

OUR SHORE Coastal Erosion Assessments and Site Reports: Long Island



Photo by Madison McClintock, Island Institute.



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The Maine Department of Environmental Protection (DEP) is currently developing OUR SHORE, a program that seeks to support homeowners, contractors, and communities who want to integrate nature-based strategies (NbS) into their plans for coastal resilience. The program provides informational tools in the form of a Quick Assessment to identify erosion hazards and a longer guide on how to apply NbS techniques, as well as outreach and training events for homeowners and shoreline stabilization practitioners.

In partnership with the Maine Conservation Corps, the OUR SHORE Program provides direct technical assistance on NbS to property owners and communities by placing Shore Corps Stewards with nonprofits across the state of Maine. Each Shore Corps Steward receives specialized training from the OUR SHORE program and state partners. From May 2025–May 2026, Island Institute is hosting a Shore Corps Steward, Emma Polhemus, to support the Casco Bay islands as they expand NbS opportunities for public and private properties.

Alongside community partners and Island Institute staff, the Shore Corps Steward visited three coastal sites on Long Island in April 2026 to complete OUR SHORE Assessments of coastal erosion. The following report documents the results of these assessments along with recommended erosion management actions that align with OUR SHORE guidelines and prioritize nature-based and hybrid strategies.

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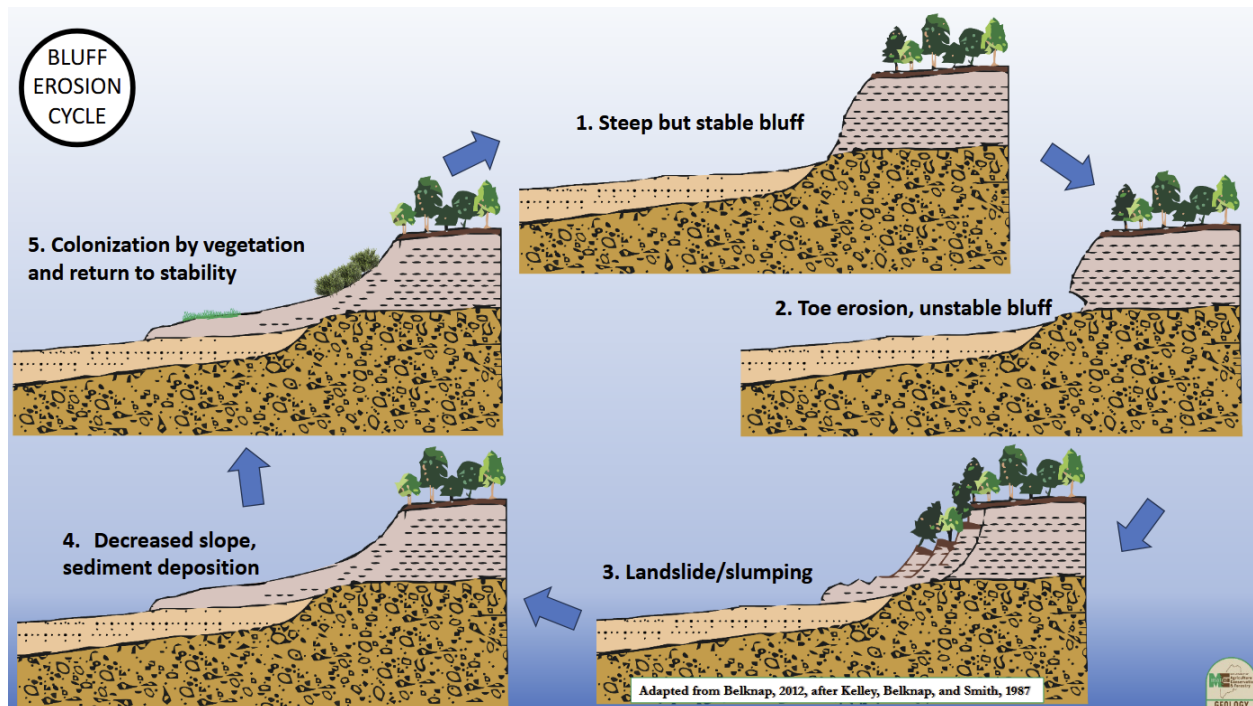
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Key Terms

Coastal bluff: A type of coastal shoreline where unconsolidated sediment (e.g. sand or clay) forms a steep slope 3 feet or taller. Coastal bluffs are located above the high tide line, and can be adjacent to different habitats like salt marshes or mud flats. The top of a bluff where flat land meets the slope is called the crest and the base of the bluff is called the toe. The slope in between the crest and toe is called the bluff face.

Bluff erosion cycle: Coastal bluffs follow a predictable geologic cycle of erosion and stability. In the bluff erosion cycle, the toe of a stable bluff is eroded, creating instability. The unstable bluff slumps, meaning that sediment from higher up the bluff falls or slides to the toe. The fallen sediment creates a more gradual slope and provides habitat for intertidal and upland vegetation, which protects and restabilizes the bluff, returning to the beginning of the cycle. The diagram below, created by the Maine Geological Survey, illustrates this cycle.



(Slovinsky, 2025)

Shoreline stabilization: Often called shoreline hardening or armoring, this typically refers to building hard, manufactured structures (like seawalls, bulkheads, and/or riprap) along a coast or water's edge to attempt to stop erosion and protect private property. Shoreline stabilization can also refer to plants and natural materials used for the same purpose.

Nature-based strategies: Strategies that utilize natural processes and ecosystems to address environmental challenges. For shoreline erosion, several nature-based solutions can be

employed to manage and mitigate erosion while also providing additional benefits to the ecosystem

End-effect erosion: Worsened coastal erosion that happens at the ends of protective structures like seawalls or riprap, causing increased damage to neighboring properties by disrupting natural sediment flow, essentially pushing the erosion problem next door in a domino effect

Scouring: An effect that occurs when waves hit a hard, vertical wall. That wave energy is not absorbed; instead, it is reflected downward and sideways. This redirected, high-energy flow "scoops out" and carries away the sediment (sand, soil, and/or sea bottom) at the base of the structure and in adjacent areas. Consequences of scouring include deepening the water in front of the structure and creating more intense wave energy, degrading habitat, and the undercutting of the foundation of the hardened structure leading to failure of the structure

Fetch: The distance that wind can blow over water towards a shoreline without interruption by a land mass or structure. Shorelines with a high fetch are very exposed to wind, and therefore experience bigger waves, while shorelines with a low fetch are sheltered from wind, storms, and waves. The exposure level of a coastal site is sometimes expressed as *annualized fetch*, which combines the fetch from different directions with how often the wind was blowing in each direction during a year.

Mapping Tools

The following maps and mapping tools are referenced throughout this report:

Living Shorelines Decision Support Tool: Created by the Maine Geological Survey (MGS), this mapping tool rates stretches of shoreline from probably not suitable to highly suitable for a living shoreline design (i.e., using nature-based strategies). Suitability ratings are based on environmental factors like the shoreline geology, annualized fetch, and height and angle of the slope. This tool is a helpful starting point for deciding whether to build a living shoreline, but any site should be assessed on the ground and in detail before choosing a shoreline stabilization strategy.

