June 30, 2026

Ms. Justine Woodward
Department of the Army
Corps Norfolk District at Fort Norfolk
803 Front Street
Norfolk, VA 23510
vbcrsm@usace.army.mil

RE: Comments on Corps' Notice of Intent to Prepare an Environmental Impact Statement for the Virginia Beach CSRM Feasibility Study (EISX-202-00-E4P-1763993292)

Dear Ms. Woodward:

Please accept these comments on behalf of the Environmental Defense Fund, Southern Environmental Law Center, Chesapeake Bay Foundation, Wetlands Watch, and Lynnhaven River NOW. Our organizations have been engaged in the Virginia Beach Coastal Storm Risk Management (CSRM) Feasibility Study from its inception, with the goal of contributing to the development of a broad set of CSRM projects that improves the city's resilience to coastal storms and other increasing natural threats while minimizing adverse impacts on communities and the environment. We appreciate the work that the U.S. Army Corps of Engineers (Corps) and the City of Virginia Beach (City) have done on the study to date.

As part of our efforts, we have retained Biohabitats, a consulting firm that specializes in identifying nature-based solutions and has worked on other CSRM projects in the Southeast, to assist us with our review of the challenges and opportunities in making Virginia Beach more resilient to flooding from rising seas, intensifying storms, more frequent heavy rainfall, and other increasing threats. Biohabitats shared significant insights and input with us, and our organizations worked with them to compile the attached report that we hereby incorporate into and offer as part of our scoping comments.

As one component of work, we asked Biohabitats to closely evaluate two Virginia Beach watersheds—Lynnhaven Bay and Back Bay— and identify potential landscape features that can provide engineering functions of flood risk management or mitigate the negative environmental impacts of proposed infrastructure, while producing additional economic, environmental, and social benefits. The result is the two sets of Natural and Hybrid Infrastructure (NHI) recommendations presented in Sections 2 and 3 of our attached report. We strongly encourage the Corps and the City to examine these and other NHI strategies as primary rather than compensatory features and as a key component of a "multiple lines of defense" approach to managing coastal flood risk in the City.

In addition, and in response to the Corps' specific request for public input on the Back Bay marsh island creation concept that was shared at the June 2026 public meetings on the CSRM study, Section 3 also includes a set of key considerations to factor into the analysis of that innovative NHI strategy in the Draft Environmental Impact Statement (Draft EIS) that the Corps and the City are developing for the project. Those considerations include:

- Staging construction and sourcing and moving material will be logistically challenging, so an incremental approach and a plan that considers these effects should be explored.
- The southern side of the islands will be constantly exposed to wind tides and may therefore redirect the wave energy laterally. The EIS should carefully consider where that energy is directed and how it is dissipated.
- For similar reasons, anchoring the sediment becomes a key concern, as is over-engineering the structures with armoring or height that could compromise habitat values. We urge consideration of the wood-based techniques described in these comments to help address these concerns.
- The small boat channels need to be sized and positioned so as not to unduly increase the velocity of water and sheer stress.
- Although the quiescent, low-fetch conditions created by the islands should be conducive to healthy SAV beds, the design needs to recognize that the construction phase will damage and displace SAV, which needs to be replaced and supported.

Further, after the Corps and the City decided to move forward with the Lynnhaven River storm surge barrier as the CSRM study's "Early Actionable Element," Biohabitats assisted us with identifying a list of potentially significant impacts that a storm surge barrier could have on the complex dynamics of the Lynnhaven River estuary. Based on those potential impacts, Section 4 of our report recommends that the Draft EIS thoroughly evaluate several factors and scenarios in connection with the proposed Lynnhaven surge barrier, including:

- Gate closure frequency and duration under a range of scenarios covering different levels of: (a) storm intensity; (b) anticipated sea level rise; (c) rainfall; and (d) surge-level closure triggers.
- How gate closures under those different scenarios would impact flooding and water levels on the upstream/landward side of the gates, especially during coastal storm events that generate significant precipitation.
- How gate closures, by preventing flushing, affect bacteria and aquaculture.
- How the project would affect sediment dynamics on both sides of the gates and at the abutments of the Lesner bridge, and the extent to which changes in sediment dynamics could increase the need for dredging and impact adjacent property owners.
- How reduced flushing during gate closures would impact dissolved oxygen levels, temperatures, salinity, and nutrient buildup upstream/landward of the gates, and how such changes would impact aquatic ecology and habitat.

- How the project would influence flooding and storm surge in communities located adjacent to or near the gates that would be subjected to the deflected storm surge, particularly since it appears the walls and dune projects under consideration on both sides of the gates are now on a separate timetable from the surge gates.
- The socio-economic demographics of: (a) the communities that would benefit the most from the project; (b) communities where the project could exacerbate flooding; and (c) communities that would bear residual flood risk.
- The maximum closure duration and frequency that would avoid significant water-quality and ecological harm.
- The project's long-term operations and maintenance costs for which the City would be responsible.
- Opportunities to reduce greenhouse gas emissions through the use of low-carbon materials, regional sourcing, and energy-efficient construction practices given the scale and anticipated service life of the project.

Finally, in addition to the broad categories and the more specific recommendations listed above, our report includes a number of other important recommendations throughout for the preparation of the Draft EIS, and we appreciate the opportunity to provide this information and analysis to the Corps, the City, and the residents and businesses of Virginia Beach as part of the CSRM study. We look forward to remaining engaged on the study as it advances, and we would welcome the opportunity to discuss our comments with you further.

Sincerely,

Emily Steinhilber
Environmental Defense Fund

Morgan Butler
Southern Environmental Law Center

Christy Everett
Chesapeake Bay Foundation

Mary-Carson Stiff
Wetlands Watch

Karen Forget
Lynnhaven River NOW

VIRGINIA BEACH COASTAL STORM RISK MANAGEMENT STUDY

Joint Scoping Comments on Virginia Beach CSRM Feasibility Study

Environmental Defense Fund, Southern Environmental Law Center, Chesapeake Bay Foundation, Wetlands Watch, and Lynnhaven River NOW

JUNE 2026

Sea Level Rise & Coastal Flood Risk in Virgina Beach

INTRODUCTION

Virginia Beach is on the front lines of an increasingly volatile climate. The City faces one of the most acute combinations of relative sea level rise and storm surge vulnerability in the United States, driven not only by global ocean expansion but also by local land subsidence (City of Virginia Beach, 2020). This trend compounds the impacts of hurricanes and nor'easters by elevating baseline water levels, allowing storm surge and wind-driven flooding to travel farther inland and persist longer. The City of Virginia Beach recognized early that increasing rainfall patterns were also exacerbating risk.

Recognizing this volatile future, the City has selected planning scenarios of approximately 1.5 feet of sea level rise by 2050, increasing to a 3-foot rise estimated for conditions from 2065-2085. Under future conditions, low-lying areas will transition from today's episodic inundation to more chronic and widespread flooding conditions. The City recognizes that sea level rise is increasing the frequency, severity, and spatial extent of coastal flood hazards, impacting infrastructure, economic systems, and long-term community viability (City of Virginia Beach, 2020).

Photo: Biohabitats

Natural & Hybrid Infrastructure for Coastal Flood Risk

LESSONS FROM NATURE

These comments seek to identify potential landscape features that can significantly improve flood risk management in the City or mitigate the negative environmental impacts of proposed infrastructure, by reducing closure time and counteracting unintended consequences while producing additional economic, environmental, and social benefits. Such features may be termed Nature-based Solutions (NbS), Living infrastructure, or the term used in this document: Natural and hybrid infrastructure (NHI).

Natural and hybrid infrastructure (NHI) is increasingly recognized as a key approach for coastal resilience. In coastal areas, natural infrastructure that builds resilience can include wetlands, dunes, barrier islands, oyster reefs, and living shorelines (NOAA, 2024). These features can reduce wave energy, attenuate storm surge, stabilize sediments, and enhance vertical accretion processes that help shorelines keep pace with rising seas (USACE, 2021). NHI often serves as the outer and intermediate layer in the "multiple-lines-of-defense" framework, a layered coastal resilience approach that combines offshore natural features, engineered structures, and land-use strategies to reduce hazard impacts progressively before they reach vulnerable communities. By complementing engineered defenses and spatial planning, natural ecosystems provide adaptable, cost-effective protection while enhancing biodiversity and long-term coastal resilience.

A fundamental advantage of NHI relative to conventional "gray" infrastructure is its capacity for adaptation over time. Natural systems can evolve through sediment deposition, vegetation growth, and ecological succession, enabling them to respond dynamically to changing conditions such as sea level rise (USACE, 2021). In contrast, traditional infrastructure is typically designed for a fixed level of protection with a defined service life, often requiring costly retrofits as conditions change.

MAINTENANCE AND COST OF NHI SOLUTIONS

From an economic perspective, responsive systems can have stronger lifecycle performance than static walls and structures. The Nature Conservancy has documented that natural systems such as wetlands and mangroves can reduce storm damages by billions of dollars, while also supporting fisheries, water quality, and recreation (The Nature Conservancy, 2025). Broader economic analyses suggest that NHI can achieve equal or higher returns on investment than traditional infrastructure when co-benefits are included, reflecting avoided damages, ecosystem services such as water quality, habitat, and recreation, and reduced maintenance costs. The results vary according to local conditions, but oyster reefs, barrier islands, and wetland restoration are generally seen as offering the best return on investment for resilience (Reguero et al., 2018). It is important to note that the costs associated with gray infrastructure are highly subject to international markets, and several recent CSRM price estimates have increased dramatically or proved inaccurate over time.

Although NHI can function to reduce flood risk reduction, too often it is deployed as required for compliance or only to mitigate the deleterious consequences of gray flood control infrastructure. **We encourage the Corps and the City to examine NHI as a primary rather than compensatory feature and as a key component of a multiple lines of defense approach to managing coastal flood risk in the City.**

LEADERSHIP ROLE OF VIRGINIA BEACH AS NON-FEDERAL SPONSOR

CSRM studies are intended to evaluate a full suite of risk reduction measures, including structural infrastructure (e.g., levees, floodwalls), nonstructural measures (e.g., elevation and floodproofing), and natural and nature-based features (USACE, n.d.). Since the mid-2010s, Congressional direction has required explicit consideration of NHI in feasibility studies (USACE, 2024; Carter and Lipiec, 2020), although these features are often deployed alongside traditional infrastructure rather than as standalone solutions. Through its Engineering With Nature initiative, the Corps emphasizes integrated systems that align engineering and ecological processes for multiple benefits, including flood risk reduction, habitat enhancement, and social value (Bridges et al., 2018).

The City of Virginia Beach has an important role in ensuring the study:

- **incorporates a wider suite of benefits,**
- **contemplates incentives for private land owners, and**
- **considers flood risk with a holistic view that includes upstream and upland management.**

Despite these positive steps, NHI still too often comes across as an afterthought in many CSRM studies. Although NHI can function to reduce flood risk reduction, it is often evaluated primarily for its aesthetic benefits or only to mitigate the deleterious consequences of gray flood control infrastructure. As such, the City has an important role to play in ensuring that the Corps use the authorities and the tools at its disposal to examine NHI as primary rather than compensatory features in the CSRM study and that the full suite of benefits of NHI provided are factored into the study's findings.

In addition, real estate requirements can limit the extent to which CSRM projects can be implemented on private land. Nonstructural measures on private property (e.g., building elevation) can be part of a CSRM plan, but ecosystem-based interventions on private lands may not be eligible for federal funding. Given the amount of privately owned shoreline in Virginia Beach, the City should consider early on how it may want to address this responsibility or advance solutions that require collaboration with other landowners as the study's non-federal sponsor. For example, the City of Virginia Beach can acquire easements or properties from willing sellers to advance CSRM projects where the federal government is prohibited from doing so. The City can also expand their Virginia Beach Conservation Assistance Program (VBCAP) that provides reimbursements to private property owners who install best management practices on their property. Practices covered include removing impervious surfaces, installing vegetated buffers, living shorelines, rain gardens, rain barrels and other practices that better manage water on private properties and reduce shoreline erosion.

For the reasons discussed above, non-federal sponsors like the City of Virginia Beach often play a critical role in expanding the scope of CSRM projects, integrating broader resilience objectives, and aligning proposed plans with local values. The City is responsible for 50% of the study cost (currently valued at $6.67 million) and 35% of the eventual implementation costs. Given the extent of the City's financial contributions and the fact that the City's staff and leadership has more communication with and better understands the interests and concerns of Virginia Beach residents and businesses, **we urge City officials to exercise their full authority and responsibility in shaping the CSRM study process and its recommendations**.

One key example of an active non-federal sponsor actively shaping a study's recommendations can be found in the Miami-Dade Back Bay CSRM study, an approximately $11.2 million, federally funded feasibility effort conducted in partnership with Miami-Dade County (Corps, 2024). The initial Miami-Dade study recommended a concrete floodwall that local business owners lobbied strongly against as an impediment to tourism and antithetical to the identity of the city. The Corps altered their plans in response to the concerns, and the CSRM study now recommends a combination of structural, nonstructural, and nature-based measures, including a Nature-Based Solutions pilot program. Miami-Dade County also leveraged the CSRM process to advance locally driven alternatives and complementary resilience initiatives outside the original federal recommendations, including environmental restoration and equity-focused adaptation programs (USACE, 2025).

