston & Sampson.

3.2 Tibwin Creek & Jeremy Creek Canal

This canal system spans approximately three miles, linking Tibwin Creek and Jeremy Creek between Tibwin and McClellanville. In their original, natural state, Tibwin Creek and Jeremy Creek each drained distinct watersheds defined by the surrounding topography. However, the constructed canal has hydrologically connected the two systems, effectively merging their drainage areas into a single, interconnected basin totaling approximately 8,850 acres. A network of smaller ditches and canals flow into this arterial canal, providing drainage for a large portion of the overall project area. However, the ditches and canals have impaired the hydrology of the surrounding wetlands and natural areas and fragmented a variety of habitats. This project focuses on the primary canal system with the longest continuous stretch, which is in a public drainage easement.

Existing Conditions





(Image 1) Bank erosion was observed and stagnant water in the canal. (Photo credited to Weston & Sampson)

(Image 2) Stagnant water and exposed loose soil are visible along the eroded banks. (Photo Credit: Weston & Sampson)

Opportunities

Re-naturalizing the canal system through a **two-stage ditch** design will mimic the form and function of natural creeks and streams by incorporating a small inset floodplain, or "bench," within the existing channel. In this approach, the lower channel conveys baseflow and smaller storm events, while the benches **activate during higher flows to slow water, store stormwater, and support native vegetation, sediment deposition, and nutrient processing**. The gentler, wider banks slow water velocity, lower water levels, and improve bank stability. Vegetation stabilizes the benches and banks, traps sediment, and absorbs nutrients, improving overall ditch function and water quality.

Converting the conventional trapezoidal ditch to a two-stage ditch system will nearly **double the volume of floodwater storage**. Applied over the nearly three miles of the canal, the additional storage volume will exceed 5 acre-feet of water, or nearly 2 million gallons.

The woodlands adjacent to the existing ditch are notably biodiverse, with regards to both tree canopy and understory vegetation. Additionally, the woods appear to be remarkably **absent of any major invasive species** that are typical to the area. During field investigations by the design team, no signs of the major invasives (e.g. Chinese tallow, privet, wisteria, etc.) that are typically found in disturbed woodlands were observed.

This endemic vegetative biodiversity also supports a rich diversity of fauna, particularly by providing host plants for larval insects that form the foundation of healthy bird populations–an important priority for Audubon. By reshaping the conventional ditch to create riparian shelves, a space is created where native wetland plant species can thrive. With the addition of species such as blue-flag iris, pickerel weed, lizard's tail, cardinal flower, and native hibiscus species, local ecological biodiversity will benefit as these native plants will support native insects which form the base of the food chain supporting song birds and more. The already beautiful area will transform into a richer, more vibrant habitat as birds, native pollinators, and other forms of beneficial wildlife will thrive. The opportunity to provide habitat enhancements such as bluebird nesting boxes, osprey platforms, and bat boxes would further increase the ecological functionality of the area. With these improvements, not only are habitats enhanced, but opportunities for humans to reconnect with nature improve and expand.

Because of these conditions, a project that incorporates enhanced community access through walking trails along these ditches provides unique opportunities to connect the community to ecosystems of natural mixed hardwood and bottomland forests. These improvements



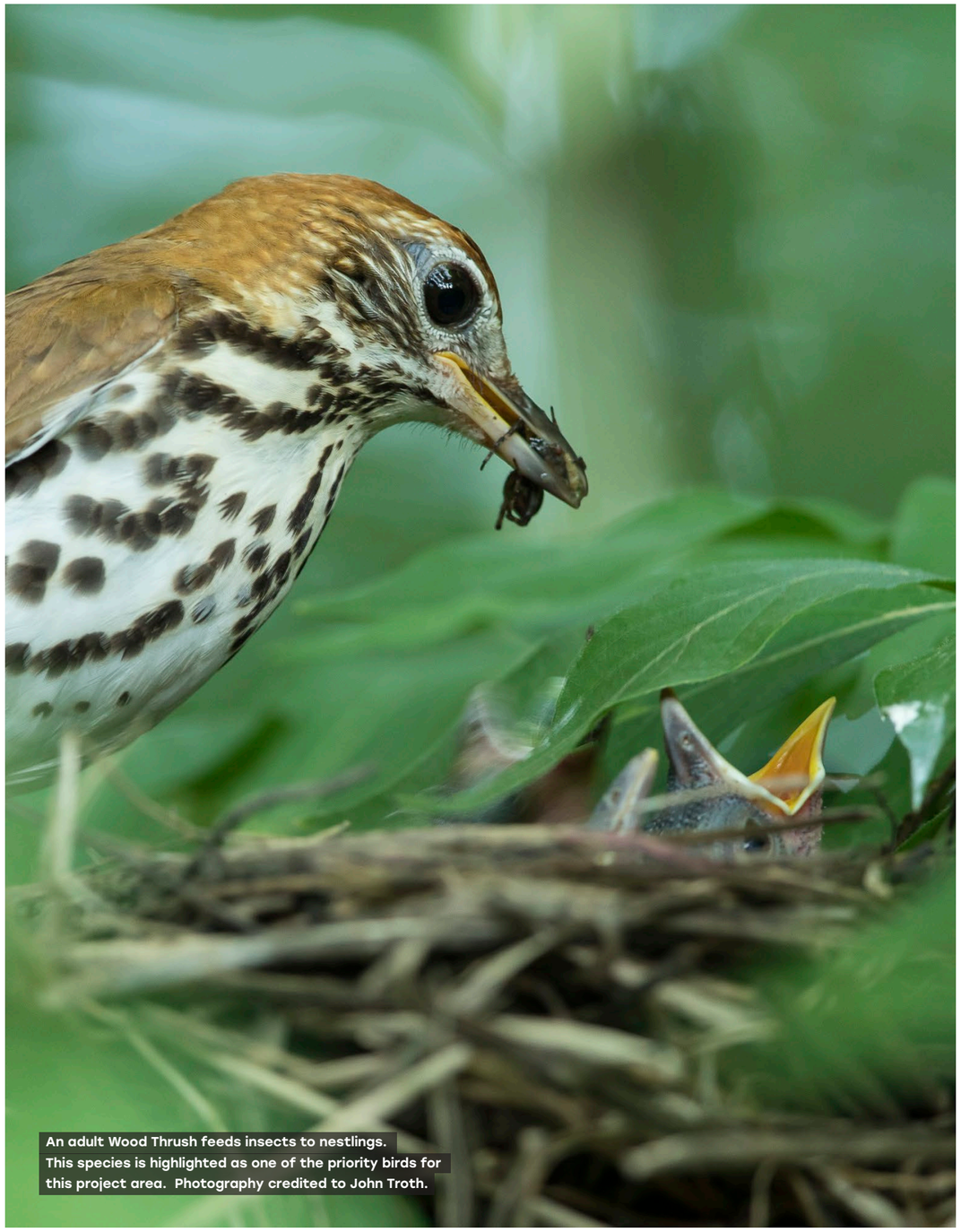
(Image right) The Swallow-tailed Kite is highlighted as one of the priority birds for this project area. Photography credited to James Gray.

Opportunities Cont.

would directly respond to community values such as Rural Character and Quality of Life. Specific programmatic opportunities could include:

- Birdwatching for a variety of species
- Botanical / wildflower hunting
- Hiking and biking
- Seating areas for quiet enjoyment
- Pedestrian connectivity among multiple communities, avoiding dangerous pedestrian, recreational, and cycle travel along the busy US Highway 17 corridor

Re-naturalizing the canal system could serve as a pilot project to spur improvements in similar ditch infrastructure throughout the study area and beyond. This project has the potential to serve as a model for retrofitting historic ditch systems for better site design that provides multiple community co-benefits and habitat enhancements. This project could serve as a model for enhancing ditch systems across the eastern seaboard where existing infrastructure is re-designed and re-shaped to provide better water management capabilities, reintroduce critical habitats and ecosystem functions, and become a recognized and enjoyed community asset.



An adult Wood Thrush feeds insects to nestlings. This species is highlighted as one of the priority birds for this project area. Photography credited to John Troth.

Constraints

- Property ownership may be complicated along the easement. Multiple owners, heirs property, and–according to community members–some of those listed are deceased.
- Less visible as a project. Additional community engagement would be required to enhance knowledge and visibility to make it a true community asset.
- Work would be needed to prevent the threat or perception of gentrification.
- Will need to determine a phased approach as the opportunity area is extensive.
- Parking and community access points will need to be identified.
- Hydrology could be complicated to determine nodes and parameters for flow.
- Consider identifying any pollution inputs that may negatively impact the system health and water quality downstream.

Regulatory Considerations

State Regulatory Considerations

South Carolina Department of Environmental Services (SCDES)

The project area is located landward of U.S. Highway 17, which serves as the statutory freshwater/saltwater boundary (per S.C. Code § 50-5-80), direct critical area permitting is not required through the SCDES Bureau of Coastal Management (BCM). However, the following state review and oversight should be considered:

- ***Section 401 Water Quality Certification*** Issued by SCDES Bureau of Water, this certification may be required to ensure that canal stabilization or any hydrological restoration do not increase turbidity or nutrient loading for downstream "Outstanding Resource Waters" within the Santee Delta.
- ***NPDES Stormwater Permitting*** Since the project may involve re-contouring or stabilizing the drainage canal, it may trigger a Construction General Permit (CGP). This requires a formal Stormwater Pollution Prevention Plan (SWPPP) to prevent silty runoff from entering Tibwin Creek during construction.
- ***Coastal Zone Consistency*** (CZC) Although the SCDES Bureau of Coastal Management (BCM) does not issue a direct permit, they must certify that the project is consistent with the South Carolina Coastal Zone Management Program. This review ensures that upstream freshwater alterations do not negatively impact the biological productivity of the downstream tidal marshes.

Regulatory Considerations Cont.

Federal Regulatory Considerations

U.S. Army Corps of Engineers (USACE) The USACE regulates the project under Section 404 of the Clean Water Act.

- ***Nationwide Permit (NWP) 27*** The project will likely be authorized under NWP 27 (Aquatic Habitat Restoration, Enhancement, and Establishment Activities). This permit supports the restoration of non-tidal wetlands and the improvement of canal profiles to mimic natural hydrological functions.
- ***Jurisdictional Determination (JD)*** A Jurisdictional Determination may be required to confirm the boundaries of regulated freshwater wetlands and the "Ordinary High Water Mark" (OHWM) of the canal and Tibwin Creek.

U.S. Fish and Wildlife Service (USFWS) Given the site's proximity to the Santee Coastal Reserve's longleaf pine buffer, early consultation with USFWS is required under Section 7 of the Endangered Species Act to assess potential impacts on the endangered Red-cockaded Woodpecker (Dryobates borealis) and if necessary, establish necessary construction windows or avoidance protocols.

State Resource Agency Consultation

South Carolina Department of Natural Resources (SCDNR)
As the project is adjacent to the 24,000-acre Santee Coastal Reserve Wildlife Management Area (WMA), SCDNR will review the design for compatibility with their management goals for migratory waterfowl and the Red-cockaded Woodpecker, an endangered species known to inhabit the area's longleaf pine buffers, as well as to ensure it does not create a barrier for terrestrial wildlife or migratory fish.