Coastal Bluff Maps: The MGS Coastal Bluff Maps classify coastal bluffs as stable, unstable, or highly unstable. Stable bluffs have dense vegetation cover, gentler slopes, and no signs of erosion. Unstable and highly unstable bluffs have exposed soil on the bluff face, steeper slopes, and signs of erosion like fallen trees and displaced blocks of soil. Data for the Coastal Bluff Maps was last collected in 2020, so some bluffs mapped as stable might be unstable at present, and some unstable bluffs might have stabilized. New Coastal Bluff Maps of Casco Bay are expected in 2026.

Beginning with Habitat Maps: Beginning with Habitat is a program created by the Maine Department of Inland Fisheries & Wildlife (IF&W) to share information on plant and wildlife habitats and conservation. Since any shoreline stabilization project, whether nature-based or a hardened structure, will impact the surrounding environment, these maps can help decision-makers and project designers understand what habitats and wildlife are in the area and how to minimize negative impacts. Some of the data included in Beginning with Habitat maps also affect the permitting process. For example, shoreline stabilization permits have to undergo additional review by IF&W if the project will occur near protected habitats like high-value waterfowl and wading bird habitat.

The OUR SHORE Quick Assessment

The OUR SHORE Quick Assessment is a tool used to quickly analyze the causes and impacts of erosion at a shoreline site. The assessor ranks the site as lower, moderate, or higher instability risk based on a variety of criteria in the following categories.

Criterion	Characteristics of Lower Instability Risk	Characteristics of Moderate Instability Risk	Characteristics of Higher Instability Risk
Example: Bank Height	Low bank (less than 3 feet)	Moderate bank (3-6 feet)	High bank/bluff (over 6 feet)

Source & Severity of Erosion – Assess the locations & sources of of instability

Height & Slope Risk – Assess contributions of height, slope, and soil to instability risk

Overland Water from Land Use – Assess how property use affects stability through overland flow and groundwater

Revegetate/reconnect shoreline buffer – Assess levels of buffer vegetation for stability and habitat connection

The Quick Assessment then provides a list of possible management options based on the instability risk in each category. A complete erosion management plan is created by combining practices to address each source of instability. The Quick Assessment was designed to provide a starting point from which homeowners, contractors, municipal officials, and others can begin to consider nature-based strategies for managing erosion. It does not represent a complete environmental assessment or provide detailed erosion management plans. The complete OUR SHORE Guide and practitioner trainings provided by DEP are available to supplement the Quick Assessment when more detailed assessment or technical guidance is needed.

OURSHORE Quick Assessment: East End Private Property Long Island, ME

Existing Site Conditions:

Location:

Approximately 180 ft of shoreline were evaluated on a private property on the East End of Long Island. The property includes a house and a set of stairs to access the shoreline.

Environmental Characteristics:

The coastal bluff at the East End private property is steeply sloped and 15-20 ft in height, with a sand beach in front of the bluff. Vegetation is present on about half of the bluff face; portions of the bluff host native species including speckled alder, while other areas have dense cover of invasive Japanese knotweed. The property is bounded to the east by a drainage ditch.

A mapped National Wetland Inventory wetland is present along the shoreline of the property. Habitat types mapped on or adjacent to the site include Tidal Waterfowl and Wading Bird habitat and shellfish beds for razor clams, blue mussels, and sea scallops.

Erosion:

Indications of bluff erosion at the East End site include bare soil on the bluff face, and exposed, overhanging roots at the bluff crest from soil slumping. Signs of groundwater saturation included observable groundwater seeps and soil with pooling water. This extensive groundwater saturation is likely contributing to erosion and instability of the bluff.

The coastal bluff at the East End property was mapped as Unstable by the Maine Geological Survey (MGS). The bluff is also mapped by MGS as a potential landslide risk based on photo interpretation of the site. A potential landslide risk indicates that the site has characteristics similar to other sites that have experienced landslides, like high bluff heights and steep slopes, but a full on-site geological evaluation has not been documented. More information about coastal landslide maps and landslide hazard mitigation can be found in the *Maine Coastal Property Owner's Guide to Erosion, Flooding, and Other Hazards* from the Maine Geological Survey.



Figure 1: A section of the beach and coastal bluff at the East End site.



Figure 2: A section of the beach and coastal bluff at the East End site, including the access stairs.



Figure 3: A section of the beach and coastal bluff at the East End site, including the transition to riprap stabilization of the bluff at the neighboring property line.



Figure 4: The drainage ditch bordering the East End site to the east.



Figure 5: Saturated soil and pooling water observed on the bluff face.



Figure 6: Dark and shimmery soil indicative of groundwater saturation near the top of the bluff face.

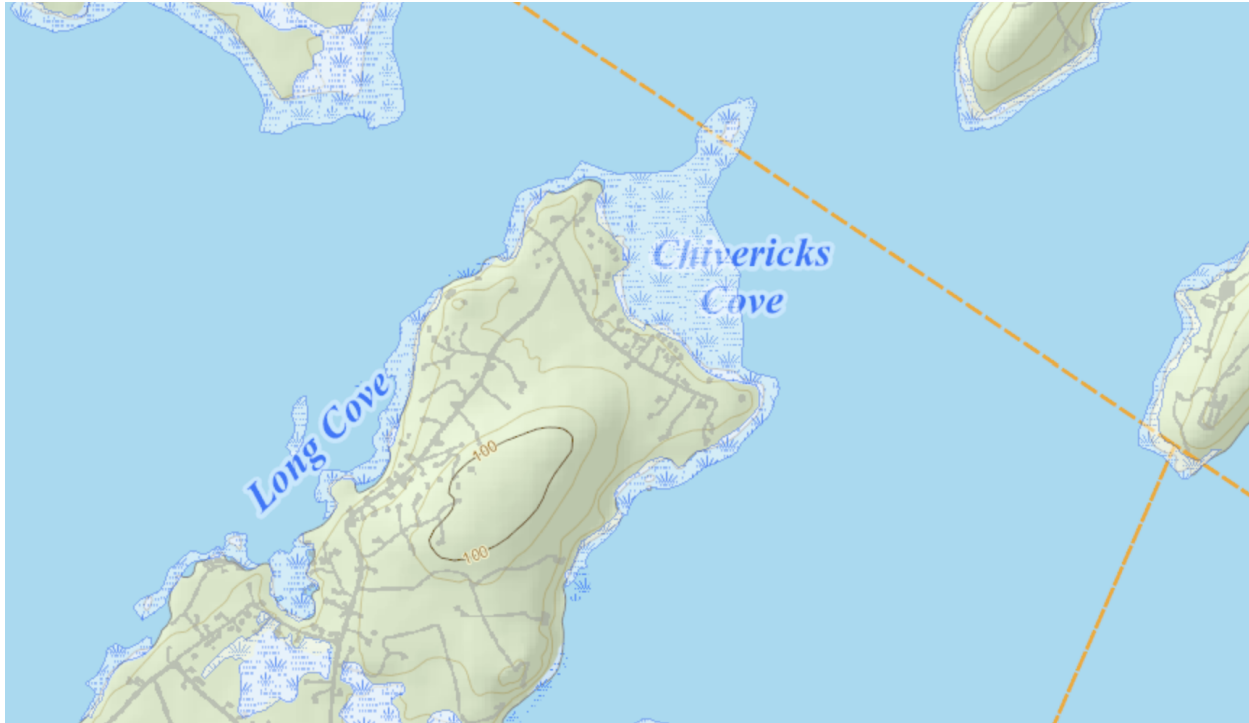


Figure 7: Beginning with Habitat map of the East End showing National Wetland Inventory areas (white and blue pattern).