Figure 1. Miami's downtown development authority commissioned this rendering of a proposed floodwall, which changed public opinion on the topic. (Image: Curtis Rogers Design Studio)

Similar patterns are playing out in other coastal regions, including Charleston, South Carolina, and Norfolk, Virginia, where non-federal sponsors contribute the required cost share while also funding additional planning, land acquisition, and ecosystem restoration efforts that fall outside federal eligibility. These efforts highlight the importance of local investment and leadership in delivering comprehensive resilience outcomes, particularly where projects involve NHI or private land considerations.

In sum, as sea level rise accelerates and storm surge risk intensifies, successful identification and implementation of resilience projects with the broadest array of benefits and community support depends on coordinated federal, state, and local action, particularly in aligning the Corps' CSRM processes with locally driven adaptation strategies and investments. **We strongly urge the Corps, the City's elected officials, and the City's local staff members to work hand-in-hand throughout the study process to include a broad array of potential solutions, fairly evaluate their benefits, and ensure that proposed projects have buy-in from the Virginia Beach community and stakeholders and reflect their values and vision.**

Section 2
Natural & Hybrid Infrastructure in Lynnhaven River

Key Ecological Dynamics in Lynnhaven River

SEDIMENT BALANCE IN AN ESTUARY

In estuaries like the Lynnhaven River, fresh and saltwater habitats and species meet at the fringes of their tolerance for salinity in a system that varies across tidal cycles, seasons, and storm events. Organisms of this area are specially adapted to withstand the dynamics of water salinity and temperature. The system is fed by inputs from both sea and land, so establishing a reliable sediment budget and model is essential for understanding how the system will react to resilience measures.

As the Lynnhaven River and other tributaries head towards the ocean, they tend to carry heavy loads of sediment. The river slows down dramatically where it meets the salty ocean water, dropping its fine sediment load. Conversely, coarse oceanic sediment is suspended and moved into Lynnhaven by wave action and tidal processes until those forces weaken (Sisson et al., 2010). This dynamic is important for marsh formation and responsible for the creation of Lynnhaven's islands.

> Sediment that is naturally imported during intense storms can increase the stability of tidal bays and counteract sea level rise (Castagno et al., 2018).

Extreme events provide an influx of sediment that boosts marsh elevations. A single storm can cause more erosion and deposition in an estuary within a few hours than would occur in decades under normal conditions (Hayes, 1978). Most of these effects are to drive more sediment in from the ocean. Intense storms increase the stability of tidal bays by providing the sediment necessary to counteract sea level rise (Castagno et al., 2018). Therefore, hurricanes can benefit wetland accretion by augmenting the delivery of mineral sediment, an essential process allowing marshes to offset submergence during rising sea levels (Georgiou et al., 2024).

OYSTERS AND SALINITY

Expansive oyster reefs were historically endemic to the Lynnhaven system (Lipcius et al., 2015). As one of the only natural hard substrates along the Mid and South Atlantic Coast, oyster reef habitat has been recognized for shoreline protection and conservation of natural capital in the face of damaging storms and wave erosion, even though they now occupy a small fraction of their earlier distribution (Ridge et al., 2015). Restoring oysters to Lynnhaven River to improve water quality and available habitat has taken decades of effort.

Oysters are sensitive to salinity gradients. Salinity in Lynnhaven River has always varied on several time scales – from the daily changes due to tidal exchange with the Chesapeake Bay to quotidian rainfall and watershed runoff, seasonal freshwater inputs, and inter-annual variation in large storm events and hurricanes. This means "historic salinity" is best understood as a range with variability, not a single value.

Eastern oysters can exist in most regions of estuaries where mean or median salinity exceeds 5. In higher salinity environments, they grow and reproduce faster but may suffer more disease and predation (Munroe et al., 2013).

In a partially mixed estuary like the Lynnhaven River, episodic, heavy precipitation events can reduce salinity to levels that are fatal for oysters (Munroe et al., 2013). Understanding oysters' vulnerability and resiliency to extreme but infrequent events requires detailed environmental observations that can help identify the conditions and thresholds.

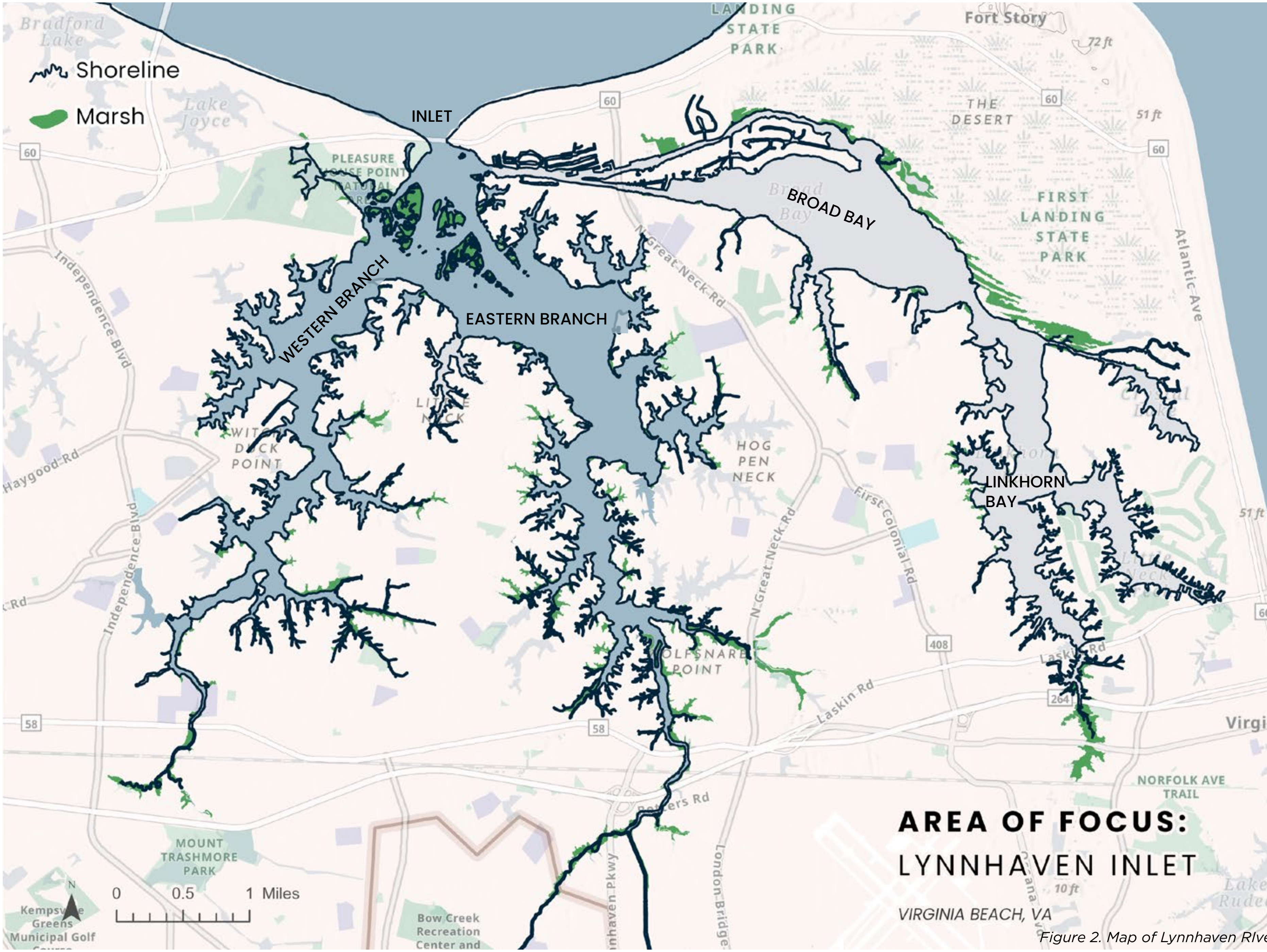


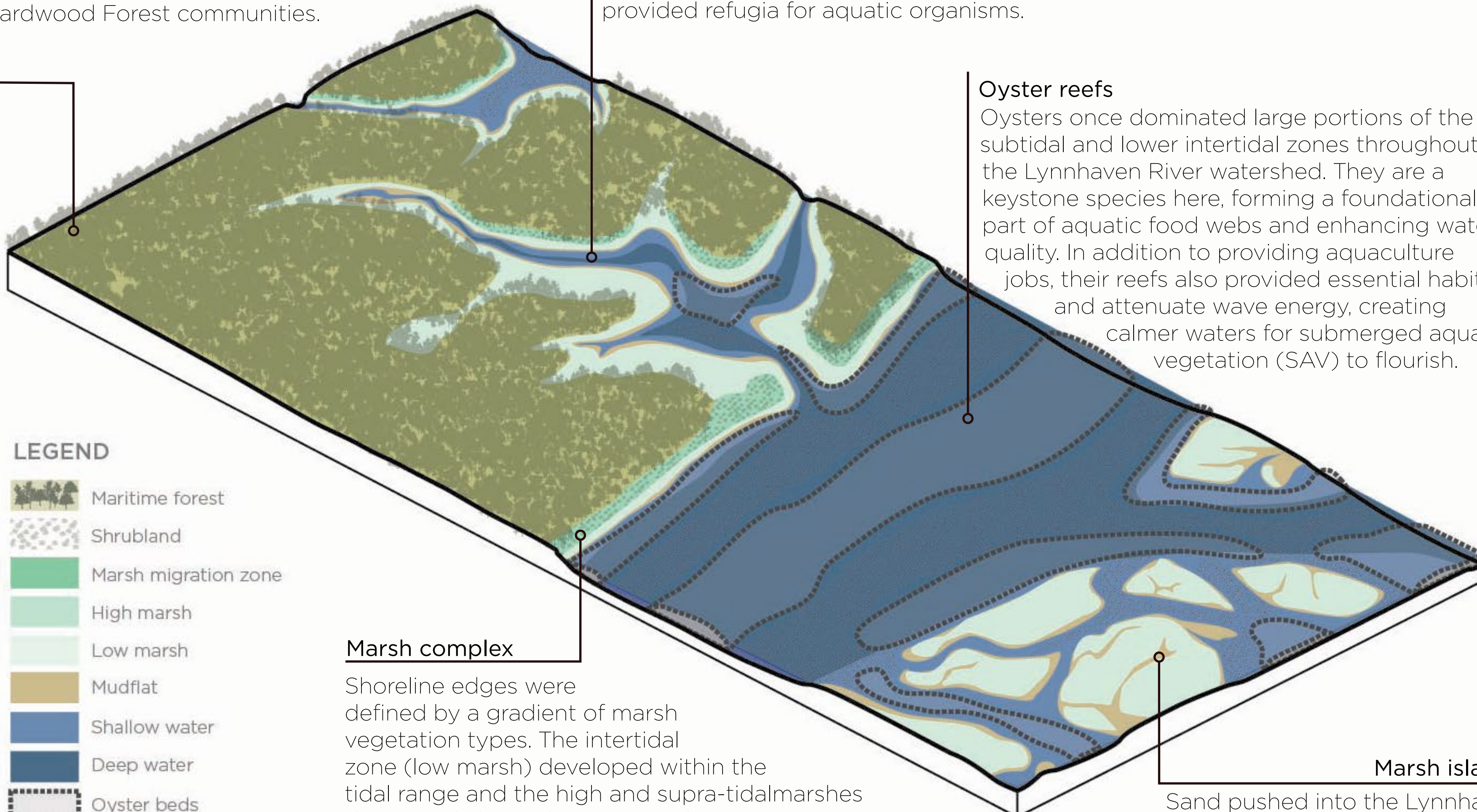
Figure 2. Map of Lynnhaven RIver

LYNNHAVEN WATERSHED - PRE-DEVELOPMENT

Maritime forests
The watershed was once extensively covered by maritime forest, consisting predominantly of Non-riverine Swamp and Wet Hardwood Forest communities.

Tributary channels
Wide shallow tributary channels provided sheltered areas for marsh vegetation and aquatic ecosystems to thrive. Vast tidal marshes existed in these areas and filtered the tidal waters and upland runoff before reaching the waterways. Higher shoreline complexity and sinuous tidal channels provided refugia for aquatic organisms.

Oyster reefs
Oysters once dominated large portions of the subtidal and lower intertidal zones throughout the Lynnhaven River watershed. They are a keystone species here, forming a foundational part of aquatic food webs and enhancing water quality. In addition to providing aquaculture jobs, their reefs also provided essential habitat and attenuate wave energy, creating calmer waters for submerged aquatic vegetation (SAV) to flourish.



LEGEND
- Maritime forest
- Shrubland
- Marsh migration zone
- High marsh
- Low marsh
- Mudflat
- Shallow water
- Deep water
- Oyster beds
- SAV beds

rendering not to scale.

Marsh complex
Shoreline edges were defined by a gradient of marsh vegetation types. The intertidal zone (low marsh) developed within the tidal range and the high and supra-tidalmarshes developed above the normal tide range, transitioning into tidal shrub and maritime forest.

Marsh islands
Sand pushed into the Lynnhaven River and formed islands. These sand islands eventually stabilized and became vegetated, further buffering wave energy in the channel.