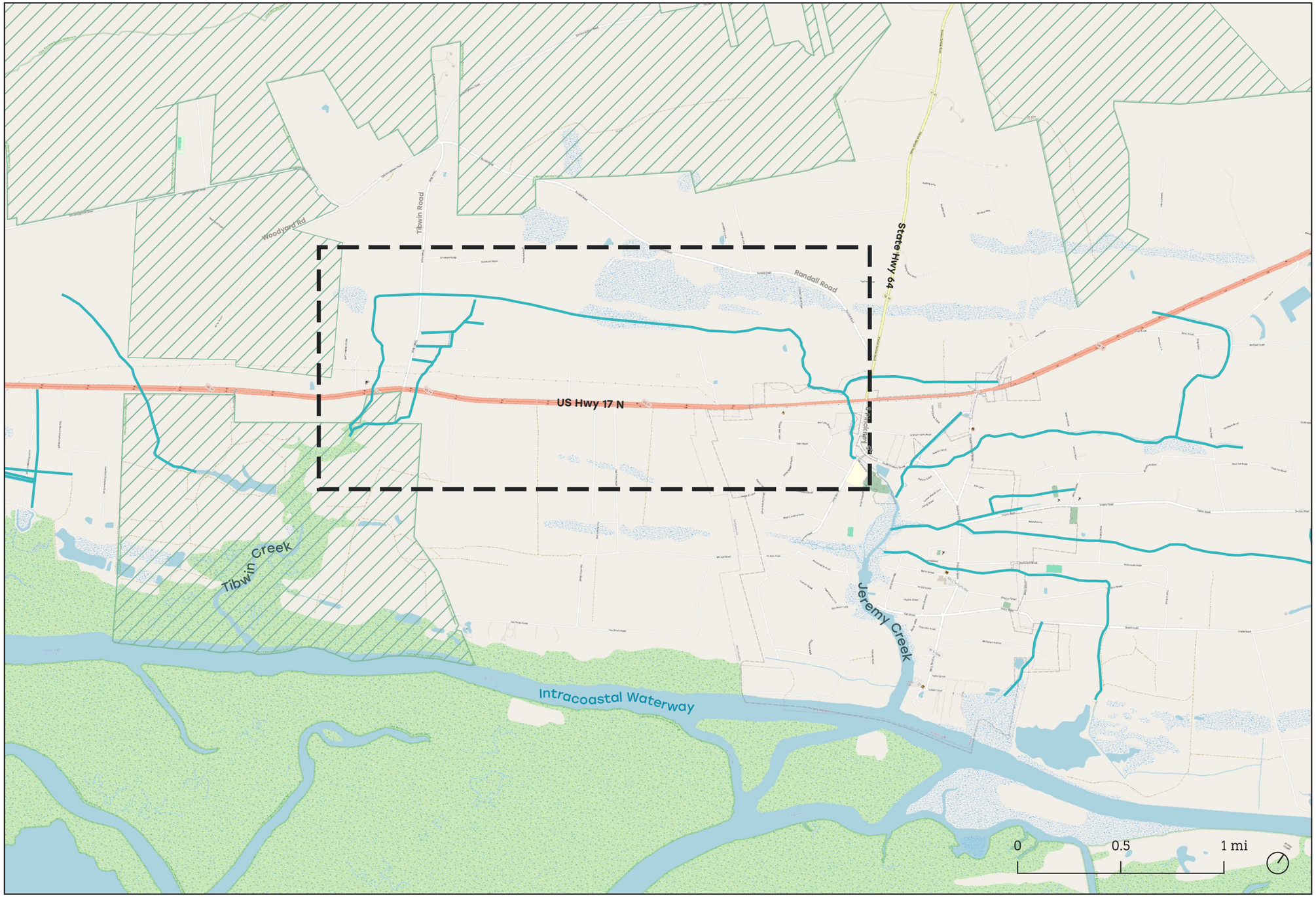
Projects in this freshwater/brackish transition zone are highly susceptible to Phragmites or Giant Salvinia infestations. SCDNR will likely require a management plan to ensure construction equipment does not introduce invasive aquatic plants into the watershed.

State Historic Preservation Office (SHPO) Under Section 106 of the National Historic Preservation Act and the Coastal Zone Management Act, the SHPO advises regulatory agencies on potential impacts to cultural and archaeological sites. Due to the project's proximity to the historic Tibwin Plantation tract and its location within a highly sensitive cultural landscape, early consultation is necessary to ensure that canal re-contouring or grading operations do not disturb undocumented archaeological or historical resources.

Estimates of Cost

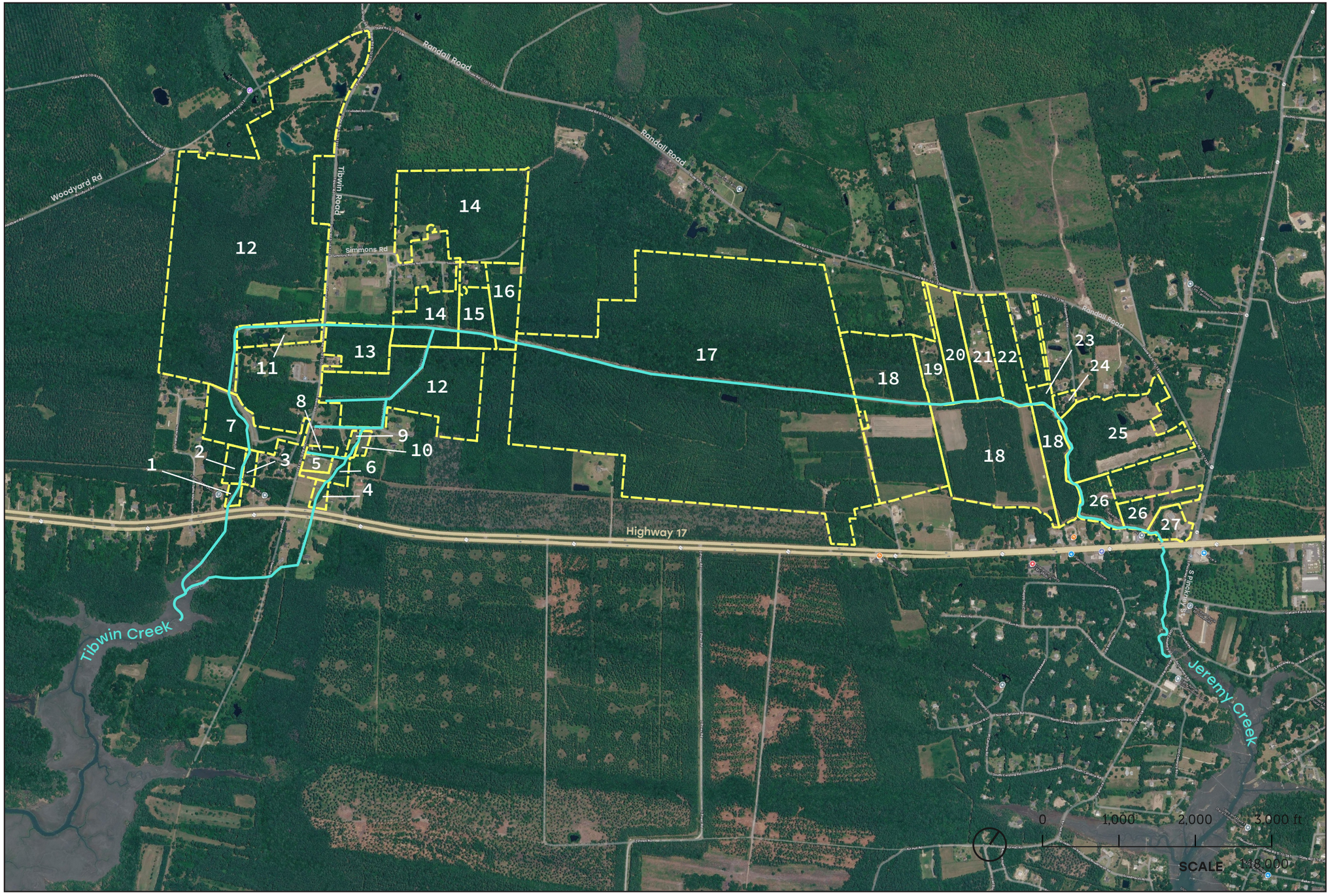
Major drivers of costs include the availability of disposal sites for excavated soil; whether the work could be performed by Charleston County Public Works in phases or whether it would be performed by a third-party contractor; and the economy of scale. Ideally, project sections of a few thousand linear feet would be constructed at one time, both to minimize the length of disturbance and to reduce costs associated with mobilizing heavy equipment. Cost estimates are preliminary, based on available information and pricing as of June 2026, and are subject to change as design progresses and site conditions are confirmed.

Item	Quantity	Units	Unit Price		Total Cost	
			Low	High	Low	High
Excavation & Haul-off	25,000	CY	$ 50	$ 110	$ 1,250,000	$ 2,750,000
Erosion Control Matting	120,000	SY	$ 0.25	$ 1.00	$ 30,000	$ 120,000
Native Seed Mix	10,000	SY	$ 0.10	$ 0.75	$ 1,000	$ 7,500
Herbaceous Plugs	10,000	EA	$ 3	$ 5	$ 30,000	$ 50,000
			Construction Subtotal		$ 1,311,000	$ 2,927,500
			Design & Permitting (10%)		$ 131,100	$ 292,750
			Survey & Deeds		$ 75,000	$ 150,000
			Grand Total		**$ 1,517,100**	**$ 3,370,250**