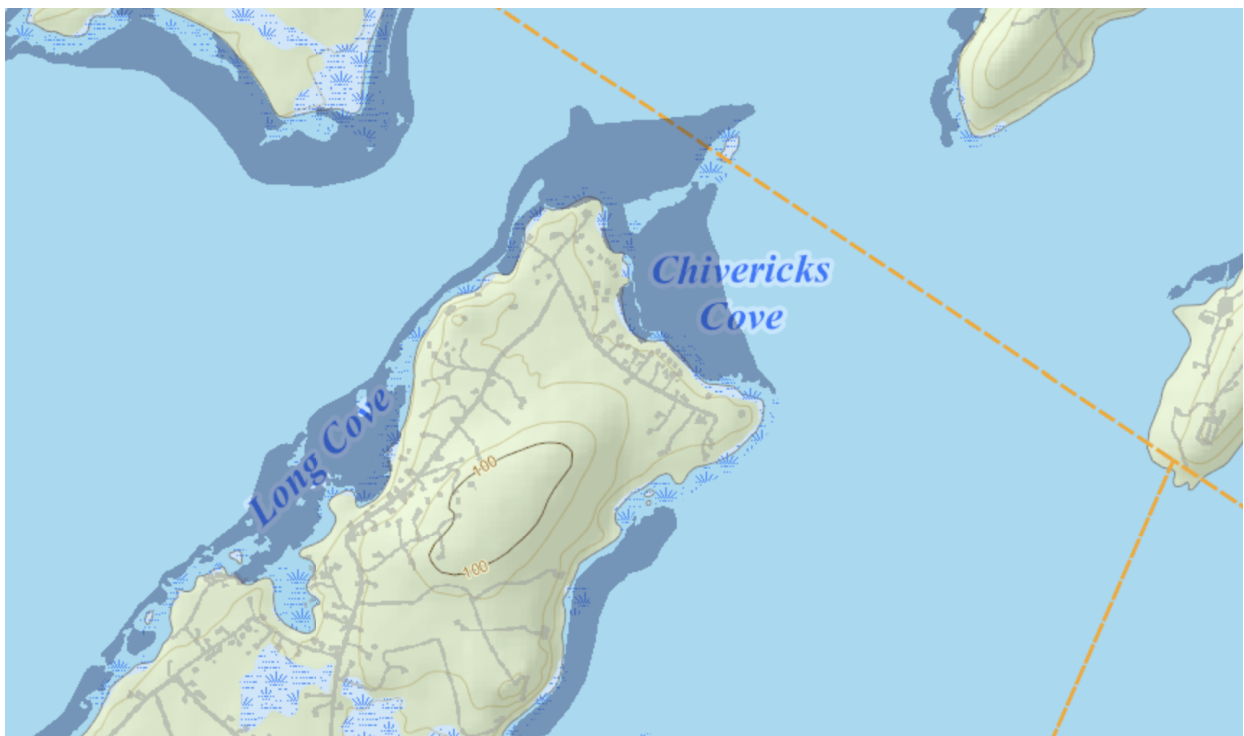


Figure 8: Beginning with Habitat map of the East End showing Tidal Waterfowl and Wading Bird habitat areas.

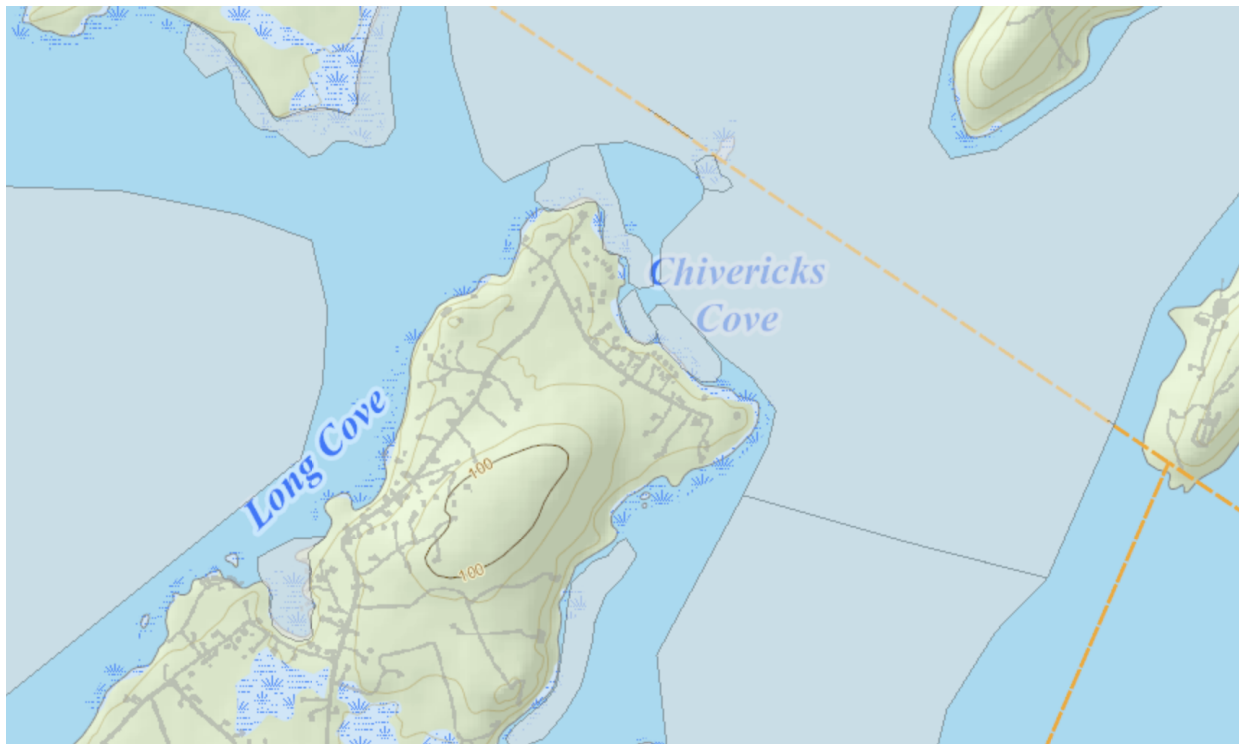


Figure 9: Beginning with Habitat map showing shellfish beds for razor clams, sea scallops, and blue mussels.

OUR SHORE Quick Assessment:

Source & Severity of Erosion:

Overland Erosion	Low - No recent bank erosion or loss from overland flows
Groundwater	High - Groundwater is severely impacting the stability of the slope
Toe Erosion	High - Bank is slumping from completely eroded toe
Wave Erosion	High - Site is exposed to wave action and increased impacts from severe storms. Waves erode toe and bank

Height & Slope Risk:

Bank Height	High Bank/Bluff (over 6 feet)
Slope Severity	High Slope (> 1L:1V)
Current Slope	High - Less than half of surface has vegetation and duff layer
Soils	Moderate - Unstable soil condition or moderate erosion rate

Overland Water from Land Use:

Surface Water Flow to Bank	Moderate - Some concentrated or channelized flow is directed toward the eroding bank resulting in minimal sheet or rill erosion
Lawn or Bare Ground Near Bank	High - Lawn area or bare ground is located within 25 feet of the shoreline
Impervious Surface Near Bank	Low - No roads, driveways, houses, or other impervious surfaces are within 100 feet of the shoreline
Overall Impact of Surface Flow	Moderate - Moderate Overland Impact from surface water

Revegetate/Reconnect Shoreline Buffer:

Vegetation Within 250 Feet	Sparse vegetation (less than 20%)
Vegetation Within 25 Feet	Average vegetation (20-70% coverage)
How Natural is the Shoreline Habitat	High - Bank and vegetation are not altered. No riprap or hardened structures installed.