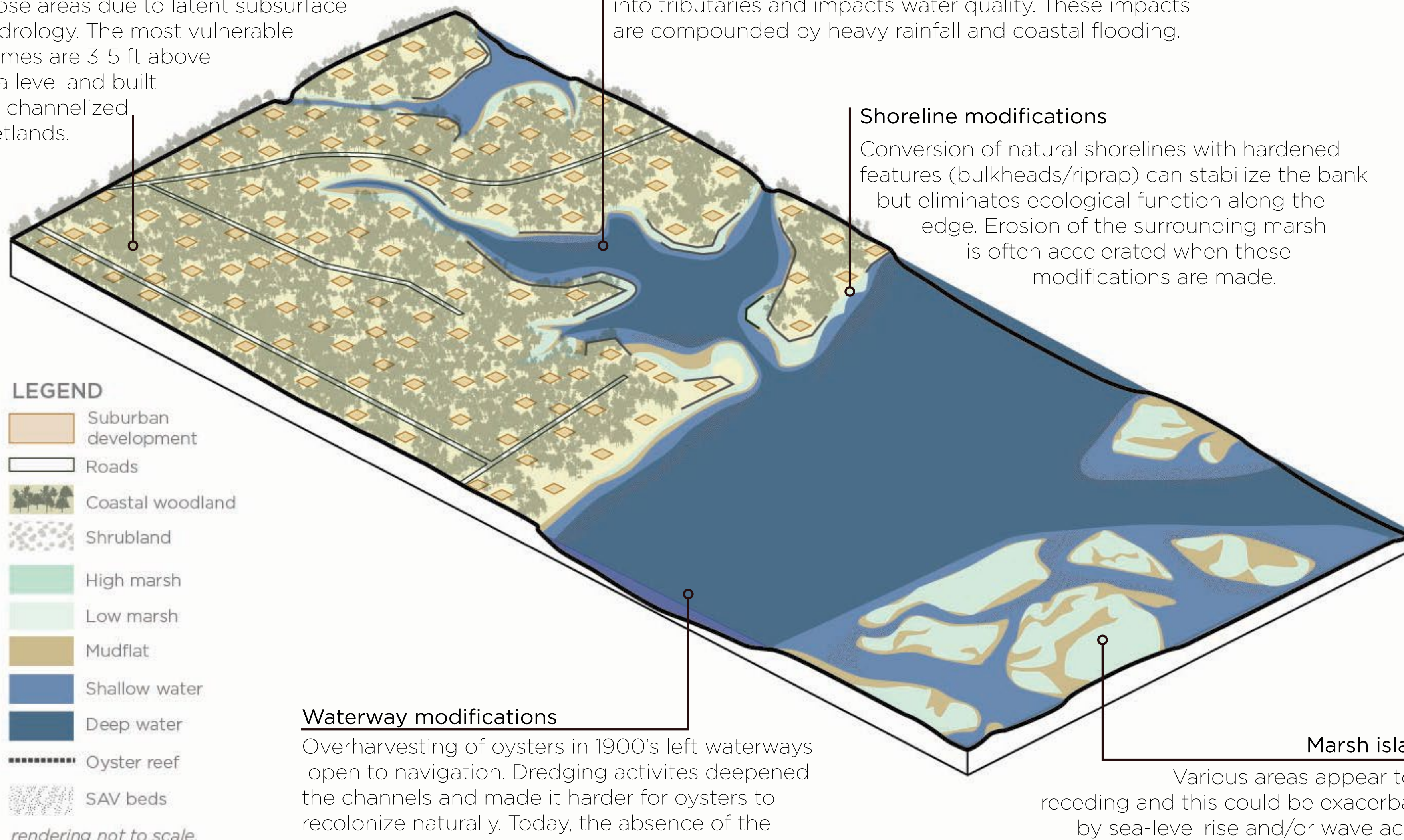
Figure 3. Lynnhaven Pre-Development

LYNNHAVEN WATERSHED - CURRENT CONDITIONS

Development
The filling, channelizing, and regrading of natural wetland features made way for increased suburban development. Reoccuring saturation and flooding issues persist in those areas due to latent subsurface hydrology. The most vulnerable homes are 3-5 ft above sea level and built on channelized wetlands.

Forest and water quality impacts
Residential development clears native forest for construction of single-family houses and installation of turf grass. Frequent use of fertilizers and pesticides washes into tributaries and impacts water quality. These impacts are compounded by heavy rainfall and coastal flooding.

Shoreline modifications
Conversion of natural shorelines with hardened features (bulkheads/riprap) can stabilize the bank but eliminates ecological function along the edge. Erosion of the surrounding marsh is often accelerated when these modifications are made.



Waterway modifications
Overharvesting of oysters in 1900's left waterways open to navigation. Dredging activites deepened the channels and made it harder for oysters to recolonize naturally. Today, the absence of the natural wave break provided by oyster beds makes shorelines more vulnerable to erosion and damage from wave energy and tidal surge.

Marsh islands
Various areas appear to be receding and this could be exacerbated by sea-level rise and/or wave action.

Figure 4. Lynnhaven current

MARSH LOSS AND DEGRADATION

In 1979, more than 1100 acres of tidal wetlands were reported in the Lynnhaven Basin (Barnard and Dumlele, 1979). In the most recent study conducted by Virginia Institute of Marine Sciences (VIMS) in 2007, only 699.3 acres remained (an approximate 36.5% reduction).

Marshes are known to trap sediment and can accommodate sea level rise depending on the pace and ability for landward migration. Reed (1995) maintains that vertical accretion must be occurring at a rate faster than or equal to sea level rise for marsh adaptation. But once sea level rise exceeds 3.0 mm/year, one would expect to see Lynnhaven's existing tidal marsh drown. Because sea level rise is predicted to exceed this rate, VIMS estimated that all wetlands could be lost by the year 2100, even under conservative estimates of sea level rise (Berman and Berquist 2009).

Current marsh loss and degradation in Lynnhaven River is driven by interacting stressors in addition to sea level rise. Degradation is observed in areas where longer fetch and deeper water allow larger waves to develop, increasing marsh-edge retreat rates. Boat wakes compound this effect in sheltered estuaries like Lynnhaven. Vessel wakes elevate turbidity, particularly in narrow creeks with high boating pressure, and repeated wake energy can damage vegetation and destabilize marsh edges. Stormwater discharge is also a significant stressor. Impervious concentrated runoff degrades water quality (increases sediment, nutrients, bateria, and contaminants entering the estuary), impacts marsh vegetation through high velocity flows, alters natural hydrology, and increases flood frequency.

Recommendations for Natural & Hybrid Infrastructure Solutions in Lynnhaven River

Comparing the pre-development and current conditions indicates that estuaries like the Lynnhaven River are complicated places with multiple inter-dependent dynamics—both natural and human-influenced—at play. These dynamics can be heavily impacted by coastal storms and other temporary changes, and it is essential to understand the interplay among these various factors when considering the viability of different strategies and techniques for reducing the impacts of coastal storms.

With the sediment, oyster/salinity, and marsh loss dynamics in mind, we offer the following recommended strategies for incorporating NHI as a key part of the CSRM strategy for the Lynnhaven River. We urge you to carefully assess these strategies in the Draft EIS.

NATURAL & HYBRID INFRASTRUCTURE RECOMMENDATIONS

Goal 1 - Protect against erosion

As noted in the 2013 Lynnhaven River Shoreline Management Plan, the average end point rate of shoreline change for Lynnhaven Inlet is only -0.1 ft/yr from 1937 - 2009 (Hardaway et. al., 2013). Shoreline hardening is the primary explanation for this, but as we increasingly appreciate the drawbacks of hardened shorelines, alternative erosion protection techniques have been developed that absorb and redirect wave energy and provide habitat benefits more similar to natural shorelines. These can be applied in front of bulkheads under some conditions. Goal 1 is to support erosion protection using NHI.

<u>Goal 1 elements include</u>:

Identify, restore, and stabilize areas currently experiencing erosion or vulnerable to erosion

- Identify based on comparative historical imagery studies or on-the-ground observations on both public and private properties
- Restore eroded areas using sediment redistribution
- Stabilize using oyster reefs and revegetation