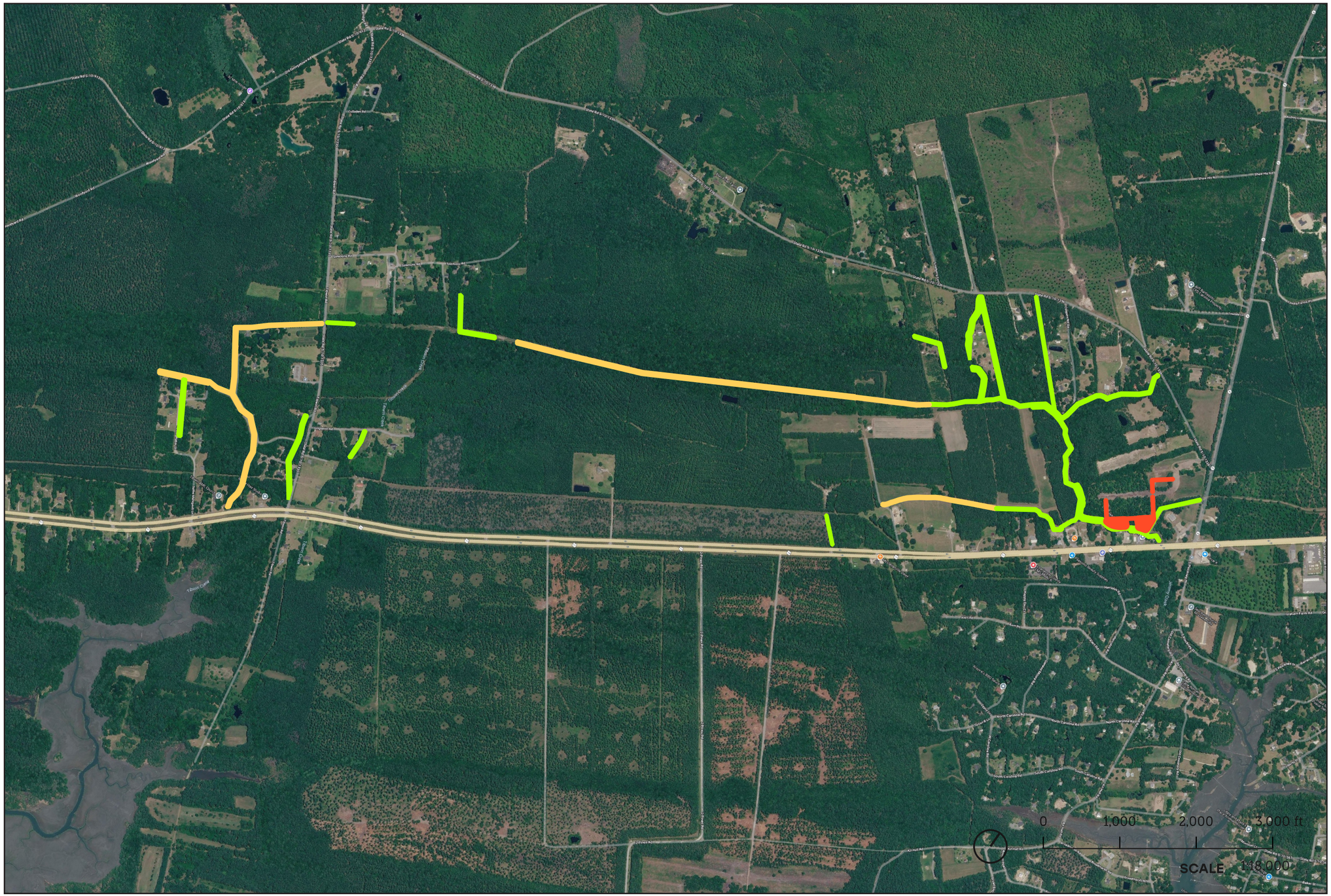
Location Map

- DITCH/CANAL NETWORK
- PROJECT AREA
- FRANCIS MARION NATIONAL FOREST
- TOWN OF MCCLELLANVILLE BOUNDARY



Project Area Map with Parcel Overlay

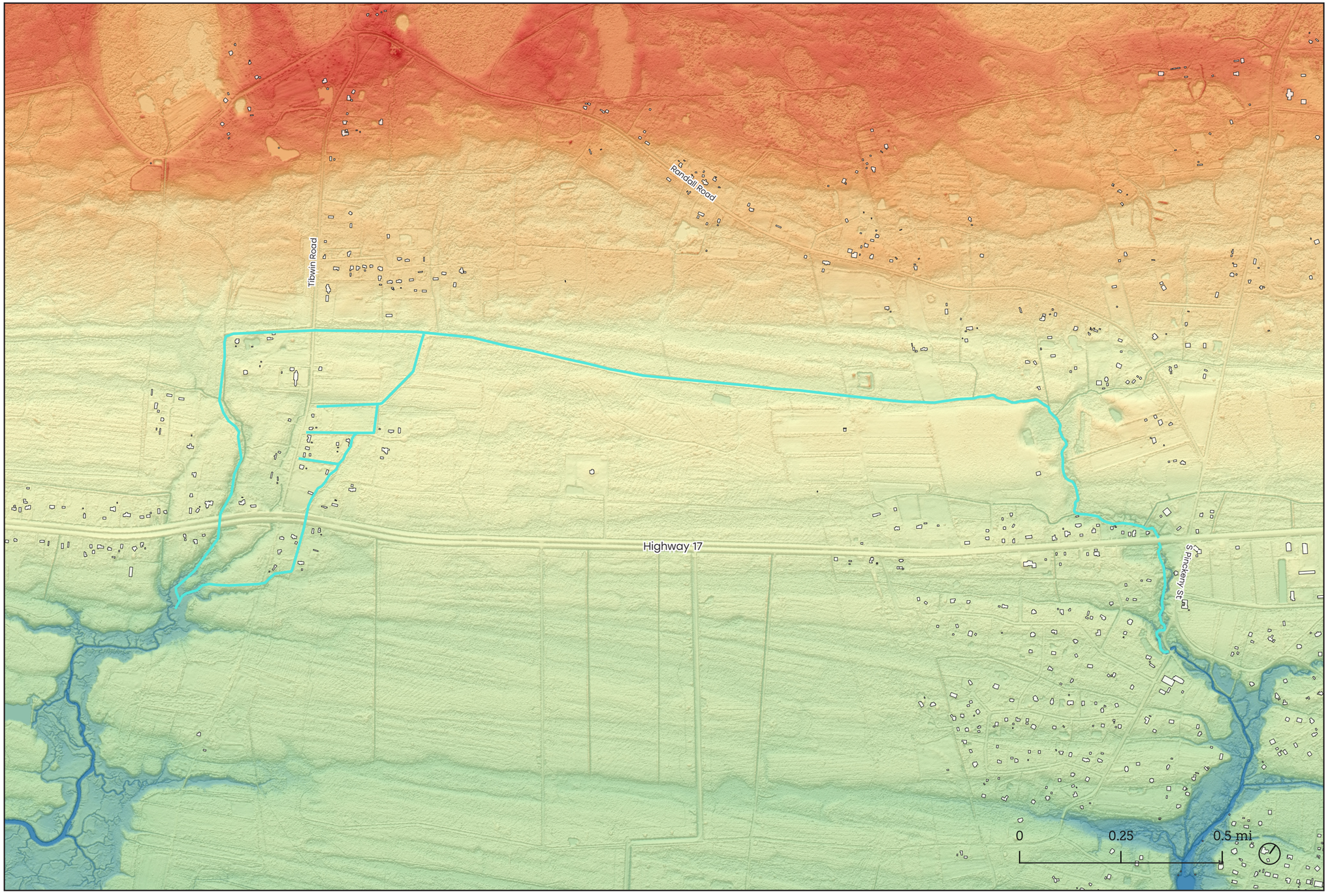
Parcel ownership information shown on this map is derived from publicly available Charleston County records and reflects conditions at the time of data collection. The map identifies approximately 27 parcels intersecting the canal corridor that require coordination and engagement as part of future project planning and implementation. Ownership and parcel conditions are subject to change and may not represent current records.



Drainage Easements

Drainage easement information shown on this map is derived from publicly available Charleston County records and reflects conditions at the time of data collection. The map identifies recorded drainage easements associated with the canal corridor; however, gaps in formally recorded easements exist on certain parcels. Additional coordination, verification, or easement acquisition may be required as part of project planning and implementation. Easement conditions and ownership records are subject to change and may not represent current conditions.

- CHARLESTON COUNTY
- PRIVATE
- PUBLIC



Digital Elevation Model (DEM)

This figure shows a 2016, one-meter resolution digital elevation model (DEM) sourced from the U.S. Geological Survey.

DEM (FT) NAVD88

34.31 FT

14.70 FT

-5.00 FT







Pteridium aquilinum
Bracken Fern
Native



Pelazoneuron kunthii
Kunth's Maiden Fern
Native



Typha latifolia
Broadleaf Cattail
Native



Arundinaria gigantea
River Cane
Native



Pontederia cordata
Pickerelweed
Native



Juncus effusus
Common Rush
Native



Tradescantia ohiensis
Ohio Spiderwort
Native



Eupatorium capillifolium
Dogfennel
Native



Anatherum virginicum
Broomsedge Bluestem
Native

Existing Vegetation Assessment of Canal

During the site visit to Tibwin Creek and the Jeremy Creek Canal, the canal corridor was walked until access was limited to document changes in channel form and vegetation patterns. Observations noted that canal depth and width vary along its length, and that plant community distribution shifts in response to localized sun/shade exposure and water-level conditions. A diverse assemblage of aquatic and facultative wetland species was observed within the canal basin and along the banks; all species documented were native, and no non-native or invasive species were observed during the visit. Where the top of bank received sustained full sun, prairie-remnant plant communities were consistently present and exhibited dense, vigorous growth, providing robust habitat structure along the canal edge.

This is a nonexhaustive list of vegetation observed on site.

Photos provided by Surculus, Robinson Design Engineers, and iNaturalist. Assessment conducted by Surculus.



Liquidambar styraciflua
American Sweetgum
Native

1



Pinus taeda
Loblolly Pine
Native

2



Magnolia virginiana
Sweetbay Magnolia
Native

3



Cyrilla racemiflora
Swamp Titi
Native

4



Tamala borbonia
Redbay
Native

5



Lyonia lucida
Fetterbush Lyonia
Native

6



7

8

9

10

11

12



Quercus laurifolia
Laurel Oak
Native



Magnolia grandiflora
Southern Magnolia
Native



Ilex opaca
American Holly
Native



Osmundastrum cinnamomeum
Cinnamon Fern
Native



Morella cerifera
Wax Myrtle
Native



Woodwardia areolata
Netted Chain Fern
Native

Existing Vegetation Assessment of Woodland Edge

During the site visit to Tibwin Creek and the Jeremy Creek Canal, vegetation was documented along the woodland edge outside of the canal maintenance zone. To more closely evaluate community composition, we “zoomed in” on a representative 10’x15’ area to observe which species were co-occurring and growing together in a healthy, intact assemblage. No non-native or invasive species were observed within this area; instead, the woodland edge supported dense, thriving native vegetation that serves as a strong on-site example of the Lowcountry woodland typology.

The species listed on this page were documented within this representative 10’x15’ woodland-edge area, and similar communities occur along the canal corridor with variations driven by local light and moisture conditions.

Photos provided by Surculus and iNaturalist. Assessment conducted by Surculus.



Osmundastrum cinnamomeum
Cinnamon Fern
Native



Woodwardia areolata
Netted Chain Fern
Native



Luzula acuminata
Hairy Woodrush
Native



Rubus trivialis
Southern Dewberry
Native



Gelsemium sempervirens
Carolina Jessamine
Native



Vitis rotundifolia
Muscadine
Native



Lyonia lucida
Fetterbush Lyonia
Native



Clethra alnifolia
Sweet Pepperbush
Native



Ilex vomitoria
Yaupon Holly
Native



Morella cerifera
Wax Myrtle
Native



Tamala borbonia
Redbay
Native



Aralia spinosa
Devil's Walkingstick
Native



Cyrilla racemiflora
Swamp Titi
Native



Ilex opaca
American Holly
Native



Pinus taeda
Loblolly Pine
Native



Quercus nigra
Water Oak
Native



Quercus laurifolia
Laurel Oak
Native



Liquidambar styraciflua
American Sweetgum
Native

Existing Vegetation Assessment of Woodland Edge

During the site visit to Tibwin Creek and the Jeremy Creek Canal, plant communities were documented along the woodland edge outside of the canal maintenance zone to characterize existing, naturally occurring vegetation. These communities occur throughout the length of the canal corridor and vary by microhabitat, with species composition and density shifting in response to light availability and soil moisture conditions.

The species listed on this page were observed within this woodland-edge zone. This is a nonexhaustive list of vegetation.

Photos provided by Surculus and iNaturalist. Assessment conducted by Surculus.