Proposed Management Actions:

Groundwater management:

Banks that are oversaturated with groundwater are less stable and more vulnerable to erosion. Signs of groundwater saturation like shimmery soil and standing water were visible at the site. Some groundwater saturation is caused by land uses, and can therefore be more easily mitigated than saturation due to natural hydrology. Common causes of groundwater oversaturation include septic systems and overwatered lawns or gardens. Aging or undersized septic systems can release more water into the soil than intended, so ensuring that septic systems are maintained and pumped following a septic professional's recommended schedule will benefit bank stability. Watering lawns or gardens as little as possible is also a beneficial management practice.

Another common contributing factor to groundwater saturation is a lack of vegetation on the property and shoreline. Deep rooted vegetation, especially larger woody plants like shrubs or trees, take up significant amounts of water from the soil. When properties are primarily covered by structures and lawns, this water uptake is significantly reduced. Adding a vegetated buffer to the shoreline in place of lawn areas can improve groundwater uptake, and thereby increase overall bank stability.

After land use contributions are addressed, groundwater management methods on the bank can be considered if groundwater oversaturation persists. One OUR SHORE recommended option is a live pole drain. This technique uses bundled live branch cuttings installed in trenches into the face of the bluff, providing a path for groundwater to drain from the bank (Fig. 10). The live cuttings will root and grow over time, helping to revegetate the bank and provide additional groundwater uptake.

Toe stabilization alternatives:

The house at the East End property is set back more than 100 ft from the eroding bluff edge. This additional space between the shoreline and any at-risk structures allows for a wider range of management alternatives to be considered. Possible approaches include allowing for natural restabilization through the bluff erosion cycle, regrading the slope, or installing structural toe protection such as a living crib wall or stone toe. Any of these alternatives should be combined with an enhanced vegetated buffer at the top of the bluff for increased stability and resilience.

Erosion of coastal bluffs follows a predictable pattern of instability, slumping, and restabilization called the bluff erosion cycle. The bluff at the East End site is currently unstable, with an eroding toe. As the toe continues to erode and support is lost, overlying soil will eventually slump, causing the upper bluff edge to retreat inland. The slumping process replenishes soil at the base

of the bluff and often forms protective habitats like mudflats or dunes, which restores the bluff system to a more stable state. At the East End property, where structures are not at risk, allowing the bluff to naturally slump and restabilize itself can be a viable and low-cost management alternative.

Regrading the bluff mimics the result of the bluff erosion cycle by cutting the steep slope into a more gentle grade (Fig. 11). After regrading, the shallower slope helps to dissipate wave energy and has a lower risk of slumping, since there is less weight from overlying soil over the slope toe. Slope grading should be combined with temporary erosion protection like erosion control blankets as well as planting of native vegetation as it exposes bare soil on the slope. While regrading projects are more costly than allowing the bluff to erode naturally, they provide more predictability and control compared to natural erosion.

Lastly, structural stabilization of the toe could be installed. Since the majority of bluff erosion and instability occurs at the toe, OUR SHORE recommends targeting structural intervention to this area of the slope. Structural options following OUR SHORE best practices include living crib walls (Fig. 12) or vegetated riprap (Fig. 13), both of which incorporate structural support from timber beams or stone with native vegetation. Either of these structures can be designed to provide toe protection while maintaining a vegetated slope higher on the bluff. Because there is a potential landslide risk identified at the site, slope stabilization projects should be evaluated by a licensed geologist or geotechnical engineer.

Vegetated buffer establishment:

Planting a vegetated buffer along the upland edge of the coastal bluff is a simple and cost-effective method to improve stability and resilience. At sites with groundwater saturation concerns, planting deeper-rooted native vegetation increases the amount of water taken up by plants, reducing saturation. Root systems of plants also help hold soil together and in place on the bank. Additionally, if the bluff does experience further slumping, many native shoreline plants are able to re-establish after disturbance and provide stabilization and protection to slumped soil. This process increases the natural restabilization that occurs through the bluff erosion cycle.

A densely planted, 10-15 ft wide buffer of native plants is recommended to maximize shoreline stabilization benefits. Vegetated buffers can be created passively on many sites by designating an area to stop mowing and allowing natural vegetation to regrow. For faster buffer establishment, or if seed sources are not present in nearby areas, new plants can be introduced through a variety of planting methods including seeding, live staking, or planting purchased container plants. For tall coastal bluffs, larger trees that will add excessive weight to the top of

the bluff should be avoided. Instead, the buffer should consist of a mix of shrubs and herbaceous plants like native grasses, ferns, or groundcovers. To minimize watering needs that could increase groundwater saturation, plants that are suited for the site's sun and soil conditions and are resilient to drought should be selected if any new plantings are added. Plant selection guides like the Coastal Planting Guide from the Cumberland County Soil and Water Conservation District can help identify plants that match the shoreline growing conditions.

Regulatory Considerations:

Hand planting up to 25 one-gallon potted native plants per year to establish a vegetated buffer for shoreline stabilization may be done without a permit. Planting methods that do not contribute to soil disturbance, like seeding or live staking, also do not require a permit. Any other active erosion management strategies described in this report will require municipal and state permits. At the state level, many shoreline stabilization projects that integrate OUR SHORE principles and incorporate native vegetation can be permitted under the Permit by Rule process, which has a shorter, 20-day review period.