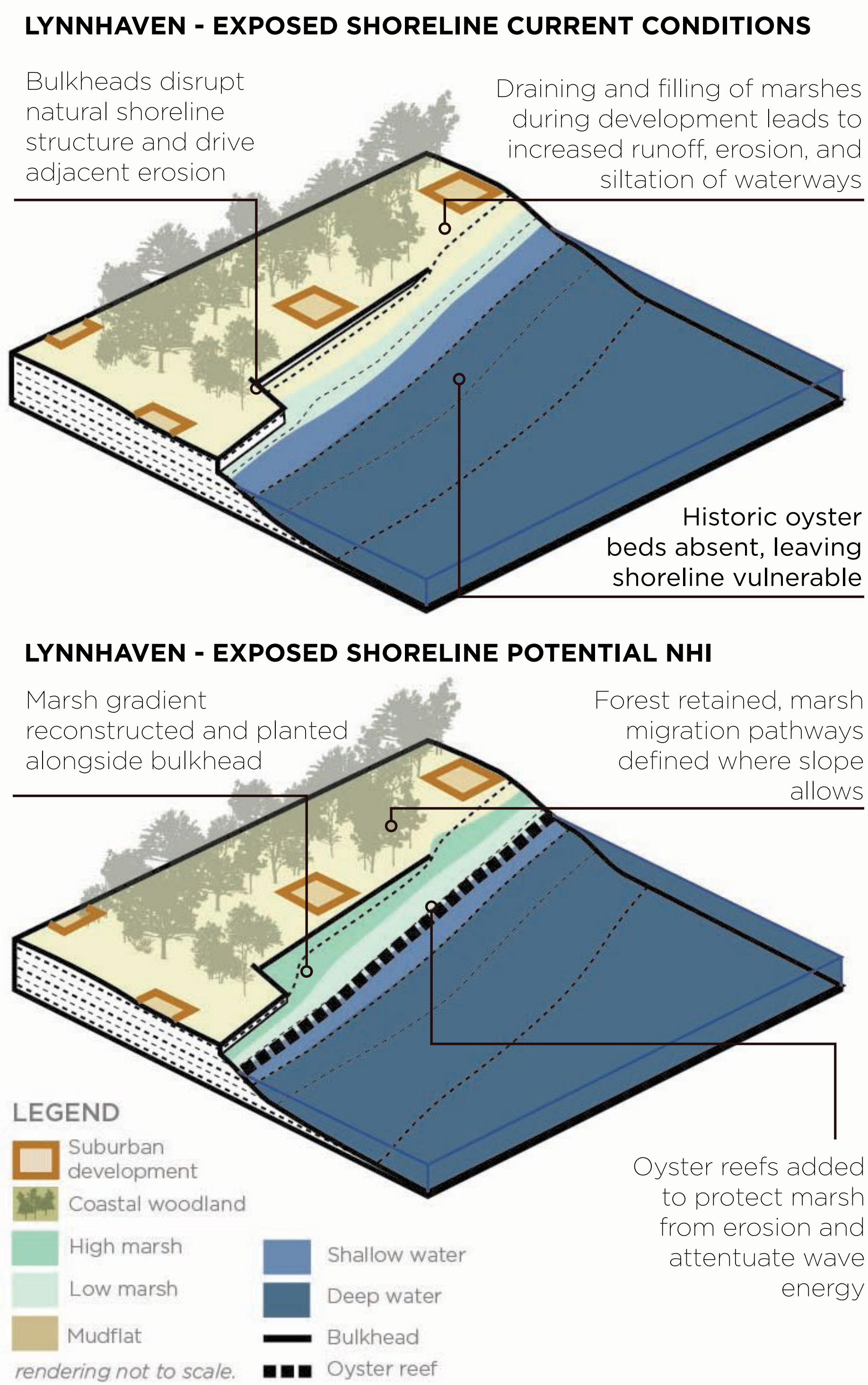


Figure 5. Lynnhaven exposed shoreline

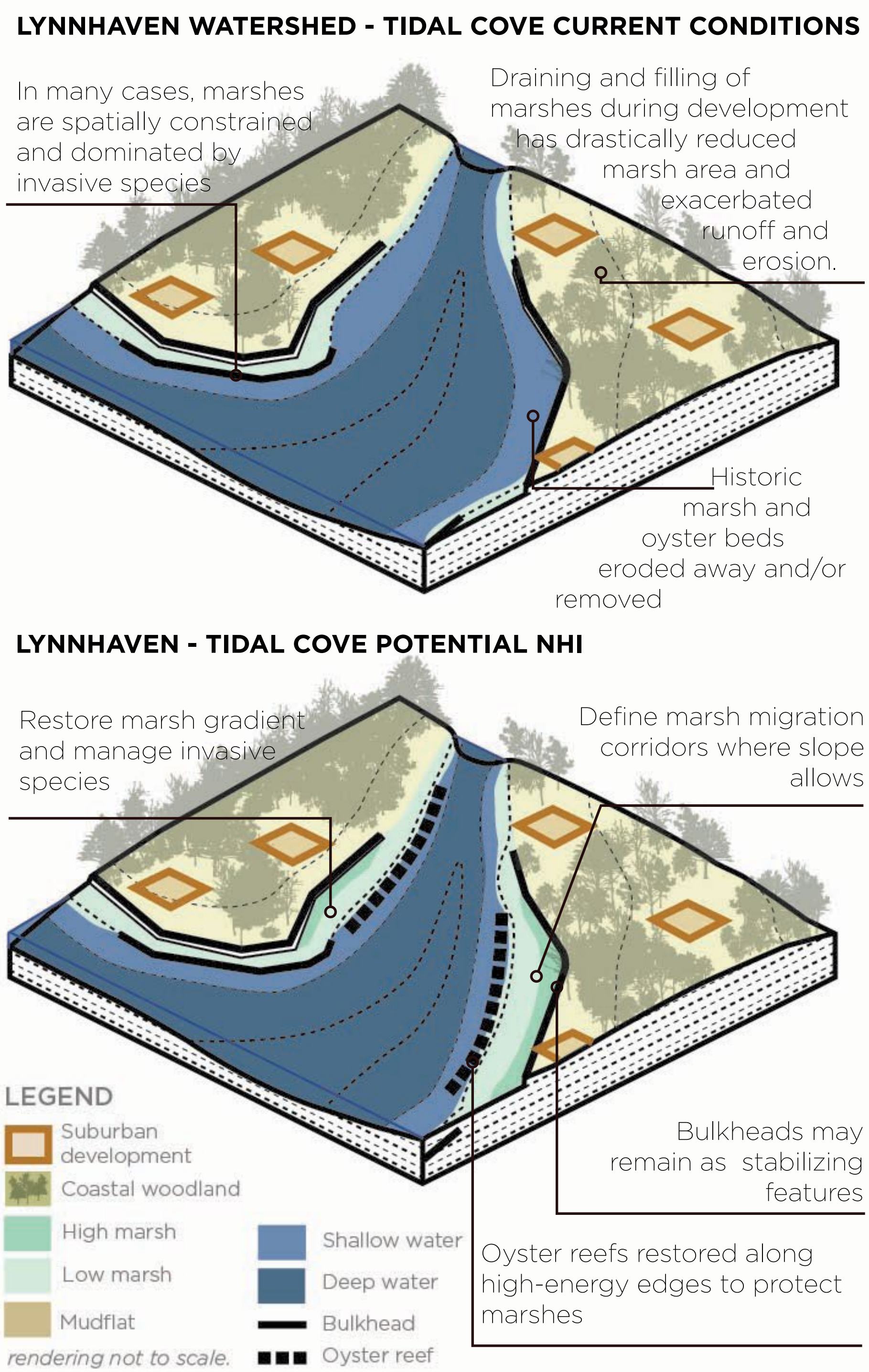


Figure 6. Lynnhaven tidal coves

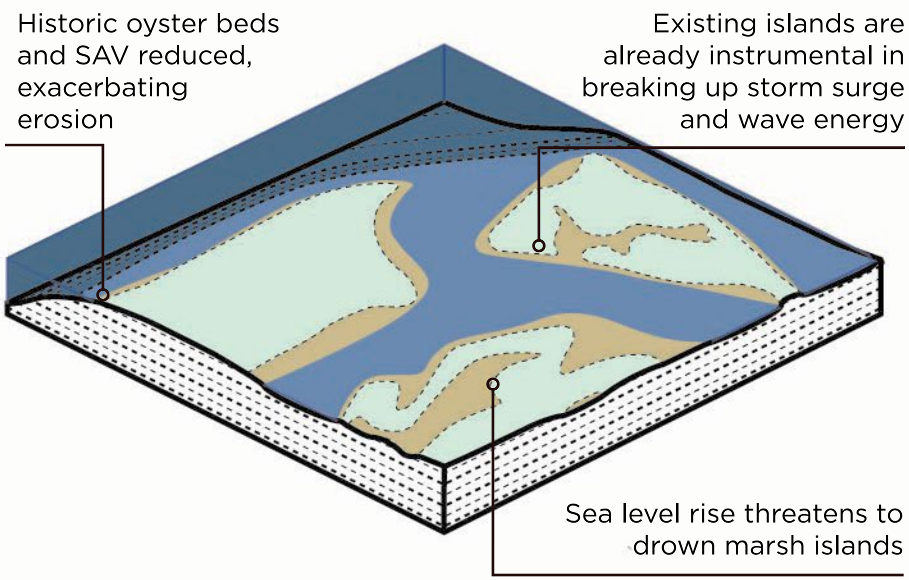
Goal 2 - Expand and enhance existing tidal wetland resources

A consensus priority of the Corps' Lynnhaven River Basin Ecosystem Restoration Project, restoring tidal wetlands can address the effects of decades of degradation from urbanization. Expanded tidal wetlands can improve water quality, enhance habitat for fish and shellfish, and restore ecological processes. These efforts need to be protected against the potential effects of the CSRM project and enhanced.

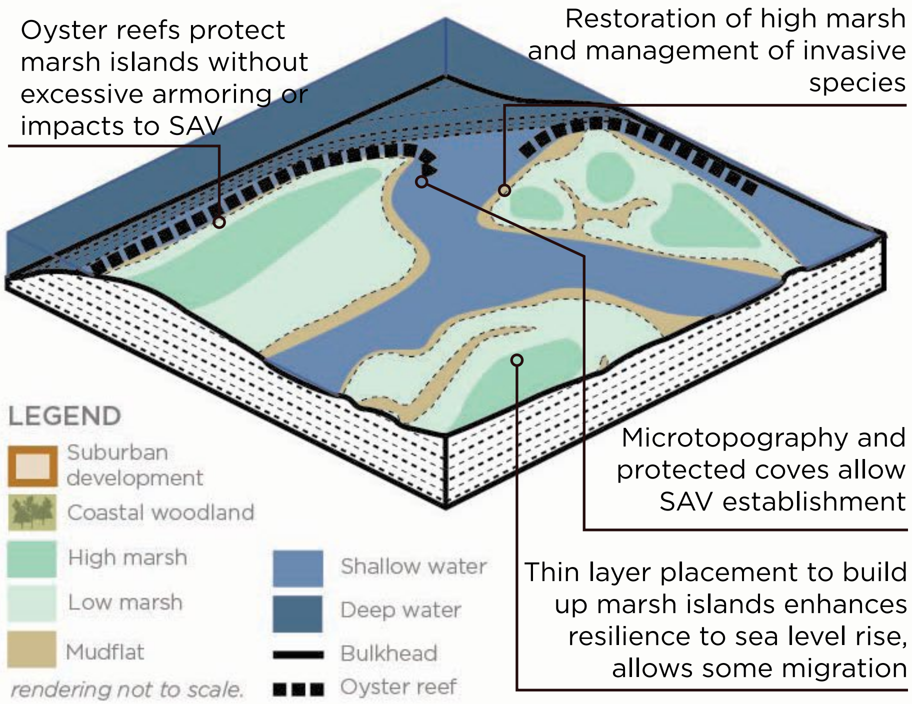
Goal 2 elements include the following:

- Identify areas where tidal wetlands could be most effectively restored and enhanced, on both public and private property
- Example landscapes for this include shallow, low-energy tidal tributaries, drainage ditches that are currently mudflat, and fringe wetlands in high-energy environments
- Enhancement and restoration may include sediment redistribution or thin layer placement
- Stabilization may include oyster breakwaters in higher-energy environments
- Prioritize restoration of low marsh elevations and revegetation, coupled with management of *Phragmites australis* (where applicable)

LYNNHAVEN WATERSHED - MARSH ISLAND CURRENT CONDITIONS



LYNNHAVEN - MARSH ISLAND POTENTIAL NHI



Goal 3 – Strategize for marsh migration

Marsh migration allows coastal wetlands to adapt to rising sea levels and changing hydrologic conditions. As water levels increase, marshes must shift landward to maintain their ecological function. Without available space for migration, wetlands can become trapped between rising tides and developed uplands, drown, and disappear. Large sections of the Lynnhaven River are lined with riprap or bulkheads or have steep bluffs and lack the shoreline topography that would allow for marsh migration, which makes the areas with conducive conditions even more valuable.

Planning for marsh migration requires protecting adjacent uplands, removing barriers to landward movement, and seeking opportunities to support marsh habitat as water levels rise, such as on existing shoals.

Goal 3 elements include the following:

- Identify areas throughout the watershed where marsh has the potential to migrate upland and facilitate this process
- Example landscapes for this include marsh islands in Lynnhaven River near the inlet as well as private shorelines with adequate upland space and appropriate shoreline slope gradient
- Designate marsh migration pathways and preemptively protect future marsh land
- Protect existing healthy marsh from impacts
- Use thin layer placement to elevate marshes to keep pace with sea level rise and reestablish native low marsh vegetation

Figure 7. Lynnhaven marsh islands

LYNNHAVEN WATERSHED - FUTURE POSSIBILITIES

Maritime forest retention

Maintaining and enhancing existing forest vegetation slows, retains and infiltrates stormwater. Retaining stormwater reduces concentrated flows through local tributaries and reduces erosion.

Tidal marsh enhancement and reconstruction

Enhancing and protecting tidal marshes are crucial to buffering against storm surge. Using techniques such as thin layer placement and high marsh revegetation can bolster these communities against degradation.

Oyster reef construction

Adding to existing efforts to reestablish oyster populations, strategic placement of oyster reefs helps retain marsh sediment, rebuilds ecological systems, filters water, and reestablishes natural wave breaks.

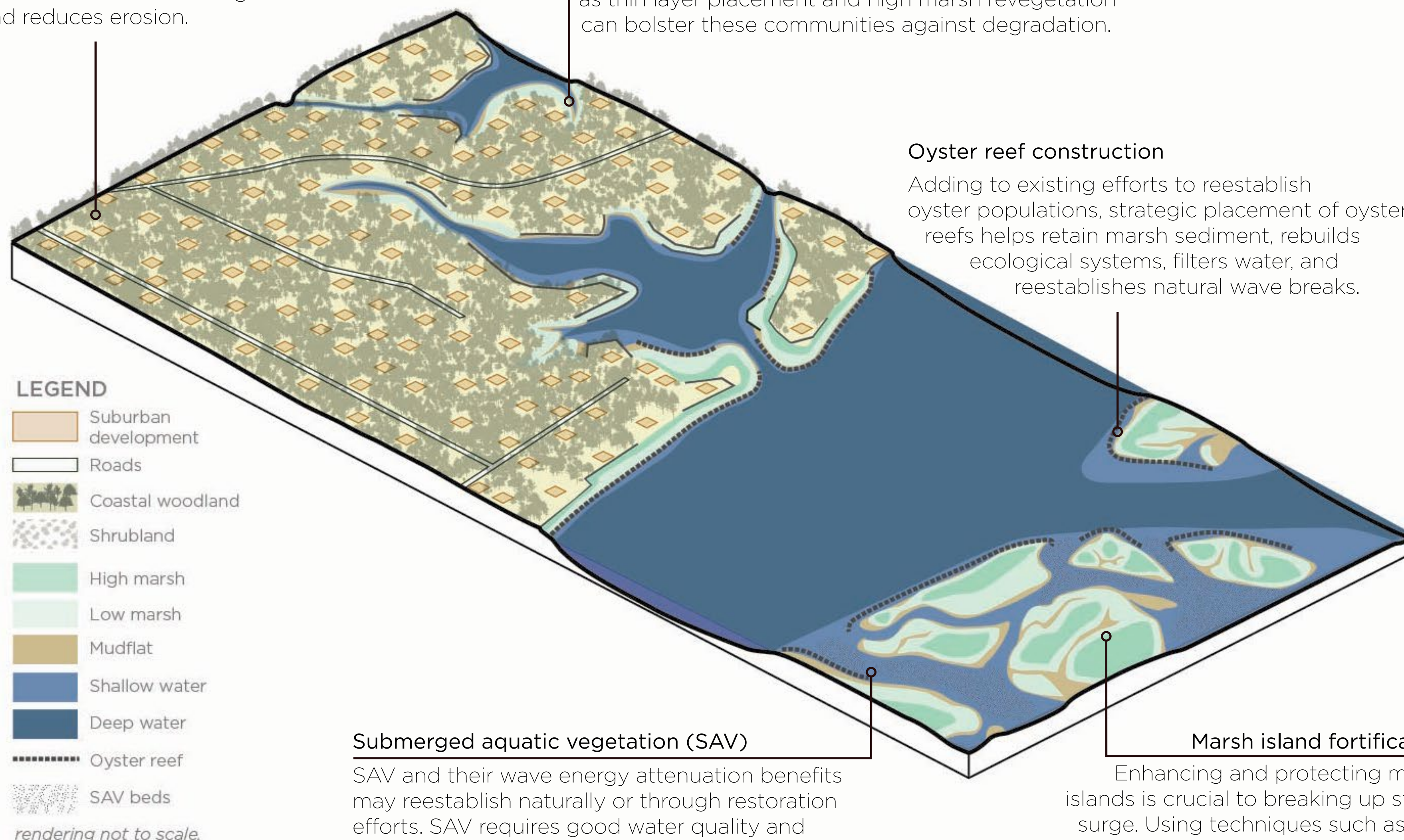


Figure 8. Lynnhaven future

Submerged aquatic vegetation (SAV)

SAV and their wave energy attenuation benefits may reestablish naturally or through restoration efforts. SAV requires good water quality and low energy to establish conditions which may be facilitated by oyster reef construction and marsh enhancement and continued water quality improvement efforts by the City.

Marsh island fortification

Enhancing and protecting marsh islands is crucial to breaking up storm surge. Using techniques such as thin layer placement and high marsh revegetation can help bolster these communities.