FIGURE 7 Existing Conditions at the Canal Linking Tibwin and Jeremy Creek

Graphics credit: Surculus

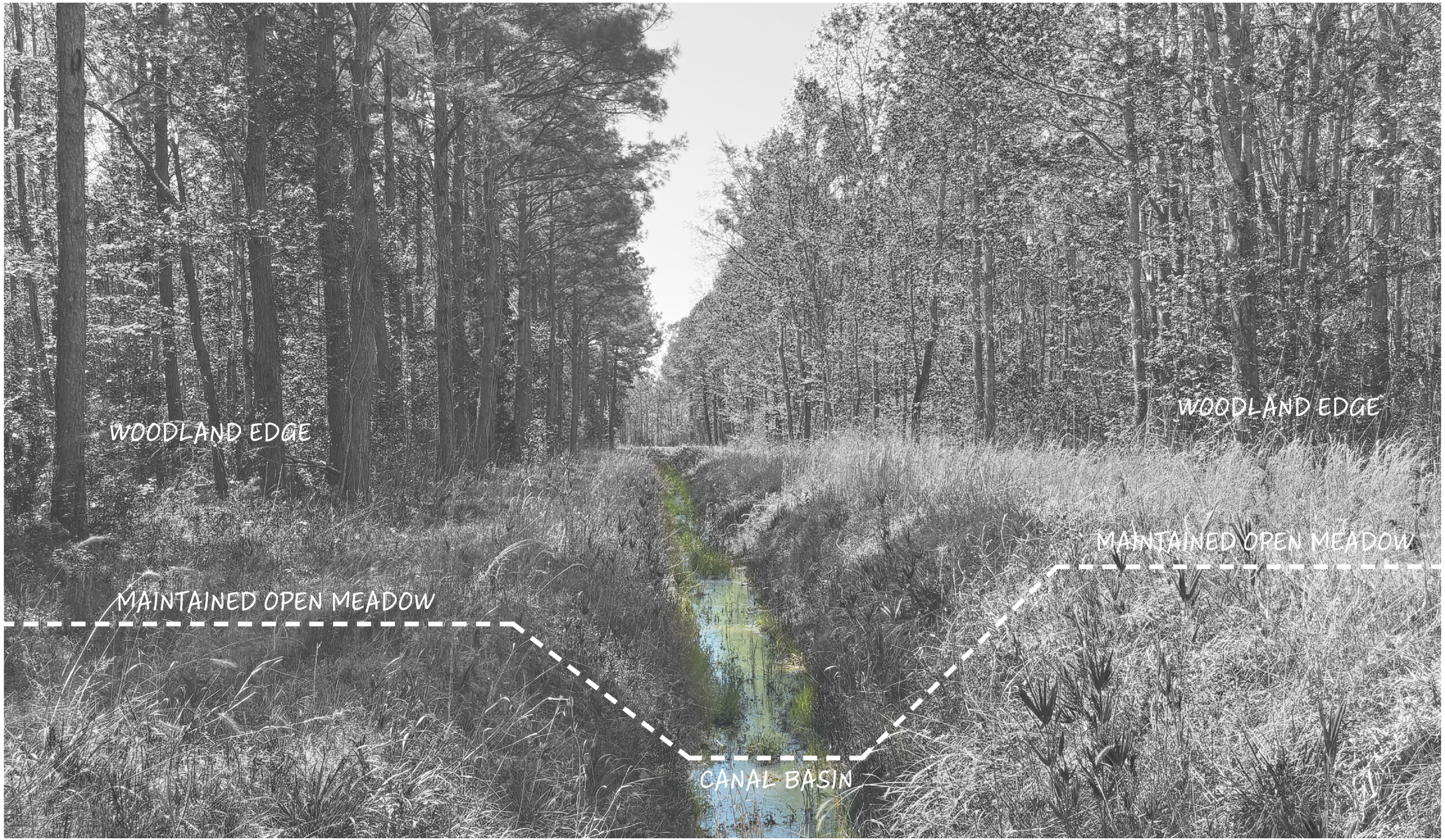


FIGURE 8 Proposed Cross Section of Two-Stage Ditch

Graphics credit: Surculus

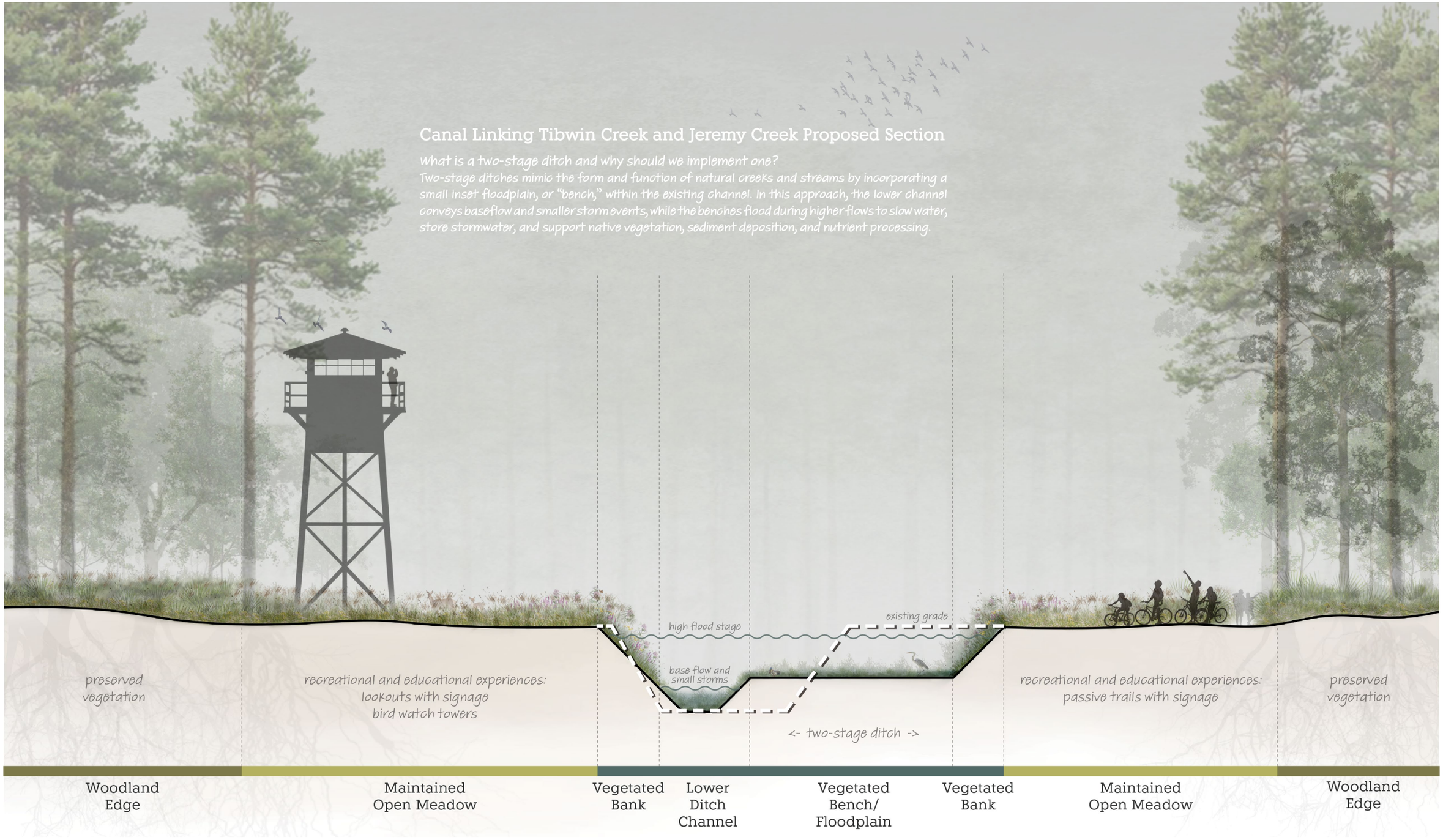


FIGURE 9 Proposed Plant Species for Project Area

Graphics credit: Surculus



Woodland Edge



sweetgum | loblolly pine | sweetbay mag.



swamp titi | red bay | laurel oak



southern mag. | a. holly | wax myrtle



palmetto | fetterbush | cinn. fern

Maintained Open Meadow



bluestem | river oats | indian grass



switchgrass | beardtongue | coneflower



sunflower | blazing star | b.-eyed susan



joe-pye weed | tickseed | goldenrod

Vegetated Banks and Bench/Floodplain



buttonbush | rosemallow | juncus



white-top | s. milkweed | pickerelweed



lizardstail | cardinal flower | blue-flag iris



View of marsh edge along Seafood Road, showing exposed mudflats, areas of marsh die-off, and stagnant water conditions. (Photo credited to Robinson Design Engineers)

3.3 Ten Mile Salt Marsh & Seafood Road

The Ten Mile community project area faces a range of drainage and flooding problems driven by infrastructure degradation and increasing tide levels coupled with ecological impairments. Along Seafood Road and Robbie Glover Road, King Tide events cause recurring inundation and deposit large amounts of wrack across the road surface and ditches. The enlarged roadside drainage ditch on the landward side of the road is functioning as a degraded salt marsh, exhibiting stagnant water and unconsolidated sediments. Siltation and clogging have diminished the function of tidal creeks and ditches across the project area. At stormwater outfalls from the ditches into the marsh, outlet erosion has scoured away sediments and impaired the marsh. Tidal backflow into the drainage canals and ditches reduces their capacity to store and convey stormwater runoff from upland areas. Gradual saltwater intrusion is advancing into upland areas, including the community-owned parcel, threatening the viability of many large trees and plant communities intolerant to such frequent exposure to salt water.

Existing Conditions

(Image 1) Patches of marsh die-off adjacent to Seafood Road (Photo credited to Robinson Design Engineers)

(Image 2) A large area of mudflat near the bend of Bee Hive Road and Seafood Road (Photo credited to Robinson Design Engineers)





Existing Conditions Cont.

(Image 1) Photo is looking southwest and taken near the culvert draining the Overlook at Copahee Sound Neighborhood development. Poor outfall conditions are observed.

(Image 2) Man-made canal in the marsh. Photo is taken at the same spot as photo #1 but looking south towards the marsh.

Opportunities

The problems in the Ten Mile Community will require a combination of ecological restoration, nature-based solutions, and conventional or “gray” infrastructure.

Gray infrastructure solutions should include elevating Seafood Road and replacing failing culverts. Some culverts have collapsed, some are set below the low-tide line, and some are constricted through sedimentation. Tidal check valves should be installed at the outlet of the culverts beneath Seafood Road to prevent tidal backflow into drainage ditches and to help prevent sedimentation.



(Image right) The Saltmarsh Sparrow is highlighted as one of the priority birds for this project area. Photography credited to Jesse Gordon.

Elevating the roadway should be paired with a nature-based effort to reestablish the high marsh habitat along the seaward side of the elevated roadway, creating a natural transition to the tidal low marsh and tidal channels. The current dredged channel parallel to the roadway is severely impairing salt marsh hydrology and exacerbating flooding throughout the community. Filling the canal along Seafood Road presents an opportunity for beneficial use of dredged materials. Doing so would reestablish the salt marsh platform and upland transition area, and it would restore tidal hydrology to the entire saltmarsh.

Opportunities Cont.

Several tidal creeks have been straightened and channelized, or have gradually been filled by sedimentation as tidal flows were diverted into the roadside channel. Tidal creeks should be restored to their natural sinuous path, which would restore natural tidal flows, allow a healthy marsh ecosystem to reestablish in the existing “dead” marsh zones, and increase flow in areas where stagnation and marsh dieback is visible. Aerial imagery clearly reveals that small tidal creek tributaries are limited, which has led to a decline in salt marsh health as these areas are starved of regular tidal flushing. Salt marsh restoration should include creation of small tidal creek channels to direct tidal water into isolated salt marshes, long starved by the ditches and canals through the marsh.

Restoration of salt marsh will also likely include planting *Spartina alterniflora* via seeds collected, germinated, and cultivated locally to ensure a local genotype. The opportunity for a community-based restoration would further involve community members who clearly treasure their salt marshes.

Living shorelines will help to catalyze oyster growth, prevent shoreline erosion along the larger tidal channels, and improve water quality via the enhanced filtration provided by the oysters.

On the landward side of the road, opportunities to provide pedestrian infrastructure should be explored. Safety was a repeated concern of the community, due to a lack of sidewalks and lighting, and increased traffic at night. These could be tied with pocket parks and other community greenspaces to enhance community experiences and provide opportunities for the community to engage with the reestablished natural environment.



(Image Right) Clapper Rail photography by Matthew Reitinger. This species was identified as a priority bird for the Ten Mile project area.



A Seaside Sparrow perched on marsh grass. This species was identified as a priority bird for the Ten Mile project area. Photography credited to Jennifer Leitao.

Constraints

- The elevation of the existing road is low. Elevating the road requires multiple driveway and cross-street connections.
- Salt marsh ecosystems have migrated inland across Seafood Road due to tidal influx through the existing culverts and occasional road overtopping (spartina, fiddler crabs, sea oxeye, salt-compromised hardwood trees, etc. are observed inland of Seafood Road). Reshaping these ditches and installing tidal check valves will require careful regulatory coordination since some of the ditches may be considered Critical Area.
- Private property considerations for privately held marsh properties will need to be vetted during future phases. According to Charleston County parcel data, the salt marsh in the Ten Mile community is privately owned, and any activity within the salt marsh will need to be in close coordination with the owner in addition to regulatory agencies.
- Salt marsh restoration work and canal-filled will require a source of dredged sediments appropriate for this context. Sediment availability is a key constraint.
- Charleston County Parks and Recreation Commission (CCPRC) is operating and maintaining a public facility within one of the privately held tracts. The causeway to the paddlecraft landing at this facility has impaired the saltmarsh by blocking tidal flows across the marsh platform.
- Future infill residential subdivisions will burden existing infrastructure and will likely cause new stormwater flooding problems. Work along the canals, ditches, and stormwater culverts should account for the effects of additional stormwater runoff from future "built-out" scenarios.
- Development pressures and small, infill residential subdivisions intersecting with a historic settlement community means that community consensus is difficult to achieve. The work should favor the long-time residents and community members, but will need buy-in and engagement with newcomers.

Regulatory Considerations

State Regulatory Considerations

South Carolina Department of Environmental Services Bureau of Coastal Management (SCDES BCM) The implementation of nature-based solutions and marsh restoration within the Ten Mile community necessitates a multi-jurisdictional permitting strategy. Given the project's location within the state-designated critical area, SCDES BCM holds direct permitting authority under the South Carolina Coastal Tidelands and Wetlands Act.