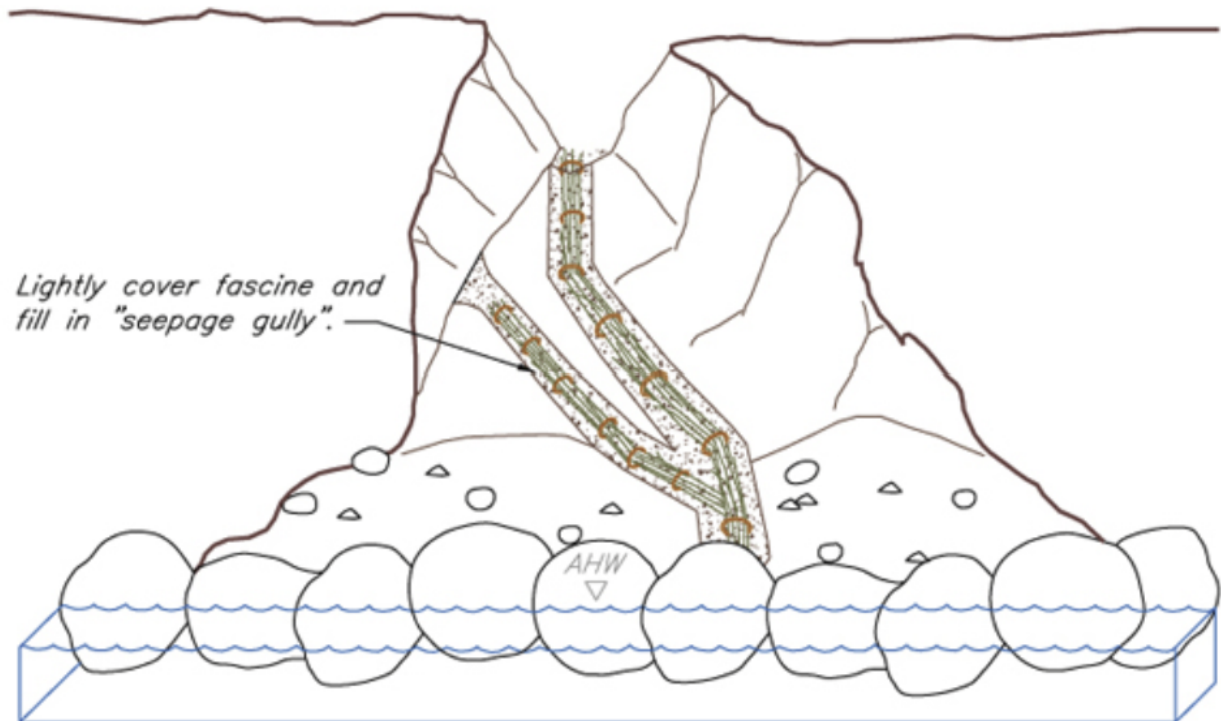


Figure 10: Diagram of a live pole drain to address groundwater seepage (Virginia Department of Transportation).

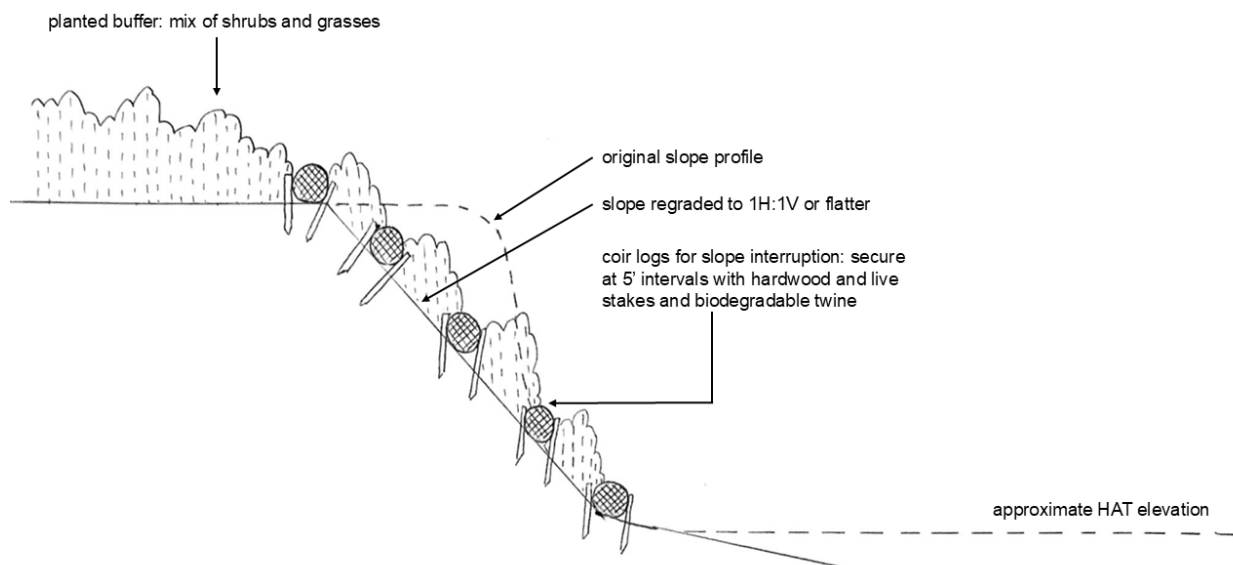


Figure 11: Example cross-section of slope regrading.



Photo: VT ANR Lake Wise Program

Figure 12: Example of a living crib wall from the Vermont Bioengineering Manual.

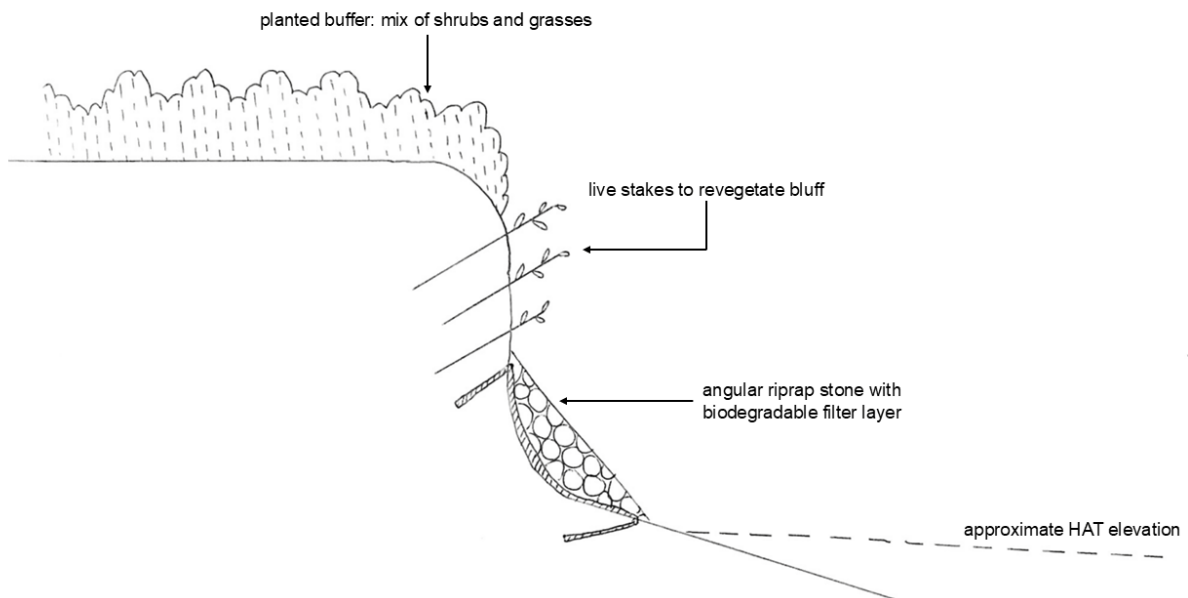


Figure 13: Example cross section of bluff stabilization using a riprap stone toe combined with revegetation of the upper bluff face and upland buffer.

OURSHORE Quick Assessment: Fern Avenue Long Island, ME

Existing Site Conditions:

Location:

This report describes a section of Fern Avenue near 343 Fern Ave. The assessed site includes the roadway, a culvert that crosses under the road, and the shorelines on both sides of the road. To the east is a tidal shoreline, and to the west is a freshwater pond shoreline. Fern Ave and the tidal shoreline are municipal properties. Adjacent to Fern Ave, the pond falls within a conservation property known as “the Area,” which is owned by the Long Island Community Land Operating Company (LICLOC) with the Long Island Civic Association (LICA) as the conservation easement holder.