Section 3
Natural & Hybrid Infrastructure in Back Bay

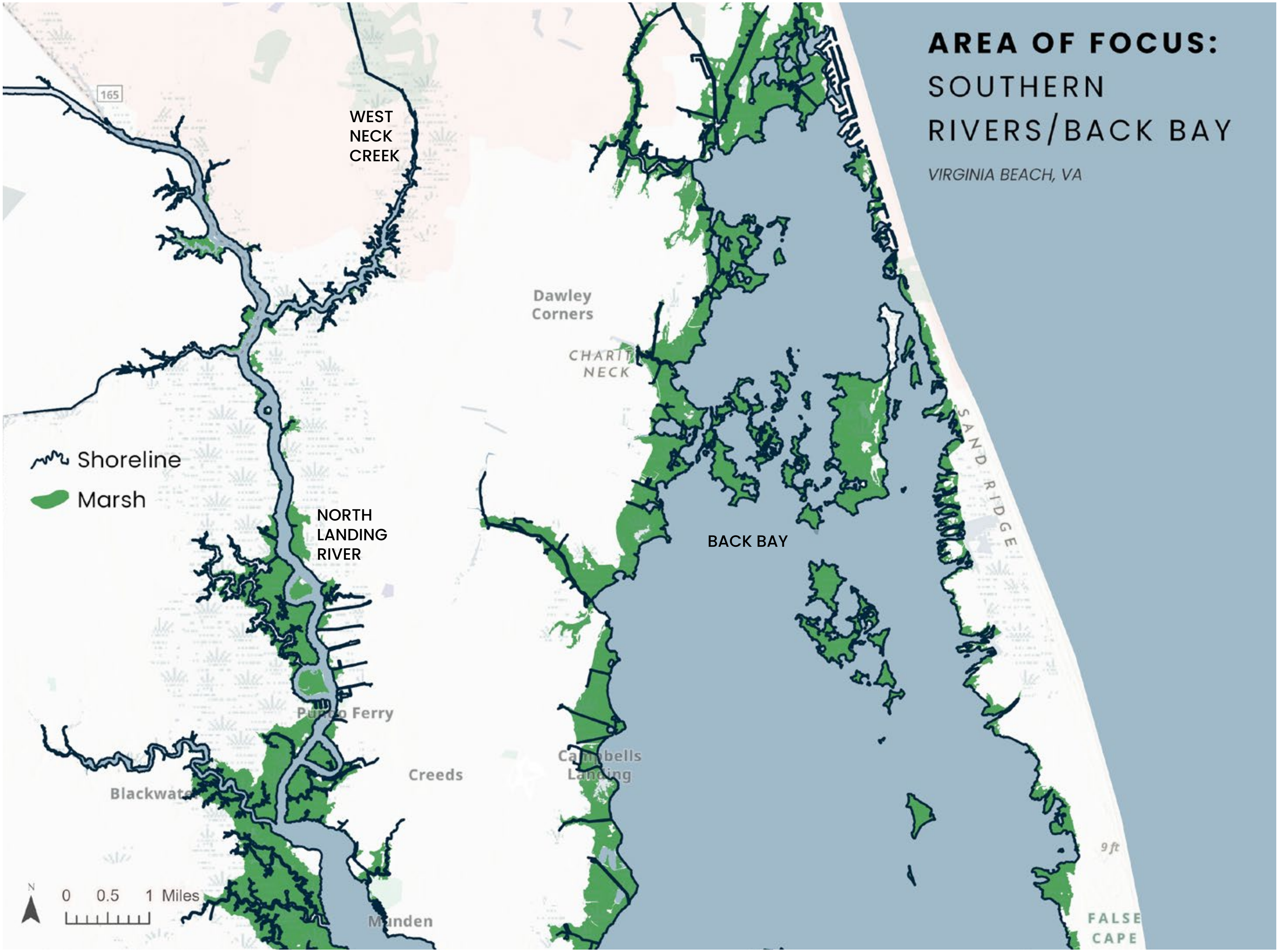


Figure 9. Back Bay map

Back Bay

BACKGROUND

Back Bay is a highly productive, shallow wetland–lagoon system whose ecological value is driven by marshes and submerged aquatic vegetation (SAV), but it is sensitive to disturbance and adjacent lands are prone to flooding. It is embedded within a broader ~65,000-acre basin that is a mosaic of open water, marshes, and submerged habitats, typically only a few feet deep. The nearest input from the ocean is at Oregon Inlet at Cape Hatteras in North Carolina, far to the south, which makes the water less saline and unaffected by daily lunar tides. Instead, wind drives the water movement via “wind tides” that cause significant flooding on roads and properties in the southern region of the City.

Back Bay’s highly productive wetland system supports diverse fish communities and serves as a critical nursery area, while also providing essential stopover and wintering habitat for migratory waterfowl along the Atlantic Flyway. Back Bay National Wildlife Refuge was established in Back Bay in 1938 to protect that habitat and support a passionate outdoor recreational community in ecotourism, hunting and fishing.

The numerous islands scattered throughout Back Bay are primarily natural marsh islands formed over thousands of years. Over geologic time, they are dynamic features that expand, erode, and shift. Human activities, including water-control structures and surrounding land-use changes, have influenced hydrology and sediment dynamics and are impacting island stability, increasing their erosion.

SUBMERGED AQUATIC VEGETATION (SAV)

According to Field et al. (2021), SAV declines in the Albemarle-Pamlico Estuarine System are driven by channel dredging and water quality degradation from excessive nutrient and sediment loading, as well as the emerging threat of accelerated sea level rise, barrier island instability, and increasing water temperatures. Secondary factors include damage to SAV beds by boat traffic, both commercial and recreational; and loss of protected, lower-energy areas.

SAV are beneficial by creating clear water conditions through their roots stabilizing sediments and slowing water movement which settles suspended solids. SAV photosynthesis contributes to healthy oxygen levels, and they support zooplankton that control algae (Chao et al., 2010). SAV density must attain a threshold level of 15 to 30 percent volume colonization before macrophytes can have a significant effect on phytoplankton, so supporting healthy SAV beds are an essential foundation to food webs (Schriver et al., 1995). Disrupted systems with increased nutrient loading allow algae to grow and block light, preventing SAV growth. Without SAV, sediments tend to rise into the water column and get moved around by wind tides, which often contributes phosphorous to the water and can enhance algal growth. Land use changes, large storms, or other disruptions can shift a bay from a relatively stable clear-water system with SAV to an unstable turbid-water system without SAV. At intermediate nutrient loading, a bay can be in either state depending on environmental setting and history.

MITIGATING THE EFFECTS OF COASTAL STORMS IN BACK BAY: NHI RECOMMENDATIONS

We offer the following recommended strategies for incorporating NHI as a key part of the CSRM strategy for Back Bay. **We urge you to carefully assess these strategies in the Draft Environmental Impact Statement.**

In the following pages, the system is described in three terms: **Upland** *refers to land at higher elevations and out of the floodplain,* **Transitional** *refers to the interface of water and land in ditches or at the marsh edge, and* **Open Water** *refers to the Back Bay.*

BACK BAY WATERSHED - PRE-DEVELOPMENT

Mixed forests and wetlands

Back Bay was once covered by forests and forested wetlands. Microtopographical differences created a diversity of habitat types, which transitioned from forest to shrublands to herbaceous wetlands.

Habitat mosaic and freshwater wetlands

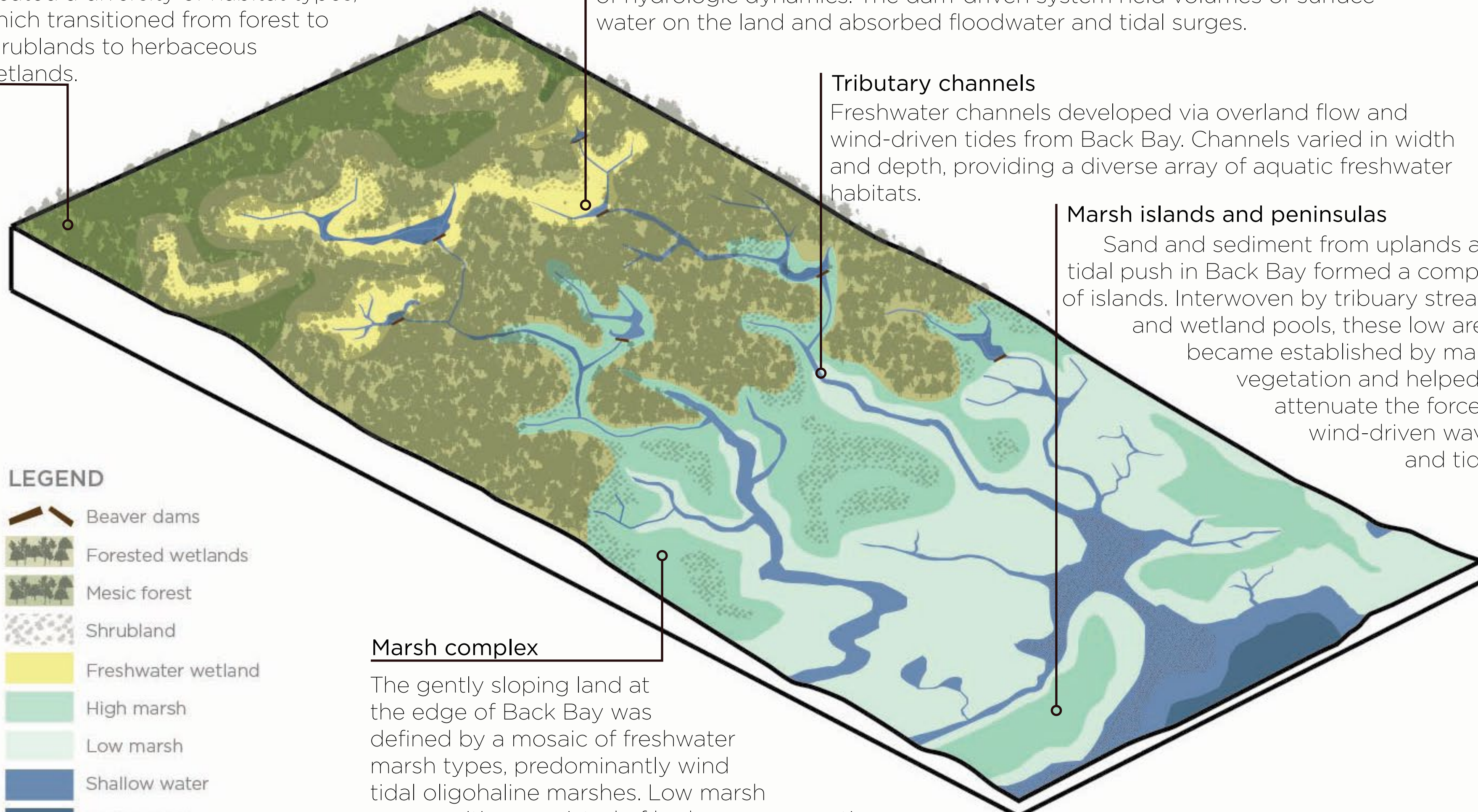
The landscape supported freshwater pools, wetlands, and sinuous streams that formed a complex habitat mosaic. Some features were created by beaver, which are native to Virginia's coastal plain and once a major driver of hydrologic dynamics. The dam-driven system held volumes of surface water on the land and absorbed floodwater and tidal surges.

Tributary channels

Freshwater channels developed via overland flow and wind-driven tides from Back Bay. Channels varied in width and depth, providing a diverse array of aquatic freshwater habitats.

Marsh islands and peninsulas

Sand and sediment from uplands and tidal push in Back Bay formed a complex of islands. Interwoven by tribuary streams and wetland pools, these low areas became established by marsh vegetation and helped to attenuate the force of wind-driven waves and tides.



Marsh complex

The gently sloping land at the edge of Back Bay was defined by a mosaic of freshwater marsh types, predominantly wind tidal oligohaline marshes. Low marsh communities consisted of herbaceous aquatic plants, while high marsh included woody shrub thickets intermixed with grasses. These plant communities developed in tandem with the wind-driven tidal dynamics of Back Bay, and worked to buffer upland communities from the force of tidal surge.