Regulatory Considerations Cont.

Per S.C. Code Ann. § 48-39-10, the project site is located within two critical area designations that trigger state regulatory review and permitting:

- **Tidelands**: Defined as all areas at or below mean high tide, including coastal wetlands and marshes contiguous to coastal waters.
- **Coastal Waters**: Defined as the navigable, saline waters of the United States subject to the ebb and flood of the tide, landward to the mean high-water mark.

Because the proposed restoration and living shoreline work occurs within these boundaries, any activity that involves "filling, removing, dredging, draining, or erecting a structure" requires a Critical Area Permit (R. 30-12).

SCDES BCM evaluates applications based on their impact on the critical areas. Specific standards include:

- **Living Shoreline Standards (R. 30-12.Q)**: The project will utilize the 2021 standards that favor nature-based stabilization over hard armoring. BCM policy strictly prohibits the creation of new upland or the "reclaiming" of lost land; the project must be designed to enhance or stabilize the existing intertidal profile.
- **Marsh Restoration & Excavation (R. 30-12.G)**: Any alteration of vegetated tidelands is generally discouraged unless it can be proven that the project results in a net ecological gain. A Major Coastal Zone Management (CZM) Permit is required for any activity involving the placement of fill or sediment within the marsh.
- **Beneficial Use of Dredged Material (BUDM)**: To mitigate marsh subsidence, the project may propose the beneficial use of compatible sediment. This aligns with BCM's focus on maintaining marsh elevations, provided the material meets strict physical and chemical compatibility standards to protect the productive capacity of the tidelands.

Regulatory Considerations Cont.

Federal Regulatory Considerations

U.S. Army Corps of Engineers (USACE) The U.S. Army Corps of Engineers (USACE) regulates these activities under two primary authorities:

- **Section 10 of the Rivers and Harbors Act of 1899**: Any work in, over, or under "navigable waters of the United States" requires a Section 10 permit. For this project, this includes the placement of any structures—such as oyster sills, breakwaters, or anchored coir logs—that could potentially impact the public's right to navigate the marsh creeks.
- **Section 404 of the Clean Water Act**: Regulates the discharge of dredged or fill material into Waters of the United States (WOTUS), including wetlands. For a living shoreline, this covers the placement of sand, gravel, or stone, as well as the planting of marsh vegetation if it involves substrate modification.

The project aims to qualify for Nationwide Permit (NWP) 54, specifically tailored for Living Shorelines. To meet NWP 54 criteria in the Charleston District, the project must:

- Include a substantial biological component (tidal fringe wetlands or oyster reefs).
- Maintain the natural continuity of the land-water interface.
- Ensure structural materials (coir logs, stone, shell) are adequately anchored to prevent relocation during wave action.

A Pre-Construction Notification (PCN) must be submitted to the USACE prior to construction. The application must include 1) a description of the proposed activity and its environmental impacts, 2) a wetland delineation verified by USACE staff, 3) documentation of coordination with the State Historic Preservation Office (SHPO) regarding cultural resources.

State Resource Agency Consultation

The following state agencies should be considered for consultation reviews during the public comment period.

SCDNR Office of Environmental Programs (OEP) - The SCDNR reviews projects for impacts on Essential Fish Habitat (EFH) and shellfish resources to provide best management practice (BMP) recommendations, such as specific timing windows for construction to avoid disrupting spawning seasons for local fisheries.

Regulatory Considerations Cont.

State Historic Preservation Office (SHPO) - Under the Coastal Zone Management Act, the SHPO advises SCDES BCM on the potential impacts to cultural and archaeological sites. Given the historical significance of the Ten Mile community, early consultation is necessary to ensure the project footprint does not disturb any undocumented cultural resources within the intertidal or adjacent upland areas.

Estimates of Cost

Major drivers of costs include the availability of dredged soil; whether the roadway work could be performed in partnership with SCDOT; regulatory requirements; whether the tidal channel excavation could be performed by hand or would require machinery. Cost estimates are preliminary, based on available information and pricing as of June 2026, and are subject to change as design progresses and site conditions are confirmed.

Item	Quantity	Units	Unit Price		Total Cost	
			Low	High	Low	High
Tidal Check Valves	3	EA	$ 50,000	$ 125,000	$ 150,000	$ 375,000
Roadway Reconstruction	3,500	LF	$ 250	$ 350	$ 875,000	$ 1,225,000
Canal Filling	10,000	CY	$ 50	$ 70	$ 500,000	$ 700,000
Tidal Channel Creation	2,500	LF	$ 75	$ 125	$ 187,500	$ 312,500
Marsh Plants (Herbaceous Plugs)	15,000	EA	$ 3	$ 5	$ 45,000	$ 75,000
Construction Subtotal					$ 1,757,500	$2,687,500
Design & Permitting (10%)					$ 263,625	$ 403,125
Grand Total					**$ 1,517,100**	**$3,090,625**


Wando High School
Mount Pleasant
HWY 17
Gadsdenville Road
Bee Hive Road
Seafood Road
Whitehall Terrace
Copahee Sound
0
0.25
0.5 mi
Project Area Map
PROJECT AREA
SALT MARSH
WATER BODY
NATURAL AREAS



Parcel Overlay Map

Parcel ownership information shown on this map is derived from publicly available Charleston County records and reflects conditions at the time of data collection. Ownership and parcel conditions are subject to change and may not represent current records.

Highlighted yellow parcels shown on this map are owned by the Ten Mile Neighborhood Association. Certain areas of the salt marsh are considered privately owned and will require further coordination.

HIGHLIGHTED PARCELS

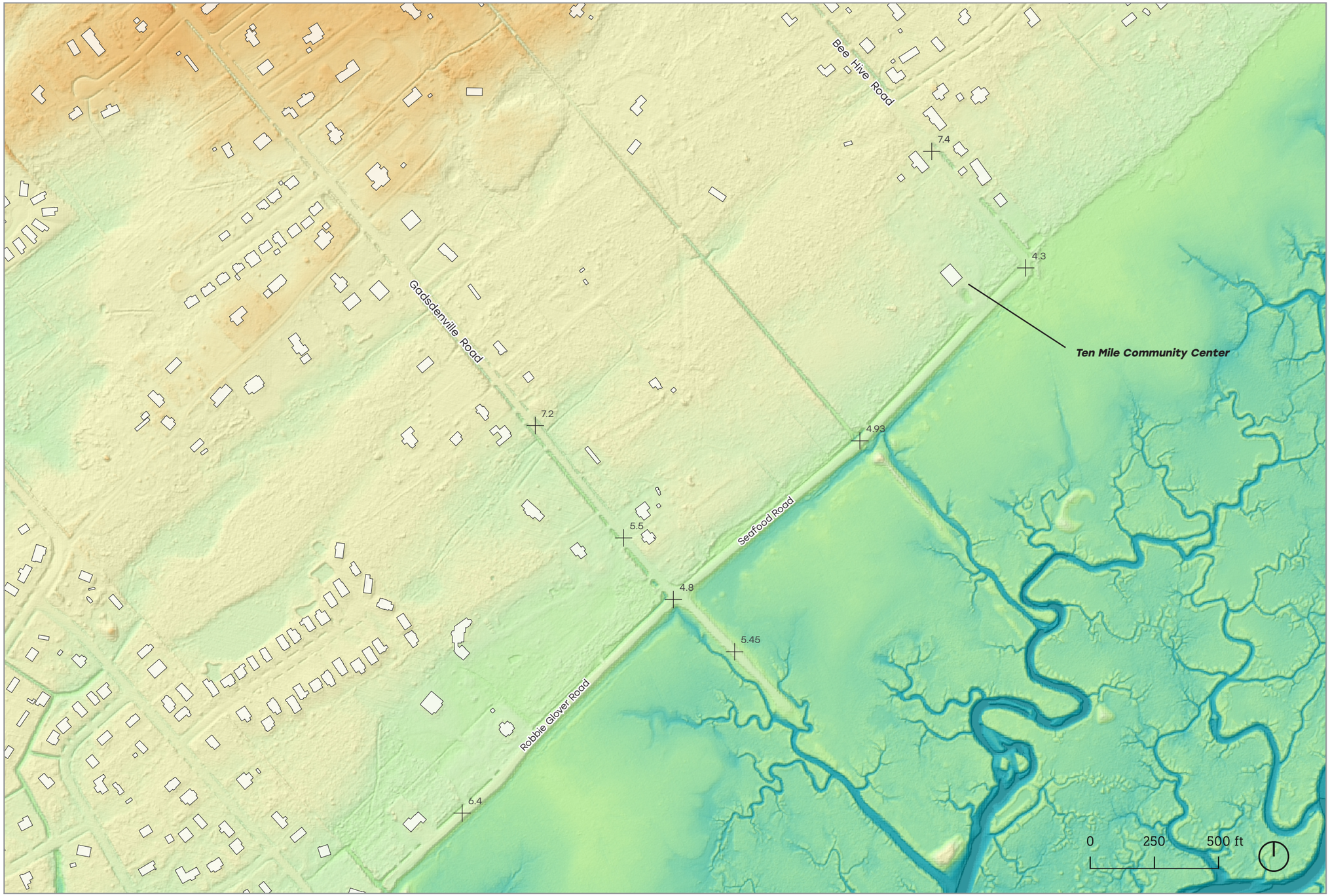
PARCELS



Drainage Easements

Drainage easement information shown on this map is derived from publicly available Charleston County records and reflects conditions at the time of data collection. The map identifies recorded drainage easements situated in and around the Ten Mile community. Easement conditions and ownership records are subject to change and may not represent current conditions.

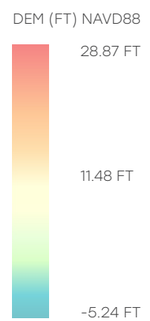
- PRIVATE
- PUBLIC
- UNKNOWN
- PARCELS



Digital Elevation Model (DEM)

This figure presents a 2016, one-meter resolution digital elevation model (DEM) sourced from the U.S. Geological Survey.

Based on this DEM, elevations along Seafood Road range from approximately 4.1 feet to 5.3 feet, while Robbie Glover Road is slightly higher, with elevations ranging from 4.9 feet to 6.5 feet.