Environmental Characteristics:

The freshwater shoreline to the west consists of a grassy bank approximately 2 ft wide along the edge of the roadway. The tidal shoreline to the east is a coastal bluff 8-10 ft in height. Riprap stone has been placed along most of the tidal shoreline near the culvert. The shoreline is on a small bay with a large, shallow tidal wetland. This coastal wetland contains salt marsh and mudflat areas. The wetland is mapped in the National Wetland Inventory (Fig. 7) and hosts Tidal Waterfowl and Wading Bird habitat and softshell clam beds (Fig. 8).

The culvert under Fern Ave is constructed of two plastic pipes that allow water to drain from the pond. The outlets of the pipes are above the high tide elevation, and the Maine Tidal Restriction Atlas identifies the culvert system as a tidal restriction. Beavers reside in the pond and have repeatedly attempted to block the culverts, creating a need for ongoing management to remove these blockages.

Erosion:

The shorelines at the Fern Ave site experience a combination of surface water and wave erosion. Runoff from the road has formed gullies on both sides of the road, worsened in areas where vegetation has been degraded by human and beaver foot traffic. While the riprap stone prevents wave erosion under normal tide and weather conditions, the coastal bluff was eroded during the 2024 winter storms, contributing to undermining and damage of Fern Ave. Federal Emergency Management Agency (FEMA) funds have been designated for repair and future hazard mitigation of this section of Fern Ave.



Figure 1: The assessed section of Fern Avenue facing northwest. The freshwater pond is to the left of the photo and the tidal shoreline to the right.



Figure 2: The shoreline of the freshwater pond and the inlets to the culvert underneath Fern Avenue.



Figure 3: The tidal shoreline adjacent to Fern Avenue and the culvert outlets.



Figure 4: The tidal shoreline to the left of the culverts showing the transition from placed stones to salt marsh vegetation.



Figure 5: This section of Fern Ave above the culvert had to be patched after it was undermined and damaged during the 2024 winter storms.



Figure 6: Runoff from the road has carved gullies into the pond shoreline.

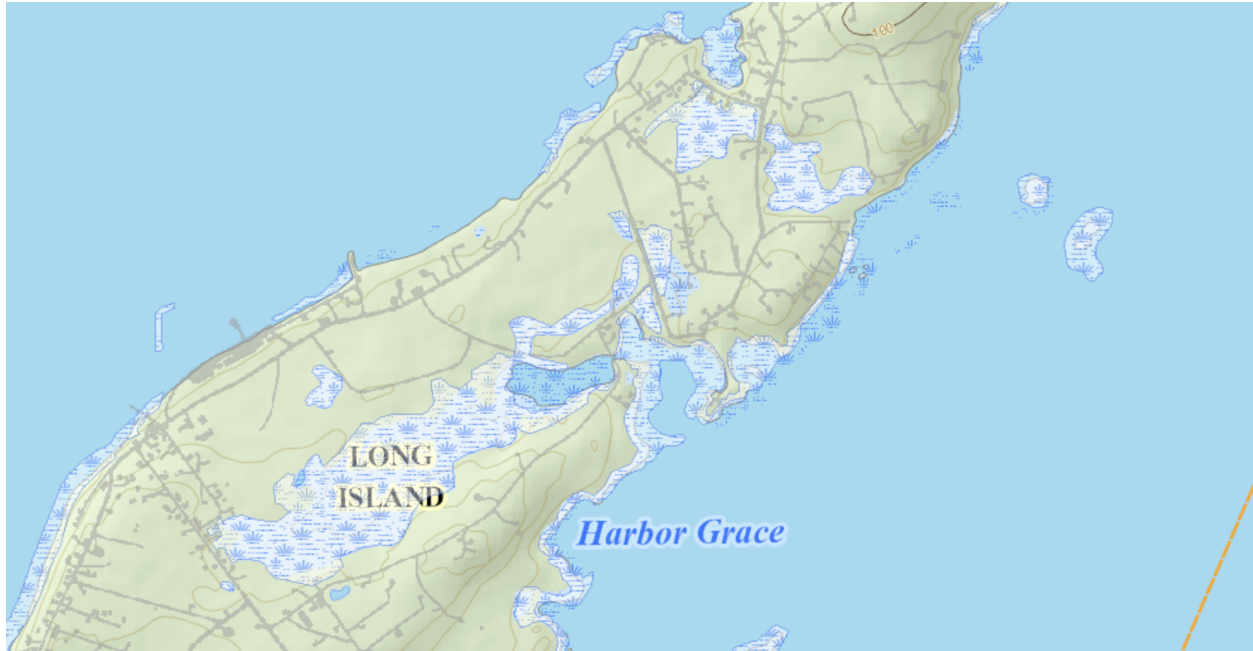


Figure 7: Beginning with Habitat map showing National Wetland Inventory areas (white and blue pattern).



Figure 8: Beginning with Habitat map showing moderate value Tidal Waterfowl and Wading Bird habitat (dark blue) and softshell clam beds (light blue).

OUR SHORE Quick Assessment:

Source & Severity of Erosion:

Overland Erosion	High - Bank erosion is occurring with measurable change from overland flows
Groundwater	Low - No evidence of groundwater seepage
Toe Erosion	Toe erosion in limited areas or none
Wave Erosion	High - Site is exposed to wave action and increased impacts from severe storms. Waves erode toe and bank

Height & Slope Risk:

Bank Height	High Bank/Bluff (over 6 feet)
Slope Severity	High Slope (> 1L:1V)
Current Slope	High - Less than half of surface has vegetation and duff layer
Soils	Low - Soils contain mix of sediments and stone; fairly stable soil condition

Overland Water from Land Use:

Surface Water Flow to Bank	High - Concentrated or channelized flow is directed down the embankment with rills and gully erosion. No protection is in place
Lawn or Bare Ground Near Bank	Low - No lawns or bare ground are within 100 feet of the shoreline
Impervious Surface Near Bank	High - Roads, driveways, houses, or other impervious surfaces are within 25 feet of the shoreline
Overall Impact of Surface Flow	High - Overland flow of water is a significant contributor to instability

Revegetate/Reconnect Shoreline Buffer:

Vegetation Within 250 Feet	Average vegetation (20-70% coverage)
Vegetation Within 25 Feet	Average vegetation (20-70% coverage)
How Natural is the Shoreline Habitat	Low - Bank is hardened and/or no vegetation present

Proposed Management Actions:

Shoreline vegetation management and enhancement:

Adding vegetation will always help improve the stability of a slope, and the narrow bank between the road and the pond is an ideal area to establish additional native vegetation. By replacing the turf grass in this area with native shrubs or herbaceous plants, a deeper and denser root system will be formed to better hold soil in place against surface water runoff and waves on the pond. To keep maintenance needs low and preserve visibility, low-growing shrubs, native grasses, and groundcovers could be selected.

Since the bank is narrow and showing signs of erosion, choosing planting methods that minimize soil disturbance is recommended. For shrubs, live staking would be effective for this bank area. Live staking uses branch cuttings from certain quickly-rooting shrubs, which are pushed into the soil to sprout and grow new plants. For shrubs that cannot be live staked and herbaceous plants, using bare-root plants or plugs and planting with a bulb auger or by slit planting is preferable to digging holes for larger potted plants.

Riprap modifications for resilience:

The coastal bluff is eroding despite existing riprap stone placement. The top of the bluff, above the riprap, has eroded during storms. The culverts and road surface also showed signs of shifting and damage during the January 2024 winter storms, which may indicate that soil behind the riprap is being washed out through gaps in the stone. Older riprap designs did not always have a filter layer installed underneath the riprap stone to prevent soil washout, and there did not appear to be a filter layer incorporated into the riprap at the Fern Ave site.