Figure 10. Back Bay pre-development

BACK BAY WATERSHED - CURRENT CONDITIONS

Remnant forests

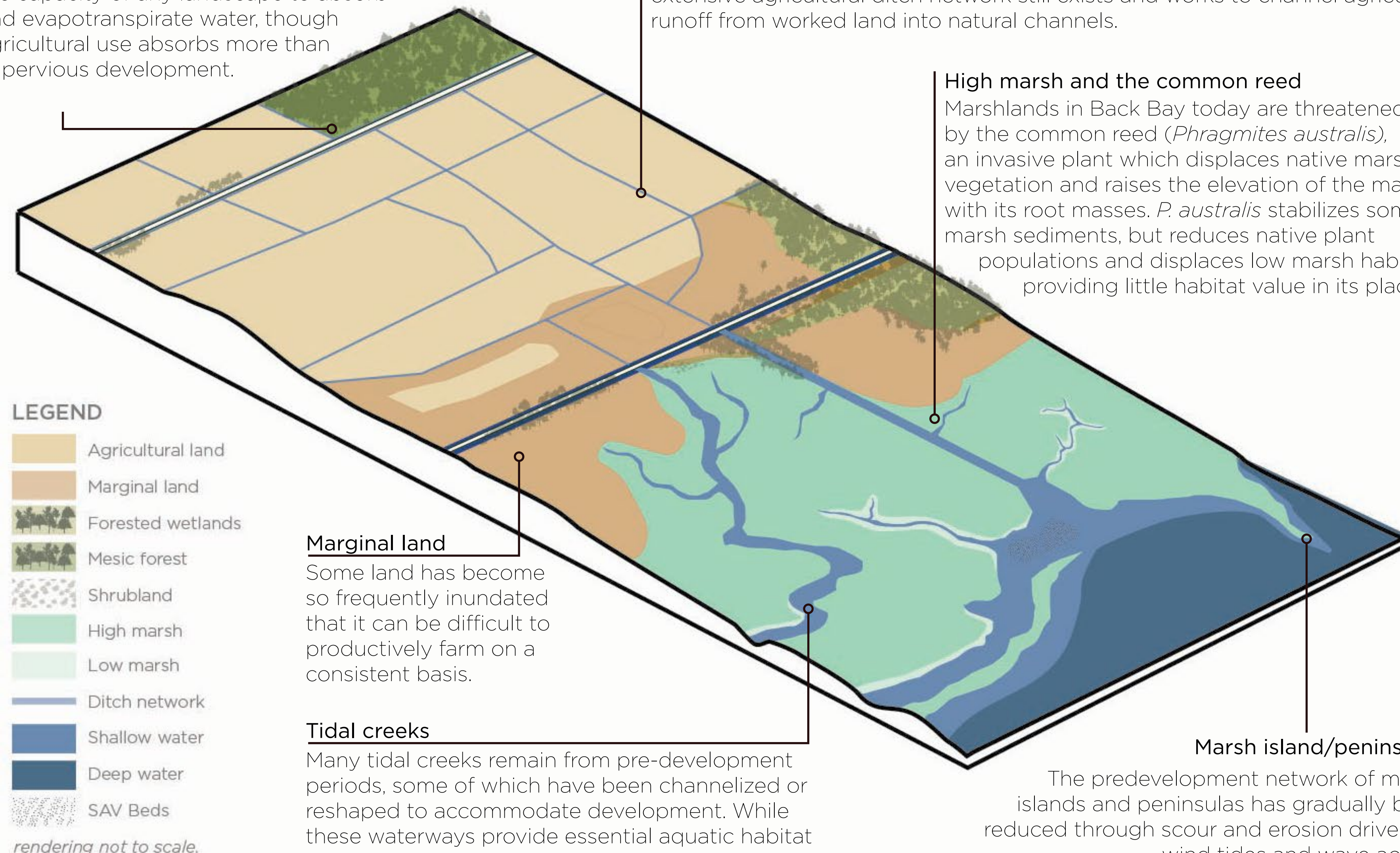
The conversion of large swaths of forest to agricultural use fragmented remaining forests and reduced their connectivity and area. Loss of forest area reduces the capacity of any landscape to absorb and evapotranspirate water, though agricultural use absorbs more than impervious development.

Agricultural ditch network

The transition of the Back Bay watershed to agricultural use came with the large scale drainage and regrading of hydric soils. This was done through extensive ditching, clearing, and filling of wetlands. Today, an extensive agricultural ditch network still exists and works to channel agricutural runoff from worked land into natural channels.

High marsh and the common reed

Marshlands in Back Bay today are threatened by the common reed (*Phragmites australis*), an invasive plant which displaces native marsh vegetation and raises the elevation of the marsh with its root masses. *P. australis* stabilizes some marsh sediments, but reduces native plant populations and displaces low marsh habitat, providing little habitat value in its place.



Marginal land

Some land has become so frequently inundated that it can be difficult to productively farm on a consistent basis.

Tidal creeks

Many tidal creeks remain from pre-development periods, some of which have been channelized or reshaped to accommodate development. While these waterways provide essential aquatic habitat and management of surface runoff and tidal flows, they are impacted by upland pollutants from development and fertilizer.

Marsh island/peninsulas

The predevelopment network of marsh islands and peninsulas has gradually been reduced through scour and erosion driven by wind tides and wave action.

Figure 11. Back Bay current

Back Bay Watershed

NHI RECOMMENDATIONS

Goal 1 - OPEN WATER - “Slow the water down”

Wind setup flooding occurs when large volumes of water are driven by winds up to the north end of the Back Bay. This process is exacerbated by long, open stretches of fetch. Existing marsh islands are taking the brunt of that energy and have been eroding over time as a result. Goal 1 uses natural and hybrid infrastructure to add friction/resistance to the water’s ability to build up, slowing the process and potentially limiting the extent of flooding for any specific event.

Goal 1 elements include:

Identify and stabilize islands currently experiencing erosion or vulnerable to erosion and install bioengineered resistance elements.

- Identify locations based on historical imagery and on-the-ground observations
- Stabilize edges using bioengineering concepts such as brushwood breakwater structures

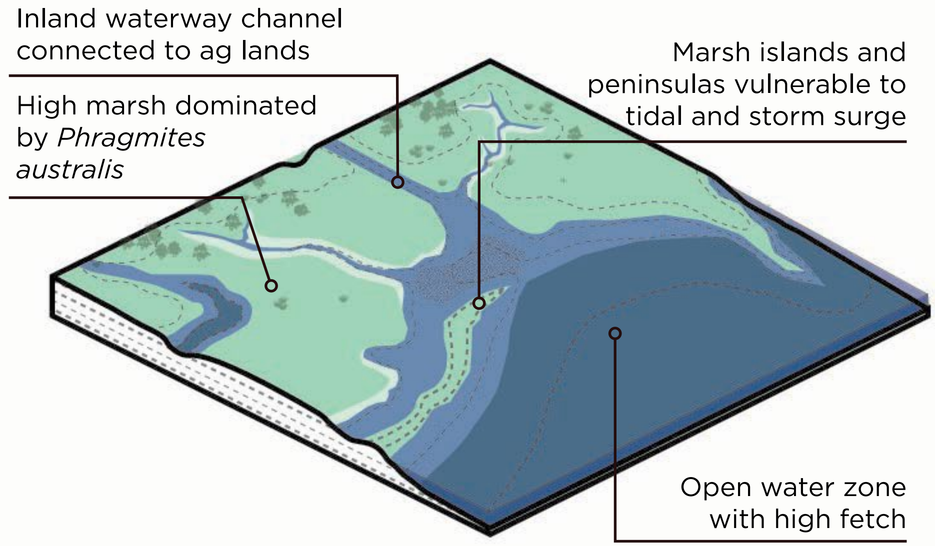
Identify existing open water “throughways” between marsh islands that convey fetch/wind setup flooding and install bioengineered resistance elements.

- Identify advantageous channel locations that are narrow, provide natural tie-in locations, and can work holistically to resist water movement north
- Install brushwood breakwaters across openings to break the fetch and resist flow up the bay

Identify existing inland water “throughways” using landscape features (coves and mouth of waterway channels) that convey wind setup and fuel inland flooding. Add bioengineered resistance elements.

- Install brushwood breakwaters to span larger gaps and woody debris vents along waterway channels to resist inland wind setup flooding

BACK BAY WATERSHED - OPEN WATER CURRENT CONDITIONS



BACK BAY WATERSHED - OPEN WATER POTENTIAL NHI

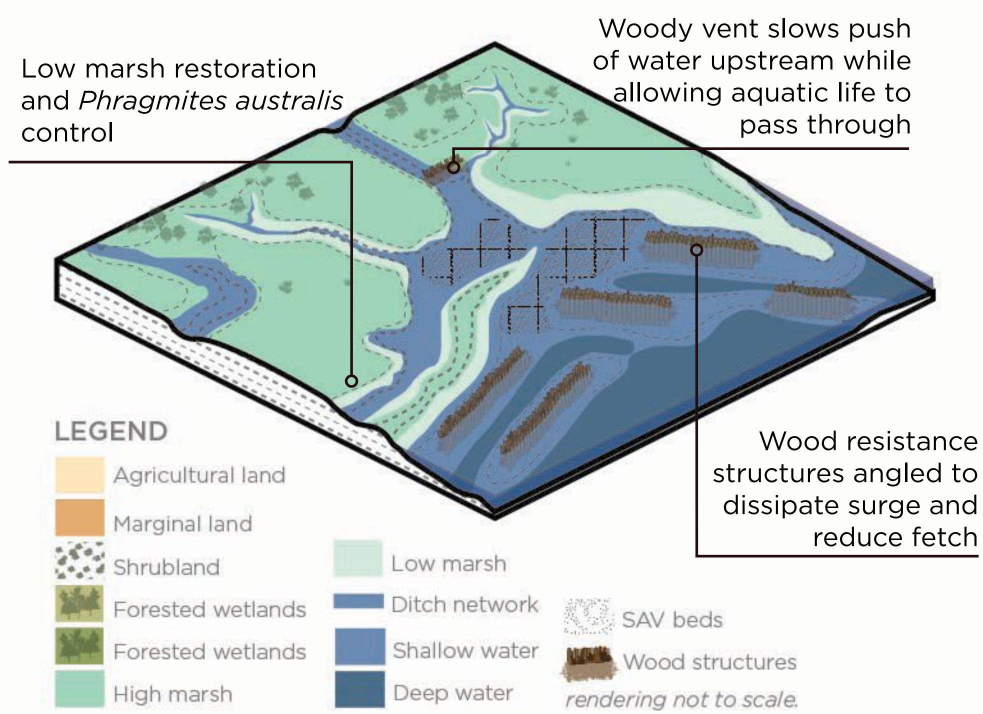


Figure 12. Back Bay open water

Example of Brushwood groyne (Eden and Thorenz, 2024)

The common design theme with all the Goal 1 elements is the repurposing of large wood to resist erosion and slow the movement of water. The recommended process build from work in Europe (brushwood groynes; Spröer et al., 2026; Eden and Thorenz, 2024; van Gent et al., 2023) and in the Middle Branch of Baltimore (brush piles and woody vents) to incorporate hardwood into the marine environment to attenuate wave energy, protect/expand marshlands, and enhance ecological function.

Although wood decomposes overtime in open air or frequent wet/dry cycles (aerobic), wood that is submerged in water (anaerobic) breaks down at a much slower rate. Additional factors reducing the decomposition rate include sourcing hardwood species and specifying whole, intact trunks for use as the structural elements. These features would be set below the median water level and remain submerged during normal conditions; and therefore require clear demarcation for boat traffic.

The Marsh Terraces proposed by Dewberry in 2020, were designed to function in much the same way as our open water (Goal 1) recommendations, but would import large amounts of fill, with significant impact to the existing SAV communities in the area. The wood resistance structures proposed here could reduce SAV impacts.

The wood resistance elements provide a number of ecological benefits beyond those described above. Wood could be sourced locally, reducing transportation costs/emissions. This feature creates complex, three-dimensional aquatic architecture that will enhance aquatic habitat for a variety of organisms, but also act as refugia for juvenile and forage fish to resist predation. Higher survivorship could expand the lower trophic level of the food web and result in recreational fishing benefits to the Back Bay community.

Important caveats include:

- Modeling is needed for specific wind setup events to understand the optimal length, width, frequency, and location to achieve the intended goal. In Europe, they accumulate sediment behind and act as depositional features; modeling could reveal how likely this is in Back Bay.
- Installing these features below the water level requires specialized contractors and equipment. Dredging will likely be required to access and install the wood resistance elements.
- Navigational hazards require continuously maintained demarcation (signs/flags/buoys/etc.).
- Adaptive management dictates regular monitoring for damage or unintended impacts to adjacent marshes, which would require repair/adjustment. Operations and Maintenance staff need to be able to respond quickly to issues that arise and have equipment on stand-by. A dedicated stockpile area is required for storage of wood that meets design specifications.
- Given the large quantity of wood material and relatively novel approach, it is advised that these features be piloted and phased in over time as material becomes available and confidence in the design and process is developed.

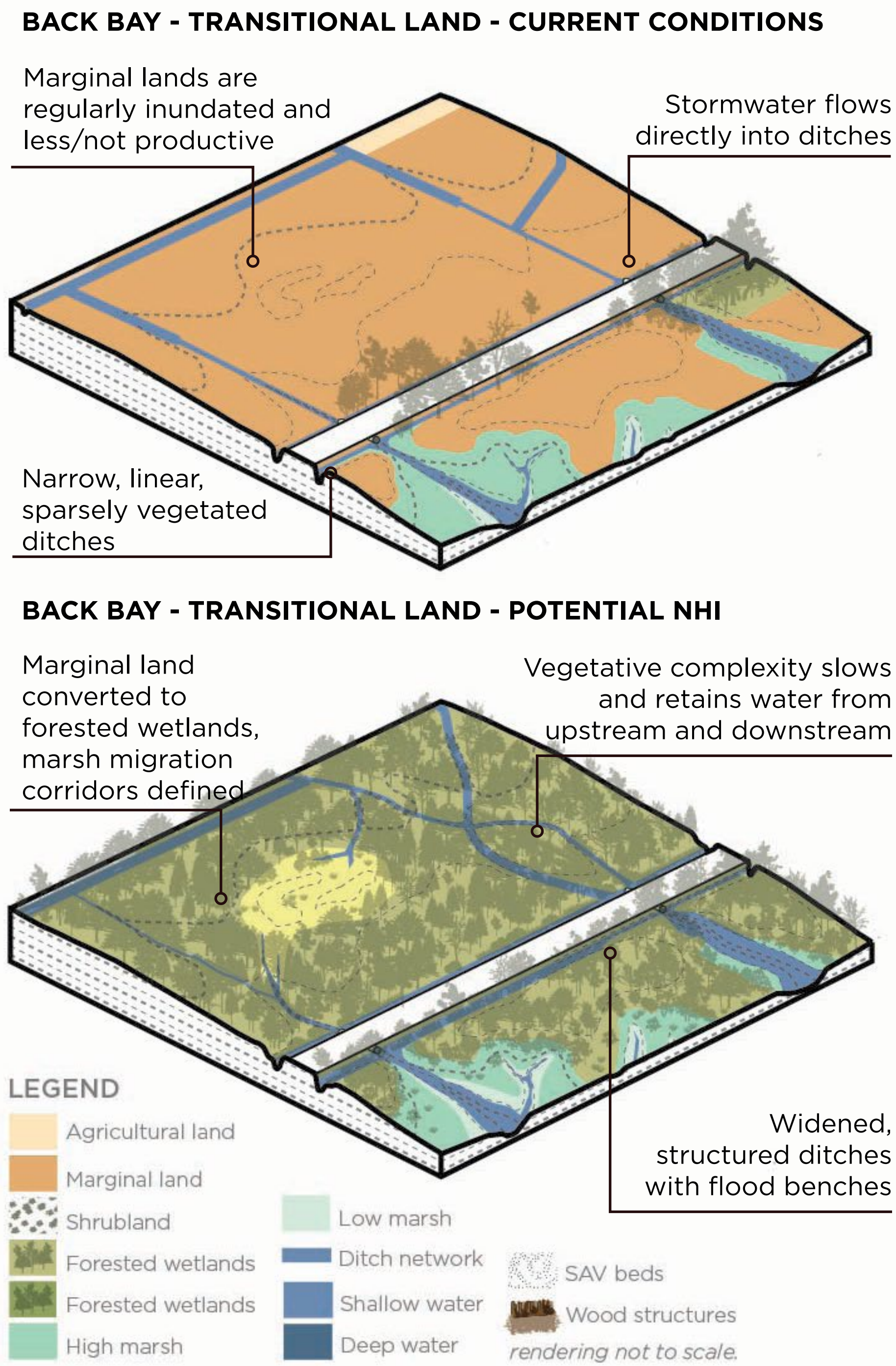


Figure 13. Back Bay transitional

Goal 2 - TRANSITIONAL- "Spread the water out"