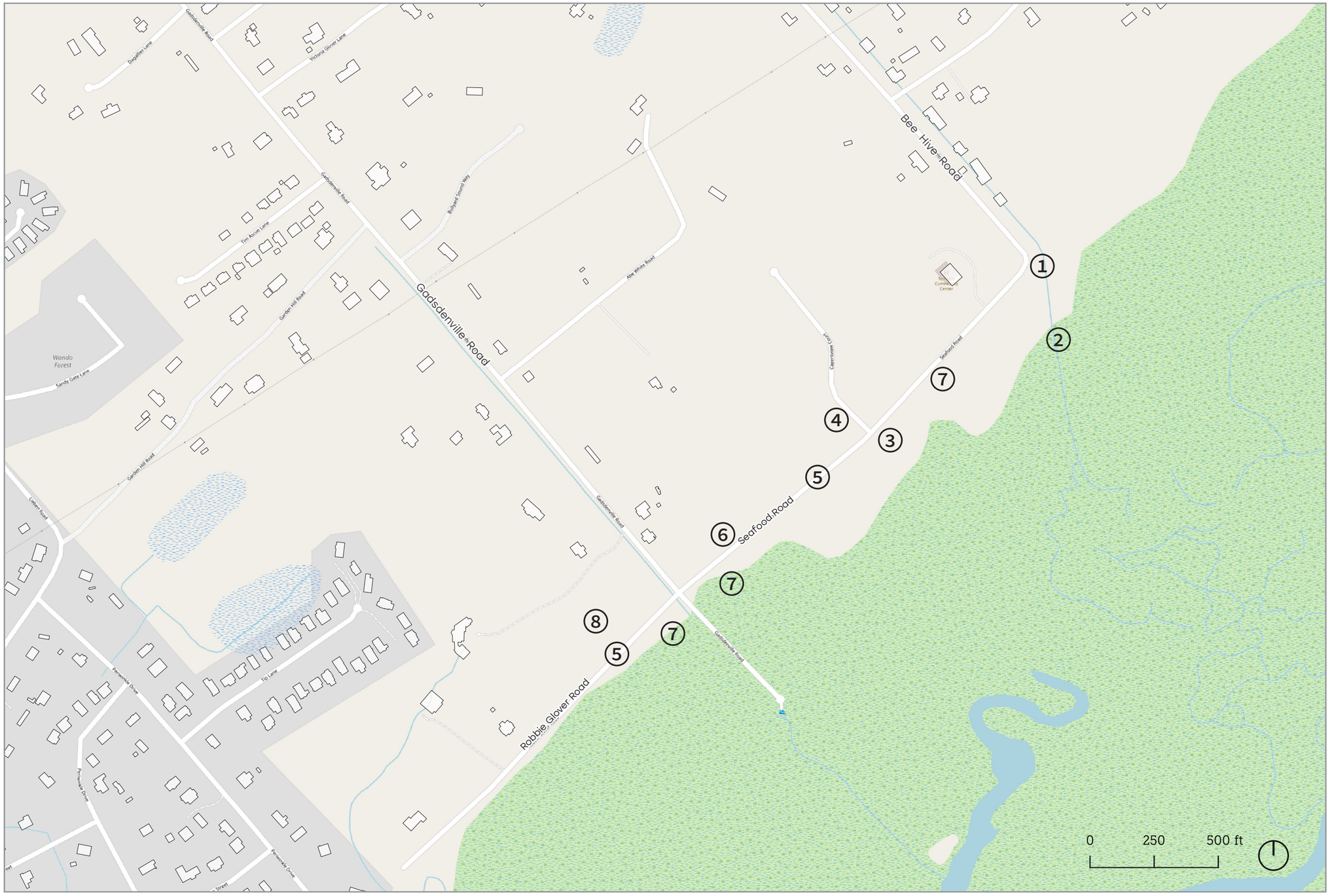




Problem Areas Map

1. Degraded outlet and tidal backflow into roadside ditch along Bee Hive Road
2. Tidal channel siltation
3. Stormwater conveyance outlet is degraded, showing signs of disrepair and erosion; tidal backflow into drainage canal
4. Drainage canal that runs parallel to the Copahee Sound neighborhood
5. Reoccurring flooding on Seafood Road and Robbie Glover Road from King Tide water levels; wrack washes onto the road
6. Enlarged roadside drainage ditch functioning as degraded salt marsh; vegetation indicative of regular brackish water inundation
7. Stagnant water, marsh die-off, unconsolidated mudflat
8. Gradual saltwater intrusion into community-owned parcel

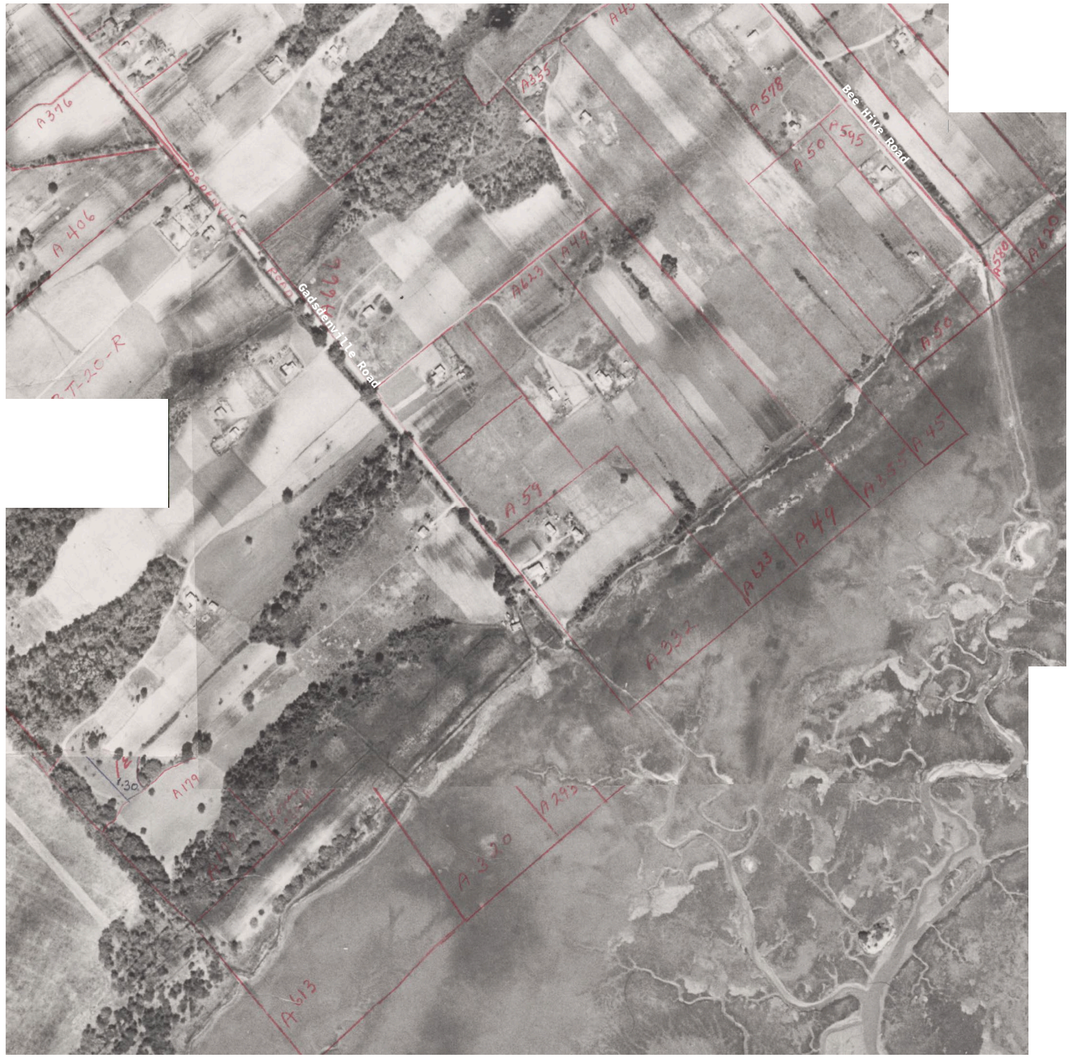
Aerial imagery is USDA National Agriculture Imagery Program 2023-04-18, 0.60m resolution.



Site Plan Map

1. Tidal check valve and outlet improvements at the end of Bee Hive Road
2. Tidal creek excavation + spartina plantings to improve drainage from Bee Hive Road outlet and salt marsh hydrology
3. Tidal check valve and outlet improvements in front of Copahee Sound neighborhood
4. Improve conditions and hydrologic connection of roadside ditch and canal that runs parallel to the Copahee Sound neighborhood
5. Elevate Seafood Road and Robbie Glover Road to address tidal overtopping from King Tide events and the associated wrack that washes over the road
6. Regrade roadside ditch
7. Beneficial use dredge material is placed along the marsh-side canal + spartina plantings
8. Wetland park, boardwalk, and educational programming in community-owned property

FIGURE 10 Ten Mile Salt Marsh in 1957 (Composite)



In 1957, there is evidence of man-made ditches and early alterations to the hydrology near the end of Gadsdenville Road and Bee Hive Road. Despite this, the marsh edge remained largely intact, with a robust shrub and forested edge.

Aerial imagery is credited to University of South Carolina Library.

FIGURE 11 Ten Mile Salt Marsh in 1963 (Composite)



By 1963, Seafood Road appears as a dirt road along the marsh edge, marking the first visible alteration of this natural boundary.

A wide, straight channel parallel to the road and two perpendicular channels observed to be excavated to tie into the larger tidal creek channel that flows to the Copahee Sound.

Aerial imagery is credited to University of South Carolina Library.





This is a nonexhaustive list of vegetation observed on site. Additional species noted include Salt Myrtle (*Baccharis halimifolia*), Live Oak (*Quercus virginiana*), Wax Myrtle (*Myrica cerifera)*, and Eastern Red Cedar (*Juniperus virginiana*).



Spartina alterniflorus
Saltmarsh Cordgrass
Native



Spartina patens
Saltmeadow Cordgrass
Native



Borrichia frutescens
Sea Ox-Eye
Native



Iva frutescens
Marsh Elder
Native



Salicornia depressa
Virginia Glasswort
Native



Oenothera laciniata
Cutleaf Evening Primrose
Native



Nothoscordum bivalve
Crowpoison
Native



Amelopsis arborea
Peppervine
Native



Melilotus indicus
Small Melilot
Non-Native

Existing Vegetation Assessment

During the Ten Mile site visit, the team evaluated both the marsh-facing and inland sides of Seafood Road and documented recurring plant species and community patterns. Vegetation observed along the corridor was predominantly native, and all species recorded demonstrated salt tolerance and adaptation to marsh-influenced conditions. Plant communities remained generally consistent along Seafood Road, with marsh-associated vegetation extending across the roadway edge and transitioning into the inland side, indicating a strong coastal influence on the adjacent upland planting character.

Image 1: Marsh-facing side of Seafood Road.

Image 2: Inland side of Seafood Road.

Photos provided by Surculus, Robinson Design Engineers, and iNaturalist. Assessment conducted by Surculus.