Adding vegetation and considering options to add a filter layer are recommended to make the existing riprap design more effective and more resilient to future storms. The structure and root systems of plants growing within riprap help hold the stones in place on the soil of the bank. This will limit movement and downward slumping of the stones that could leave higher areas of the bank exposed. The roots also act as a filter layer to help trap sediment and prevent soil from being washed out. Live staking is a simple and effective method of adding vegetation to existing riprap, as the stakes can be pushed through gaps in the stones into the underlying soil (Fig. 9). Salt tolerant plants should be used, especially in areas that may experience salt spray or tidal inundation. Adding vegetation may not be possible on lower sections of the bank that are frequently submerged at high tide. Adding a filter layer like fine gravel or a natural fiber erosion control blanket is also beneficial for increasing riprap's durability, but can be difficult to add riprap that is already in place. If modifications to the riprap are made during FEMA-funded repairs, the full OUR SHORE guide provides information on selecting filter layers that support vegetation and long-term resilience.

Salt marsh enhancement:

Healthy salt marshes provide protection from erosion by slowing down storm surges and buffering wave energy. The salt marsh patches at the Fern Ave site can be protected or extended as part of an erosion mitigation plan. Protecting existing marsh vegetation from trampling by designating a foot path to access the shoreline is a simple and cost-effective option. When possible, docks and boats should also be stored away from salt marsh vegetation on stable upland areas. Active salt marsh enhancement or creation through planting new salt marsh vegetation, supplementing sediment supply, or incorporating marsh sills has also been an effective component of living shoreline designs in Maine (Fig. 10).

Culvert improvements:

While the design of culverts is not covered within the OUR SHORE framework, culverts do affect and are affected by erosion. Available statewide programs including CoastWise within the Maine Coastal Program provide informational resources, technical guidance on best practices, and connections to funding opportunities for tidal crossing upgrades that improve aquatic habitat and infrastructure resilience.

Regulatory Considerations:

Planting vegetation for erosion control does not require a permit if soil disturbance is minimized. If more than one cubic yard of soil will be overturned for a project, considered the equivalent of installing 25 one-gallon potted plants, the project will require a state permit. Other management actions described in this report, including culvert improvements and modifications to riprap, will require a municipal and state permit when adding fill, structures, or operating heavy machinery in the shoreland zone. Any project below the highest astronomical tide line, including riprap modifications or replacement and planting of salt marsh vegetation, will require review and permitting by the U.S. Army Corps of Engineers.

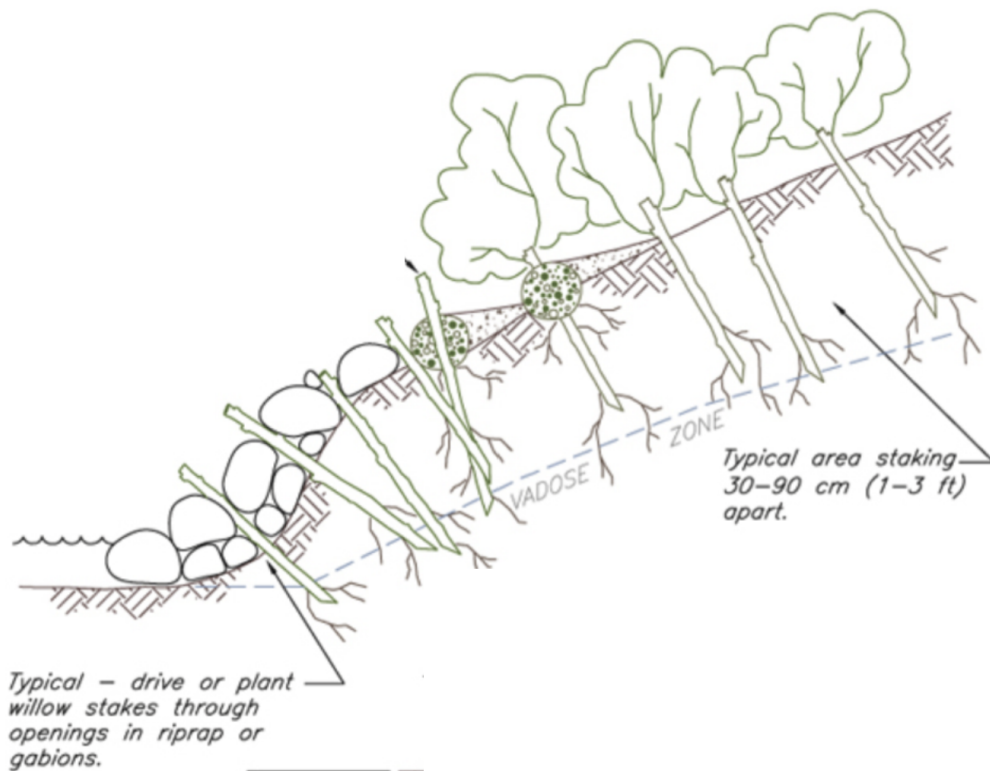


Figure 9: Example placement of live stakes into riprap (Virginia Department of Transportation).



Figure 10: Example of a log sill installed for marsh restoration. (Photo from Treyball & Bernacki, 2025).

OURSHORE Quick Assessment: VFW Hall
220 Island Ave, Long Island, ME

Existing Site Conditions:

Location:

The VFW Hall is located at 220 Island Ave on the west shore of Long Island. The Hall is now a town facility which is rented for community events. Public shoreline access is provided by a set of wooden stairs on the property.

Environmental Characteristics:

The shoreline at the VFW Hall is a coastal bluff approximately 10 ft in height. The bluff face is partially vegetated with small trees and shrubs, and invasive Asiatic bittersweet is present. In front of the coastal bluff is a sand beach. -coastal bluff, about 10 ft on average

The VFW Hall shoreline is mapped in the National Wetland Inventory. Nearby intertidal habitats include sea scallop beds and moderate value Tidal Waterfowl and Wading Bird habitat.

Erosion:

The coastal bluff at the VFW Hall is mapped as Unstable by the Maine Geological Survey. Signs of bluff erosion seen at the site include bare soil on the bluff face and leaning trees indicative of bluff slumping. Dark and saturated soil on the bluff face suggests that groundwater is contributing to bank instability at the site. A gully caused by surface water runoff has formed underneath the shoreline access stairs, leading the property manager to place riprap stone protection.



Figure 1: A section of the beach and coastal bluff at the VFW Hall.



Figure 2: A section of the beach and coastal bluff at the VFW Hall including the shoreline access stairs.



Figure 3: Bare soil and bluff erosion on the shoreline of the VFW Hall site.



Figure 4: Bluff crest and upland areas at the VFW Hall.



Figure 5: Gully beneath the shoreline access stairs and stone placed to prevent further erosion.