Goal 2 approaches the existing ditch network holistically, seeking opportunities to provide additional water storage. Currently, wind setup flooding pushes inland through open water channels that connect with the existing agricultural drainage ditch network. This network was designed for conveying groundwater out rather than managing water inflows during storm and wind events. Its linear, narrow channels can quickly fill and over-top the banks.

Goal 2 elements include:

Better understanding water flow, including connections, culverts, elevations, and widths.

- Map and model interconnected network to understand sub-watersheds, flooding dynamics and potentially undersized infrastructure
- Identify opportunities for ditch modification on public lands and via private resident cooperation/incentives
- Selectively widen the existing ditch network to include low ditch benches planted with vegetation adapted to saturated conditions
- Realign ditches into a more natural meandering alignment where possible

Recommendations for a land restoration/conversion program for marginal farmlands.

- Identify repeatedly flooded farmland with reduced yields from flooding/high groundwater impacts
- An incentive program would put the land in a conservation easement to be revegetated for marshland conversion, which will not only store water, filter agricultural runoff (fertilizer & pesticides), and provide habitat, but also compensate farmers for land that doesn't consistently produce, while giving water room in the landscape.

Goal 3 - UPLAND - “Resist water uphill”

As the interconnected drainage ditch network floods, the water pushes deeper and higher inland. Ditches that don’t typically have standing water begin to fill. Goal 3 seeks to both provide additional space for water and prevent incursion from reaching too far inland.

Goal 3 elements include:

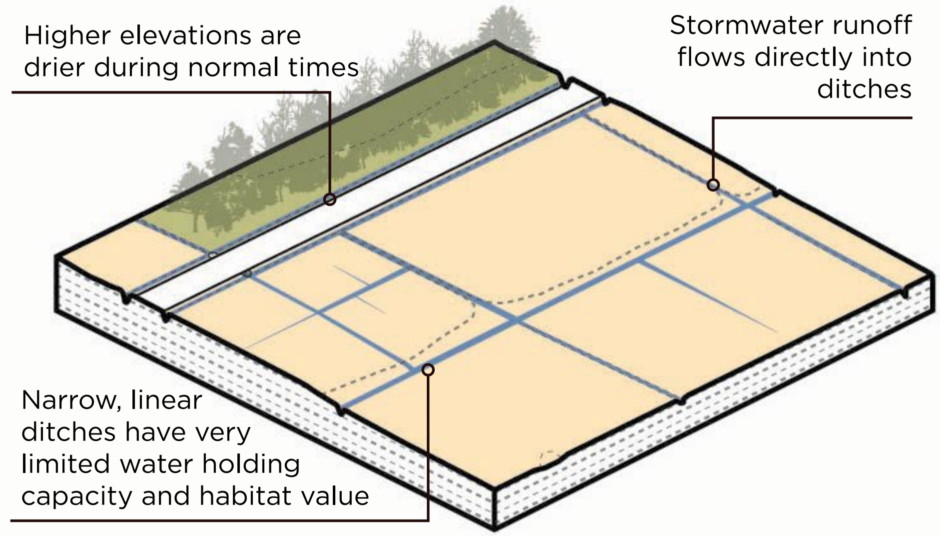
Identify opportunities for ditch modification through analysis, public land availability, and private resident cooperation.

- Building off the work in Goal 2, expand upland buffers that feed into restored marginal areas through ditch expansion and buffer establishment
- Longer stretches where the ditch enhancement can be expanded will look to adapt a naturally meandering alignment

Identify opportunities for flood gate installation.

- Analyze the drainage ditch network to understand connectivity dynamics and level of incursion based on designed high-water events
- Identify inland areas that need to be protected
- Install flood gates within the drainage ditch network to prevent water moving to the intended areas

BACK BAY - UPLAND - CURRENT CONDITIONS



BACK BAY - UPLAND - POTENTIAL NHI

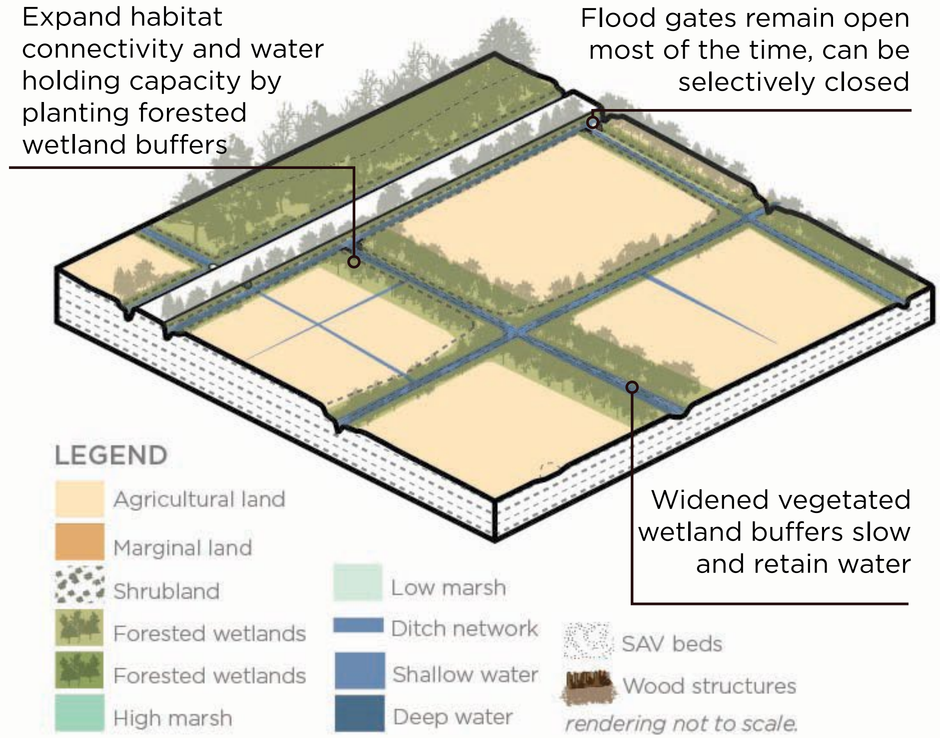


Figure 14. Back Bay upland

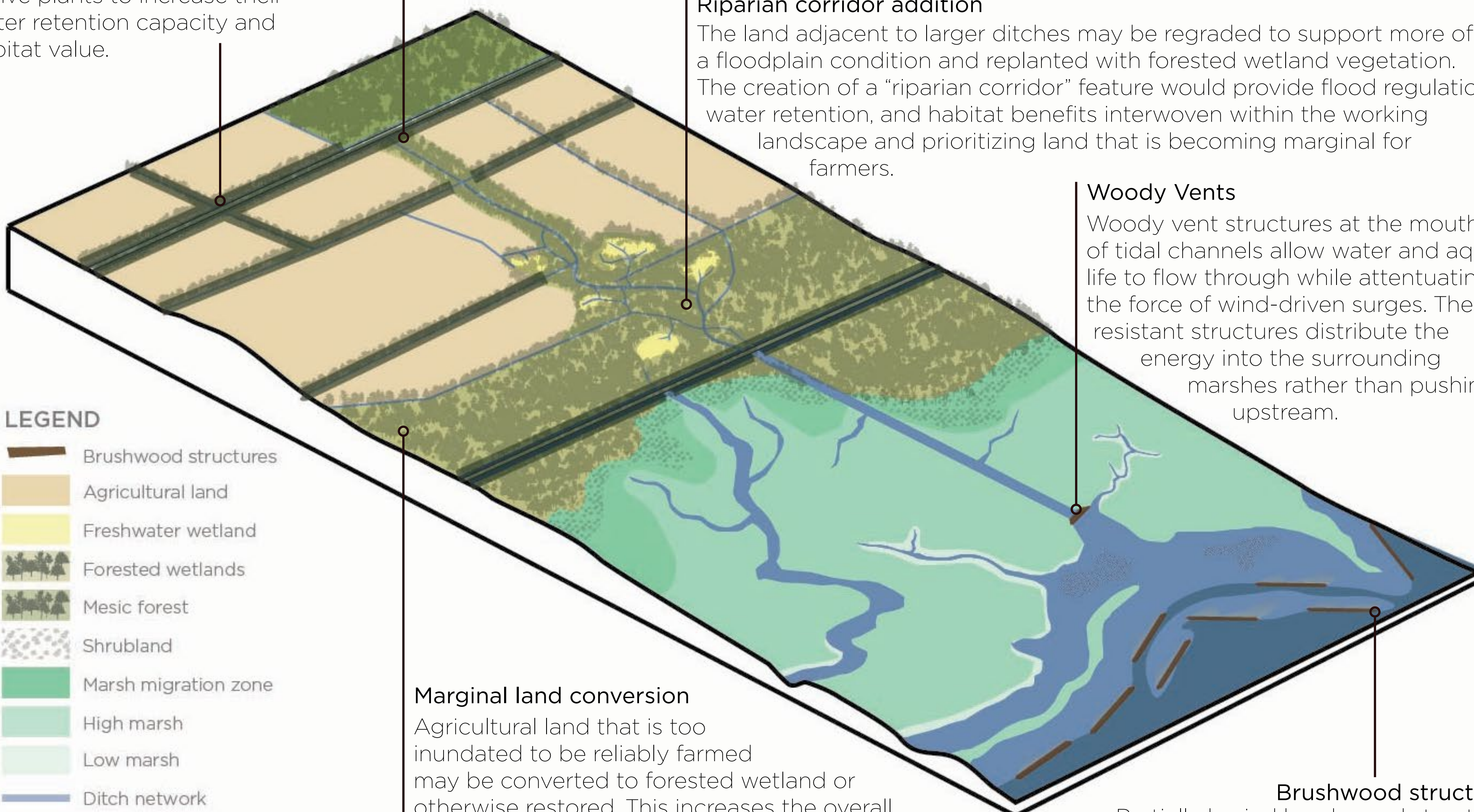
BACK BAY WATERSHED - FUTURE POSSIBILITIES

Expand, bench and revegetate ditches
Where feasible, roadside and agricultural ditches may be benched and revegetated with native plants to increase their water retention capacity and habitat value.

Flood gates
Selectively installing flood gates in existing ditches may help ameliorate effects of nuisance flooding in more upland areas during storm events.

Riparian corridor addition
The land adjacent to larger ditches may be regraded to support more of a floodplain condition and replanted with forested wetland vegetation. The creation of a “riparian corridor” feature would provide flood regulation, water retention, and habitat benefits interwoven within the working landscape and prioritizing land that is becoming marginal for farmers.

Woody Vents
Woody vent structures at the mouth of tidal channels allow water and aquatic life to flow through while attentuating the force of wind-driven surges. These resistant structures distribute the energy into the surrounding marshes rather than pushing upstream.



LEGEND

- Brushwood structures
- Agricultural land
- Freshwater wetland
- Forested wetlands
- Mesic forest
- Shrubland
- Marsh migration zone
- High marsh
- Low marsh
- Ditch network
- Shallow water
- Deep water
- SAV Beds

rendering not to scale.