FIGURE 12 Existing Conditions at the Ten Mile Community on Seafood Road

Graphics credit: Surculus

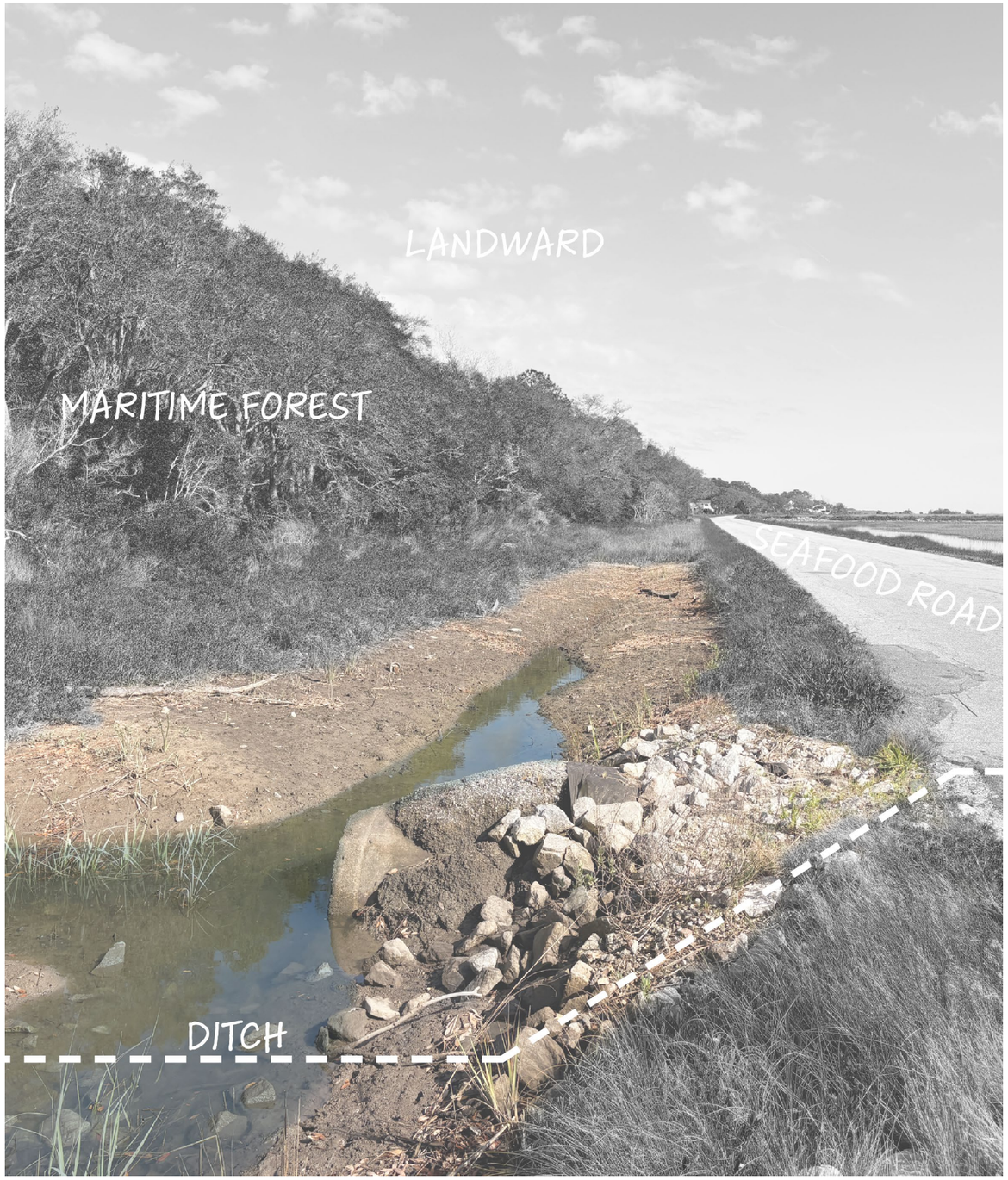




FIGURE 13 Proposed Cross Section for the Ten Mile Community

Graphics credit: Surculus

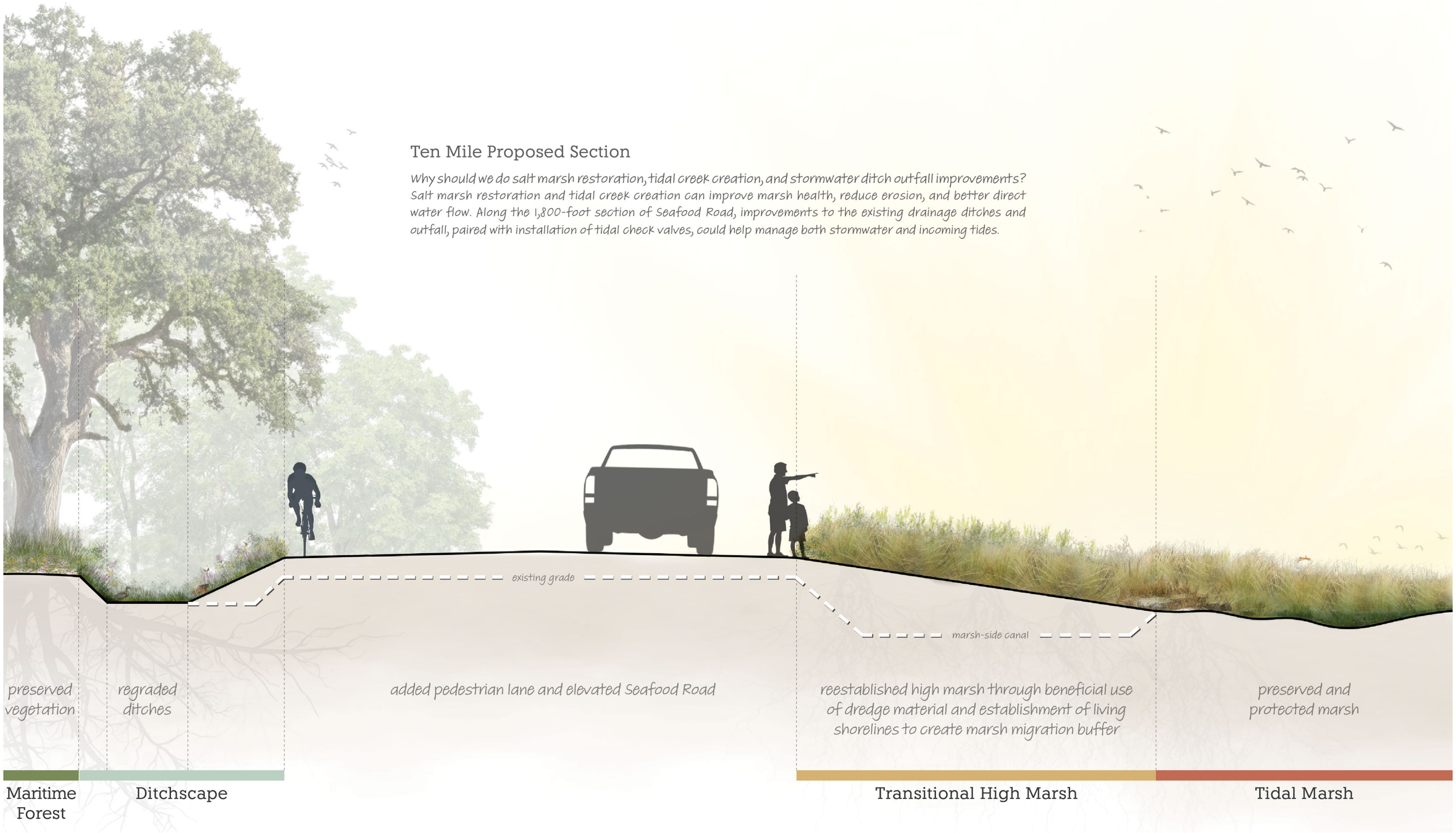
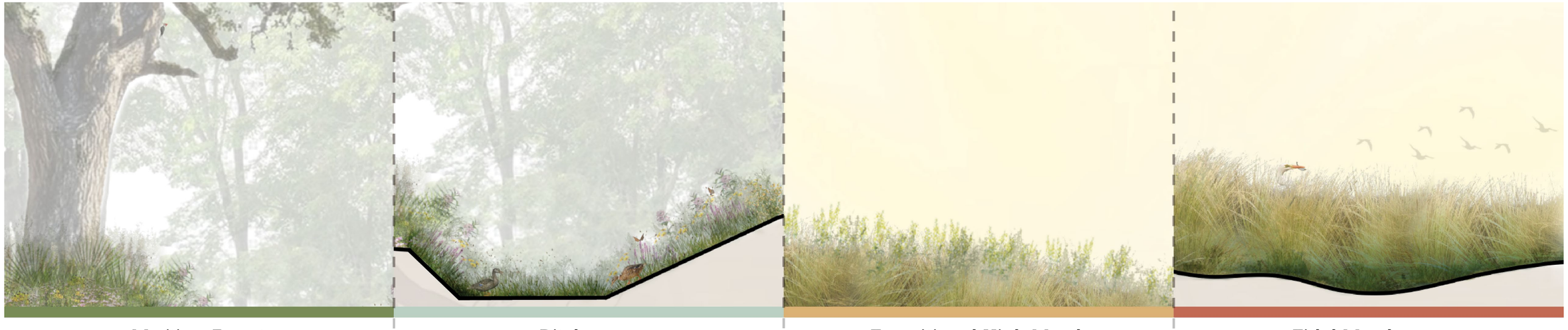


FIGURE 14 Proposed Plant Species for Project Area

Graphics credit: Surculus



Maritime Forest



live oak | e. red cedar | bull pine



yaupon | red bay | southern mag.



wax myrtle | palmetto | c. willow



s. palmetto | tough bully | toothache

Ditchscape



buttonbush | rosemallow | juncus



white-top | s. milkweed | pickerelweed



lizardstail | cardinal flower | blue-flag iris

Transitional High Marsh



salt myrtle | marsh elder | sea ox-eye



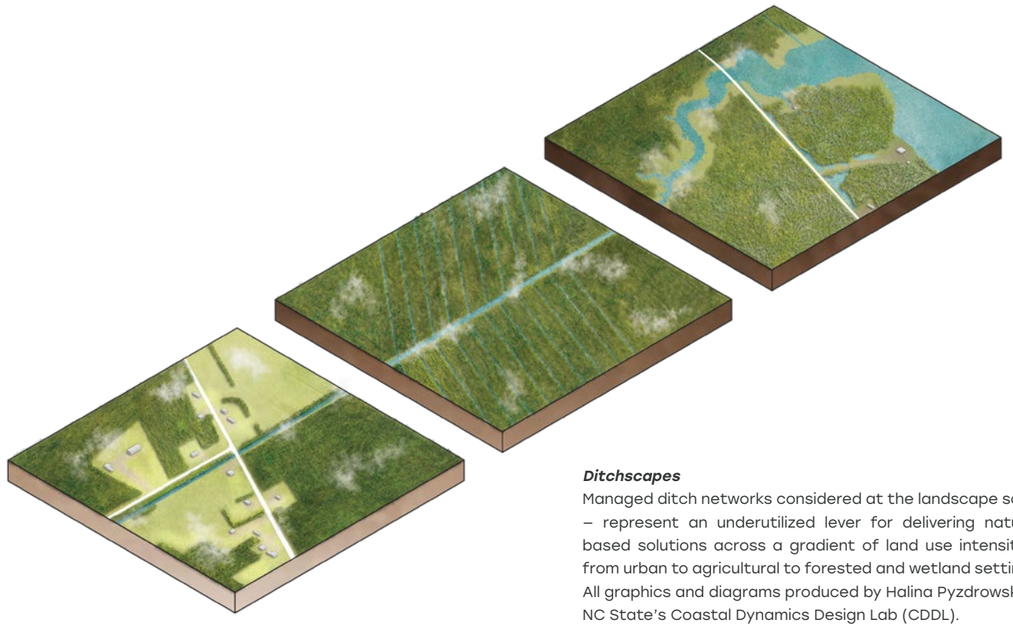
s. goldenrod | saltmeadow cordgrass | sea lavender

Tidal Marsh



saltmarsh cordgrass | needlegrass rush

3.4 “Ditchscapes”



Ditchscapes
Managed ditch networks considered at the landscape scale – represent an underutilized lever for delivering nature-based solutions across a gradient of land use intensities, from urban to agricultural to forested and wetland settings. All graphics and diagrams produced by Halina Pyzdrowski of NC State’s Coastal Dynamics Design Lab (CDDL).

The Problem

Rural communities in the coastal Carolinas—like those in the project areas in North and South Carolina—are steeped in legacies of deforestation, plantation agriculture, and/or industrial silviculture. The present-day hydrology and road infrastructure of the project areas are the direct result of centuries of agriculture and logging. Ditches originally intended to drain wetlands and facilitate logging or farming have fundamentally altered the landscape.

Ditches are one of the most common landscape features in the project areas. A recent literature review published in *Nature Communications Earth & Environment* examines ditches from multiple angles: their history, hydrology, chemistry, ecology, and social dimensions. The paper—produced by a global team of researchers who call themselves “ditchologists”—asserts that ditches hold significant untapped potential. With thoughtful management at the landscape scale—what the authors call “ditchscapes”—ditch networks can support biodiversity, improve water quality, and serve as early indicators of broader environmental change, including sea level rise (Clifford et al., 2025).



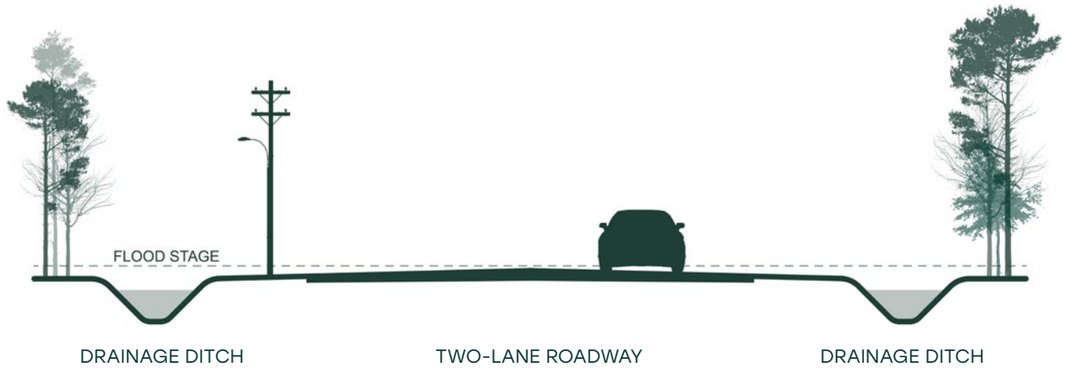
Surrounding water levels in the project areas are slowly rising—both through relative sea level rise and the creation of large-scale shipping canals that fundamentally altered tides. The ditch networks carry tides and storm surges deep into upland areas and community lands. Roadside ditches once dry between rain events are now permanently full. Sandy topsoils are saturated, killing trees, flooding septic systems, and threatening the viability of entire communities.

For several generations, ditches in these areas were actively maintained by logging operators, local farmers, and locally-run public works crews. Today, without ongoing agricultural operations, and more centralized public works facilities located outside of the project communities, the land and its ditches are not regularly managed. This governance vacuum is consequential: as Clifford et al. (2025) note, the absence of active ditch management is a pattern that disproportionately burdens underserved communities, where deteriorating ditch infrastructure becomes both a physical hazard and a symbol of broader neglect.



(Image right) Drainage canal parallel to Pledger Harbor Road in Alligator, North Carolina. Photo credited to Audubon.

Flood vulnerability mapping for this project revealed that arterial ditches present a particular challenge: rather than functioning solely as outflow conveyances carrying stormwater runoff from uplands to receiving waters, these ditches also act as conduits for wind-driven water and storm surge backflow moving in the opposite direction – from receiving waters back into upland areas and communities. This bidirectional flow behavior is consistent with findings by Clifford et al. (2025), who observe that ditches are far more likely than natural channels to flow in both directions, and that this characteristic can make their hydrological footprint difficult to delineate and manage. The same dynamic drives concerns about groundwater intrusion and



Existing Conditions Roadside Ditch Diagram
Diagram to depict man-made drainage ditches as possible conduits of road flooding. Diagram prepared and created by CDDL.

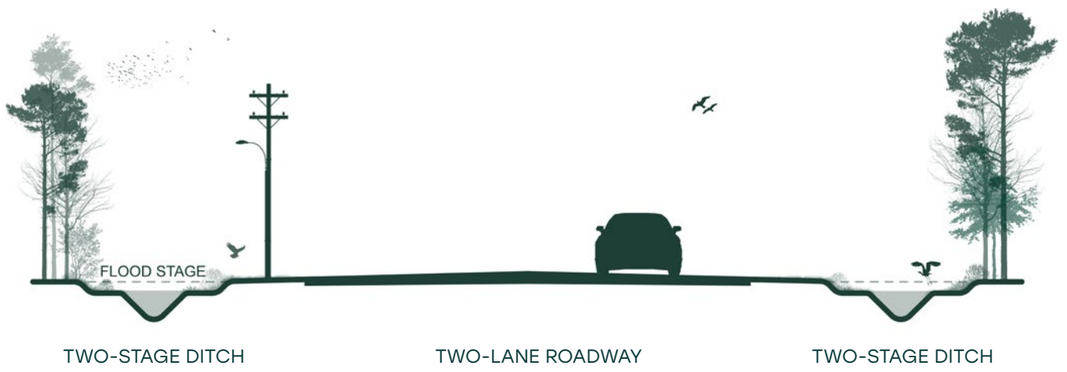
saltwater encroachment into agricultural soils, septic drainfields, and low-lying areas connected to the roadside ditch network.

Roadside ditches compound these problems at the community scale. Where they drain to arterial ditches, wind-driven water and storm surge back up through roadside ditches onto roads, cutting off access and accelerating infrastructure deterioration. Over time, persistent saturation of upland soils causes ground subsidence, septic drainage failure, ponding, and the loss of trees, gardens, and usable land. The low relief and flat valley gradients of the project areas tend to slow stormwater conveyance and extend flood duration – conditions typical of Coastal Plain systems, where rivers overflow their banks annually and often for extended periods.



(Image right) Tidally influenced roadside drainage ditch on Seafood Road in Ten Mile, South Carolina. Photo credited to Robinson Design Engineers.

Land clearing of pine forests has further altered the rainfall-runoff balance of these landscapes. Where large trees once transpired continuously and drew down the local water table, their removal has converted formerly dry areas into chronic runoff sources, worsening



Two-stage Roadside Ditch Diagram
Diagram depicting drainage ditches regraded to increase storage capacity and increase habitat and ecological benefits. Diagram prepared and created by CDDL.

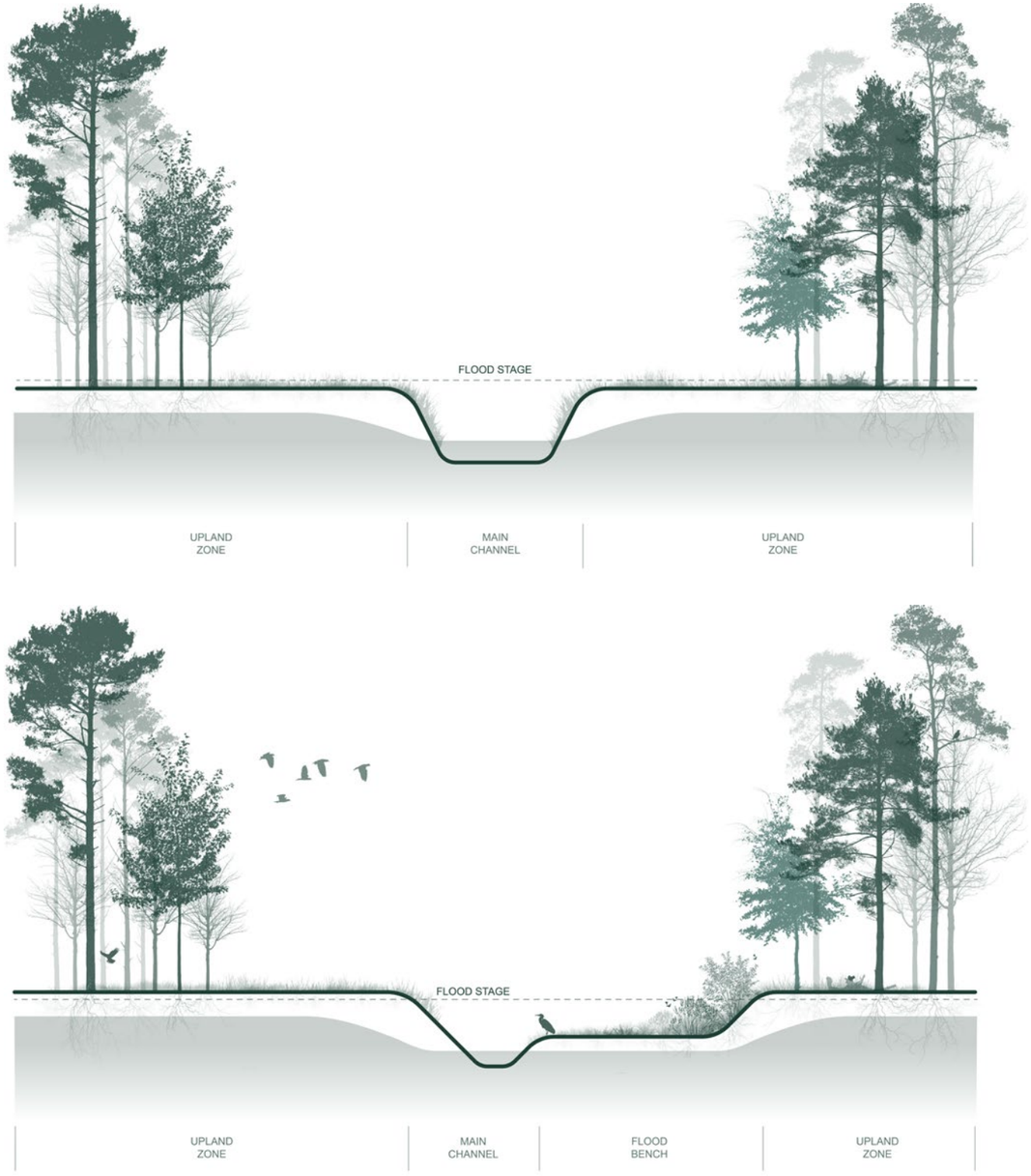
an already stressed drainage system. The cumulative result is a landscape where the ditch network – designed to drain – now both floods and is flooded, caught between the legacy of agricultural land management and the advancing pressures of coastal change.

The Opportunity

The same ditch network that defines the flooding problem also presents an opportunity. In the journal paper “North Carolina Coastal Plain Ditch Types Support Distinct Hydrophytic Communities,” Clifford & Heffernan (2023) show that drainage ditches retain ecological characteristics of the wetlands they replaced, and that management can nudge ditch plant communities toward more native assemblages. Clifford et al. (2025) extend this further, arguing that ditches are undervalued as multi-functional infrastructure capable of simultaneously delivering water quality improvement, biodiversity support, and ecosystem services. The project areas offer exactly such potential.



Re-naturalizing the canal and ditch systems using a two-stage design would mimic the form and function of natural streams by incorporating a small inset floodplain, or “bench,” within the existing channel. In this approach, the lower channel conveys baseflow and smaller storm events, while the benches activate during higher flows to slow and store water, support native vegetation, and promote sediment deposition and nutrient processing. The gentler, wider banks reduce water velocity, lower water levels, and improve bank stability. In “Managing Artificially Drained Low-Gradient Agricultural Headwaters for Enhanced Ecosystem Functions,” Pierce et al. (2012) found that aquatic plants on inset benches and banks mitigate non-point source pollution and promote biodiversity in receiving waters – functions that align with the nutrient retention and pollutant mitigation Clifford et al. (2025) document for well-managed ditch systems. Converting existing trapezoidal ditches to a two-stage system can double their floodwater storage volume.



Two-stage Ditch in Forested Setting Diagram
Diagram depicts a two-stage ditch typology in rural, agricultural, or forested conditions.

(Image right) Drainage ditches extend through wooded tracts within the South Carolina project area. Photo credited to RDE.









The ecological conditions surrounding the project areas make this opportunity especially promising. The woodlands adjacent to the existing canals and ditches are notably biodiverse, with a healthy tree canopy and understory and a striking absence of invasive species. This endemic vegetative diversity supports a rich fauna, functioning as exactly the kind of refugia that Clifford et al. (2025) identify as a critical and underappreciated role of ditch systems in intensively managed and degraded landscapes. Beyond ecology, re-naturalized ditch corridors present a meaningful opportunity to reconnect the community to its landscape. Walking trails along the improved ditches would provide safe pedestrian access through mixed hardwood and bottomland forests, offering experiences for birdwatchers, naturalists, and recreationists. This integration of ecological and social benefit reflects what Clifford et al. (2025) describe as the cultural ecosystem services that well-managed ditch systems can provide, and what they call for in their vision of multifunctional ditchscapes that serve people and nature simultaneously.

The conditions present in the project areas – historic agricultural ditches, underserved coastal communities, high ecological value, and compounding flood risk – are not unique to these sites. They are common across the mid-Atlantic and Southeast coastal plain. A successful project in these areas could demonstrate what thoughtful ditch redesign looks like in practice and catalyze similar improvements throughout the study area and along the broader eastern seaboard.

Stakeholders and Community Partners

We wish to extend our gratitude to the many stakeholders and community partners that contributed to this effort.

North Carolina

NC Wildlife Resource Commission (NCWRC)

NC Department of Transportation (NCDOT)

NC Department of Environmental Quality (NCDEQ)

NC Coastal Federation (NCCF)

US Army Corps of Engineers (USACE)

US Fish and Wildlife Service (FWS)

Tyrrell County Soil & Water District (SWCD)

Tyrrell Community Development Corporation

The Conservation Fund

Albemarle-Pamlico National Estuary Partnership (APNEP)

Communities of Alligator and Goat Neck

South Carolina Stakeholders

Concerned Citizens of Unincorporated Areas

Gullah Geechee Heritage Corridor

Ten Mile Neighborhood Association

Lowcountry Land Trust

Coastal Expeditions and Coastal Expeditions Foundation

St. James-Santee Elementary/Middle School

Lincoln Regional Center

Buckshot's Restaurant

Mt. Zion AME, Howard AME, Greater Howard Chapel, Bethel AME

The Nature Conservancy

Friends of Coastal South Carolina

Berkely-Charleston-Dorchester Council of Governments

Town of Awendaw Planning Department

Cape Romain National Wildlife Refuge

Legacy Works

Communities of Pineland, Buck Hall, Tibwin, Awendaw, McClellanville, Germantown, and South Santee

Audubon