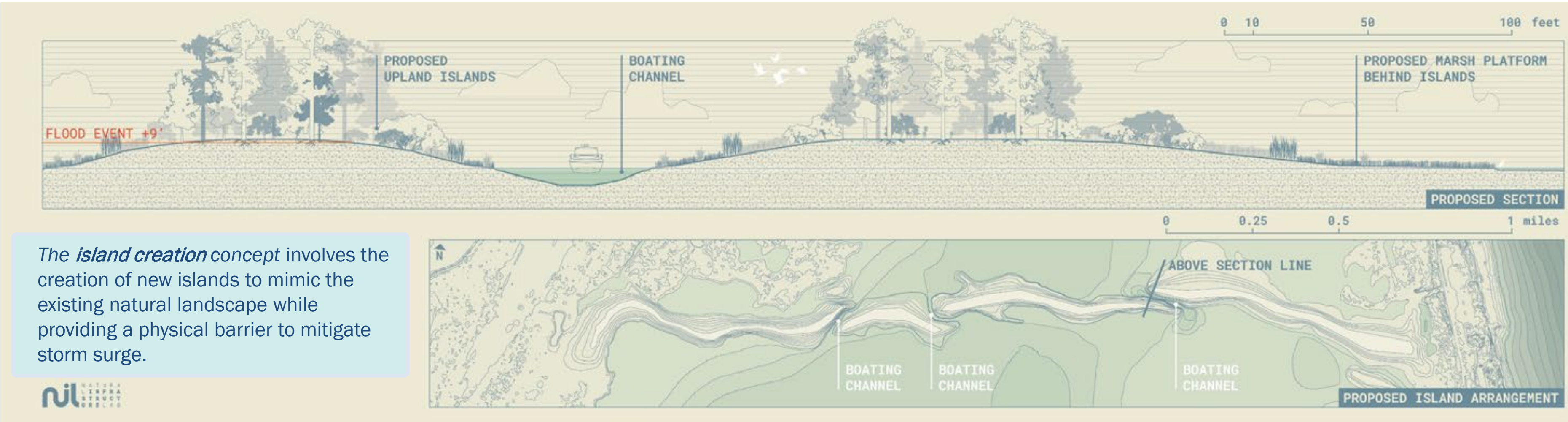
Marginal land conversion
Agricultural land that is too inundated to be reliably farmed may be converted to forested wetland or otherwise restored. This increases the overall capacity of the land to absorb water and buffer the effects of inland flooding.

Brushwood structures
Partially buried brushwood structures may be strategically placed to help attenuate wave energy, resist wind-driven surges, create refugia for aquatic plants and animals, and potentially trap sediment.

Figure 15. Back Bay proposed

Back Bay Island Creation

Figure 16. Island creation concept



The public information meetings by the Corps in June 2026 shared an innovative proposal for Island Creation (pictured above), which responds to many of the same concerns aired in the previous pages. We applaud the creativity and habitat considerations in this NHI proposal, and we note the following design considerations to factor into the analysis of that strategy in the Draft EIS.

KEY CONSIDERATIONS

- Staging construction and sourcing and moving material will be logistically challenging, so an incremental approach and a plan that considers these effects should be explored.
- The southern side of the islands will be constantly exposed to wind tides and may therefore redirect the wave energy laterally. The EIS should carefully consider where that energy is directed and how it is dissipated.
- For similar reasons, anchoring the sediment becomes a key concern, as is over-engineering the structures with armoring or height that could compromise habitat values. We urge consideration of the wood-based techniques described in these comments to help address these concerns.
- The small boat channels need to be sized and positioned so as not to unduly increase the velocity of water and sheer stress.
- Although the quiescent, low-fetch conditions created by the islands should be conducive to healthy SAV beds, the design needs to recognize that the construction phase will damage and displace SAV, which needs to be replaced and supported.

Section 4
Lynnhaven Inlet Surge Barrier

Early Actionable Element: Rising Sector & Tainter Gates

As of May 2026, the Virginia Beach City Council has agreed to advance a detailed study of the Lynnhaven Inlet Surge Barrier as the "first actionable element" of the CSRM project. Therefore, in addition to the NHI strategies for the Lynnhaven River presented above, we provide considerations that the Draft EIS should assess in connection with the potential construction of a massive storm surge barrier across the Lynnhaven Inlet.

EARLY ACTIONABLE ELEMENT

Of the watersheds included in the CSRM study, the Lynnhaven watershed has the highest concentration of structures and the highest expected economic damages, and it already experiences frequent repetitive losses. Therefore, the Corps and the City have proposed advancing the Lynnhaven Inlet storm surge barrier as the CSRM's Early Actionable Element and advancing the component to 35% design by 2028.

CONFIGURATION

The proposed surge barrier would be made up of several components. The central movable surge barrier would span the inlet and be connected laterally to floodwalls or seawalls, which then transition into engineered dune systems. The lateral tie-ins would provide continuous protection across the shoreline. Future support for this system would likely include beach nourishment to widen berms and raise dune elevations, and adaptable dunes that can be incrementally heightened over time to address sea level rise. However, it is unclear at this time how the proposed structures will tie into land on either side of the inlet.

Credit: Corps

GATE SYSTEM AND ENGINEERING FEATURES

The conceptual design includes a movable gated barrier system consisting of one 200-ft rising sector gate and four 120-ft tainter (radial) gates. The concept is intended to allow tidal exchange and navigation under open conditions but close quickly during storm events to block surge.

Additional elements include jetty structures for inlet stabilization, floodwalls for lateral continuity of protection, and emergency response infrastructure to support reliable operations.

A tainter gate is a curved, radial gate that rotates about horizontal trunnions.A rising sector gate is a segment-shaped gate that pivots upward from below the water surface into a closed position. Tainter gates primarily regulate flow and are hinged at the sides, rotating vertically within a fixed frame. Rising sector gates, in contrast, lift upward from the channel bed to block storm surge entirely. Tainter gates are better for flow control and partial closure, whereas rising sector gates are designed for full-width, high-level surge protection with minimal obstruction when open.

Anticipated Effects of the Surge Barrier

A massive surge barrier will elicit strong opinions among Virginia Beach residents and business owners, requiring thoughtful outreach and adjustments to adapt to feedback.

Currently, fewer than 20 storm surge barriers have been constructed across the world, although interest is increasing. Barriers have predominantly been built on broad, shallow deltas (New Orleans), in tidal rivers (Thames River), or in small harbors with limited freshwater inputs (Ralston, 2022). Because they are rare, there is a lack of information available on their impacts. However, based on their blocking the inflow and outflow of water when they are closed, they can fundamentally alter key estuarine dynamics including hydrology, salinity, sediment transport, and ecological connectivity (Orton et al 2023). By modifying natural flow regimes, floodgates can change sediment transport patterns, water temperature, and nutrient cycling, potentially degrading habitat quality (see chart on p.33). Another major concern is the disruption of fish migration. Further, altered flow conditions may either concentrate or dilute pollutants, influencing water quality in complex ways depending on how they are operated. Surge barriers can also interfere with the functioning of NHI. Although they provide flood control and water management benefits, storm surge barriers present a serious risk of long-term ecological degradation.

Inevitably, gate closures will be triggered more frequently over time as sea level rise and climate conditions accelerate and worsen. As the base sea level rises, surge conditions will also last longer and public demand for closures will increase. Therefore, these predictable changes in frequency and duration need to be factored into modeling to properly understand the impacts of gate closures.

What We Don't Know

Although they provide flood control and water management benefits, surge barriers come with a serious risk of long-term ecological degradation. The most direct effect of a surge barrier on an estuary is to change its hydrodynamics, and these effects tend to be poorly understood in real cases. Recent studies have highlighted what we do not know about them in a Research Agenda for Estuary Effects of Storm Surge Barriers (Orton et al 2023). The top needs for additional research are:

1. Data collection and research on a wider variety of estuaries
2. Modeling sensitivities because the models of sediment transport and other important features were not designed for surge barriers
3. Effects on sedimentary systems and tidal wetlands
4. Effects on migrating and resident organisms
5. Combined effects of surge barriers, dredging and climate change

Table 2. Summary of possible surge barrier effects on natural systems			
	Natural Capabilities	**Current condition**	**Likely Surge Barrier Effects**
Sediment Transport	During large storms, waves and currents suspend sediment into the water column and tend to move it into estuaries, nourishing marshes (Georgiou et al., 2024).	High loads of fine sediment enter the system from nearby developed areas. Based on the Norfolk District records, an average of 36,000 m3 (47,000 yd3) of sediment is dredged annually from Lynnhaven Inlet and is beneficially used on nearby beaches or deposited in a nearby confined dredged material area. (McGill et al., 2026)	Little to no input from ocean during large storm events; will limit re-suspension of sediment and mixing. Under high intensity rainfall, local studies have shown intense pollution loads (Macias-Tapia et al 2023), that would be trapped in the system for longer by the surge barrier.
Oyster reefs	Provide shoreline structure and survive storms	The abundance of oyster reefs in the Lynnhaven has decreased dramtically from historic levels. However, focused restoration work in the past 30 years has had significant and measurable impacts.	Long-lasting low salinity >7 days is one of the biggest natural threats to oyster populations, often leading to widespread mortality (Cheng et al., 2016). Salinity effects may be important to consider.
Salinity	Highly variable, but flushing—oceanic conditions near the mouth	Some changes to salinity based on runoff rates	Freshwater inundation when gates are closed
Marsh equilibrium	Marshes withstand SLR and storms by accreting sediment if water rises more slowly than 3 mm/year or migrate upland and re-form at higher rates of sea level rise.	Marsh loss from development is now slower, but inundation by freshwater (stormwater runoff from developed land), erosion, and sea level rise are degrading marsh. There is little space for marsh migration.	If the surge barrier exacerbates current stressors to the exisiting marsh, they, combined with sea level rise, could lead to increased marsh loss, potentially to tipping point levels
SAV	Shelter and support zooplankton that consume alga, oxygenate water for other forms of life, stabilize sediment.	SAV have all but disappeared from Lynnhaven, though some small areas remain and restoration efforts are underway.	Uncertain effects, but healthy SAV conditions can sometimes shift to turbid, algae-dominated water in a way that is difficult to reverse.
Connectivity & Habitat	Estuaries support a host of animals with specialized tolerance or adaptations to brackish water/ Many depend on moving back and forth from fresh to salt	Both finfish and shellfish species are affected by habitat loss.. *P. australis* is invading wetlands. Utilization of shallow-water habitats, tidal creeks, and marshes by nekton for nursery areas (Bilkovic, 2011).	Passage will blocked before and during storm events, which will affect a wide range of species
Water velocity	Stormwater is absorbed and filters slowly into the estuary. Storm events bring large surges.	Stormwater enters the system more quickly and forcefully when piped and ditched; water velocity entering the inlet is similar to historic levels.	Strong tidal velocities through barrier openings enhance salinity mixing locally, though overall mixing in the estuary may decrease due to reduced tidal velocities (Ralston, 2022).

EIS Considerations for Surge Barrier

KEY CONSIDERATIONS

In sum, there are serious questions about how a storm surge barrier could alter the complex dynamics underlying the Lynnhaven River system, and what the environmental impacts of those changes would be. It is therefore crucial for the Draft EIS to evaluate the following considerations:

- Gate closure frequency and duration under a range of scenarios covering different levels of: (a) storm intensity; (b) anticipated sea level rise; (c) rainfall; and (d) surge-level closure triggers.
- How gate closures under those different scenarios would impact flooding and water levels on the upstream/landward side of the gates, especially during coastal storm events that generate significant precipitation.
- How gate closures, by preventing flushing, affect bacteria and aquaculture.
- How the project would affect sediment dynamics on both sides of the gates and at the abutments of the Lesner bridge, and the extent to which changes in sediment dynamics could increase the need for dredging and impact adjacent property owners.
- How reduced flushing during gate closures would impact dissolved oxygen levels, temperatures, salinity, and nutrient buildup upstream/landward of the gates, and how such changes would impact aquatic ecology and habitat.
- How the project would influence flooding and storm surge in communities located adjacent to or near the gates that would be subjected to the deflected storm surge, particularly since it appears the walls and dune projects under consideration on both sides of the gates are now on a separate timetable from the surge gates.
- The socio-economic demographics of: (a) the communities that would benefit the most from the project; (b) communities where the project could exacerbate flooding; and (c) communities that would bear residual flood risk.
- The maximum closure duration and frequency that would avoid significant water-quality and ecological harm.
- The project's long-term operations and maintenance costs for which the City would be responsible.
- Opportunities to reduce greenhouse gas emissions through the use of low-carbon materials, regional sourcing, and energy-efficient construction practices given the scale and anticipated service life of the project.

Permitting Natural and Hybrid Infrastructure

The regulatory environment is ever-evolving, and there are recent and ongoing efforts to reduce obstacles for nature-based designs. For example, effective July 1, 2026, legislation (HB 237) adopted by the Virginia General Assembly during its 2026 session will require that the next update to Virginia's Coastal Resilience Master Plan identify areas where tidal marshes can migrate inland as sea levels rise. More broadly, the changes to the Coastal Resilience Master Plan require state agencies to prioritize projects that "protect and enhance natural and nature-based approaches" and use best-available science and equity criteria in decision-making. The 2026 update to the Master Plan directs planners to account for dynamic ecosystems rather than fixed shorelines.

In short, many aspects of Virginia flood resilience policy and law are increasingly demonstrating a preference for nature-based approaches to flood resilience, such that techniques once perceived as hurdles to the natural-hybrid infrastructure may be easier to permit in the future.

SECTION 203

We recommend that Corps and the City discuss a Section 203 process as an option, especially for items/project concepts that are supported by residents but that may have been removed by the Corps or not been evaluated or prioritized.

Section 203 could provide a useful avenue for the City to make more rapid progress on other important storm and flood protections, while the focus of the CSRM study narrows on the Lynnhaven Inlet Surge Barrier. We would be happy to discuss ways we may be able to help the City evaluate utilizing the Section 203 process.

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