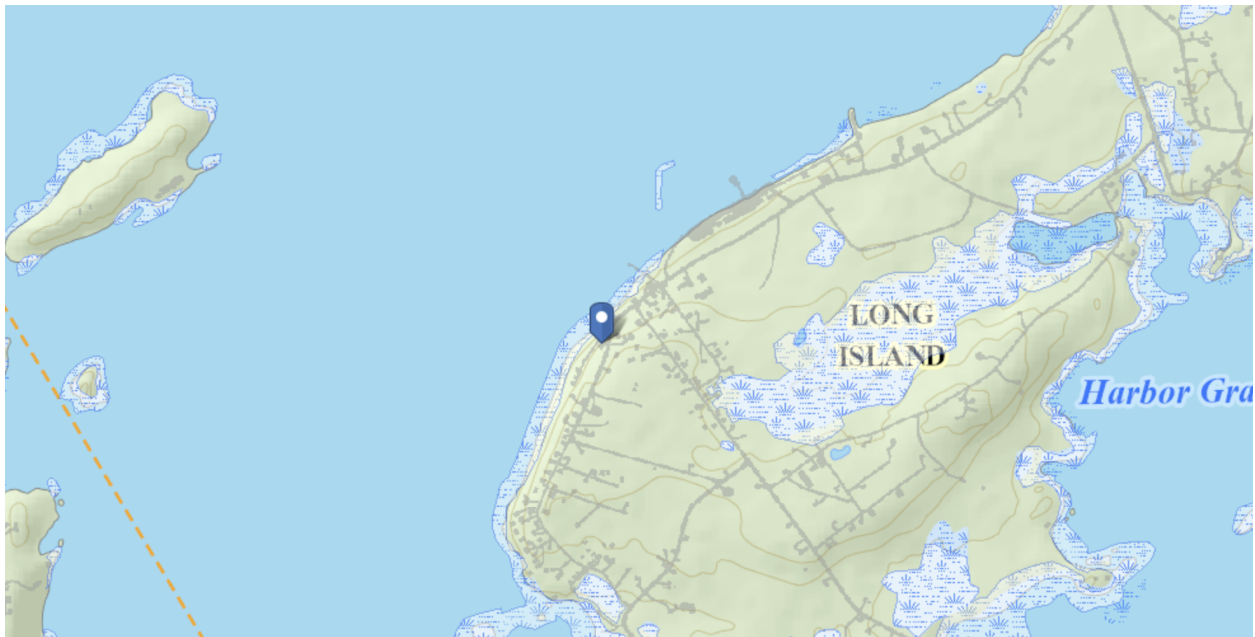


Figure 6: Beginning with Habitat map of the VFW Hall site showing National Wetland Inventory areas (white and blue pattern).



Figure 7: Beginning with Habitat map of the VFW Hall site showing Tidal Waterfowl and Wading Bird habitat (dark blue) and sea scallop beds (light blue).



Figure 8: Maine Geological Survey Coastal Bluff map of the VFW Hall site. The yellow line indicates that the bluff was mapped as Unstable.

OUR SHORE Quick Assessment:

Source & Severity of Erosion:

Overland Erosion	Moderate - Bank is eroding with observable change and loss from overland flows
Groundwater	High - Groundwater is severely impacting the stability of the slope
Toe Erosion	High - Bank is slumping from completely eroded toe
Wave Erosion	High - Site is exposed to wave action and increased impacts from severe storms. Waves erode toe and bank

Height & Slope Risk:

Bank Height	High Bank/Bluff (over 6 feet)
Slope Severity	High Slope (> 1L:1V)
Current Slope	Moderate - More than half of surface has vegetation and duff layer
Soils	Moderate - Unstable soil condition or moderate erosion rate

Overland Water from Land Use:

Surface Water Flow to Bank	Moderate - Some concentrated or channelized flow is directed toward the eroding bank resulting in minimal sheet or rill erosion
Lawn or Bare Ground Near Bank	High - Lawn area or bare ground is located within 25 feet of the shoreline
Impervious Surface Near Bank	Moderate - No roads, driveways, houses, or other impervious surfaces are within 25 feet of shoreline
Overall Impact of Surface Flow	Moderate - Moderate Overland Impact from surface water

Revegetate/Reconnect Shoreline Buffer:

Vegetation Within 250 Feet	Average vegetation (20-70% coverage)
Vegetation Within 25 Feet	Average vegetation (20-70% coverage)
How Natural is the Shoreline Habitat	High - Bank and vegetation are not altered. No riprap or hardened structures installed.

Proposed Management Actions:

Stabilizing overland flows:

Surface water flowing down the bank is eroding a gully beneath the access stairs. This is common on parts of the bank where vegetation is shaded out by a structure, leaving the soil unprotected. Placed stones and geotextile fabric are helping to mitigate the issue, but some erosion is still occurring. Additional practices to stabilize this area could include adding vegetation for surface protection and installing slope interruptions to slow the flow of water underneath the stairs.

While adding vegetation underneath a structure can be challenging due to low light conditions, shade tolerant plants can often be successful in these areas. Looking at what plants are growing in similar nearby areas is a helpful tool in plant selection. For example, property owners also on the west end of Long Island reported blackberry shrubs successfully growing under similar staircases. The geotextile fabric currently placed under the stones will prevent plants from growing into the underlying soil, so it will need to be removed to install vegetation. An erosion control blanket made of biodegradable materials that will allow plant growth could be used as a replacement, if desired. For small areas, like the section of bank beneath the stairs, the thick burlap bags used by coffee roasters make an effective alternative to purchased erosion control blankets, and can often be sourced for free from local companies. The current riprap stones can be replaced after the geotextile is removed for additional surface protection while vegetation establishes.

Slope interruption is a technique where materials are placed horizontally along a slope to interrupt and slow down the flow of water, as well as spreading out concentrated flows. Coir logs are frequently used for slope interruptions, but erosion control “socks” made of burlap or natural fabric tubes filled with mulch and gravel or living plant bundles called fascines can also be used. When installing slope interruptions, it is important to make sure that any redirected water is directed towards a stable area of the bank with good vegetation cover.

Buffer improvements:

A vegetative buffer provides many functions in a shoreline stabilization project. The deep, fibrous root systems of native plants help hold soil in place, and aboveground plant material slows surface runoff and can help buffer wave energy during storms. For slopes with groundwater oversaturation, like the VFW Hall site, vegetated buffers can also help reduce groundwater saturation because the plants will take up more water from the soil than shallow-rooted turf grass. Planting a vegetated buffer of at least 10-15 ft in width from the top of the bluff is recommended at the VFW Hall. A functional buffer for erosion control should include densely planted native plants, including a mix of shrubs, grasses, and groundcover

plants. Because they add additional weight to the top of the bluff and can lean or fall, planting new large trees near the eroding bluff edge is not recommended.

Toe protection:

Some kind of structural toe protection will help prevent further toe erosion and slumping of the coastal bluff. The VFW Hall is in an area considered to have a moderate wind and wave exposure based on annualized fetch. Options for toe protection that are suitable for higher-energy coastal environments include living crib walls or vegetated riprap toe protection. A living crib wall uses timber beams placed in a tiered formation that extends backwards into the bank. Each tier of the wall is planted with vegetation for additional long-term stability. Salt tolerant plants should be selected for any plantings on the bank.

A riprap stone toe combined with vegetation is another alternative. Stone is placed only at the base of the bluff subject to most frequent wave energy and erosion, which minimizes the cost and environmental impact of the project. Above the stone toe, dense native vegetation is used as the primary method of bank stabilization. OUR SHORE recommends vegetating riprap whenever possible. This increases connectivity between the stones and underlying soil through plant root systems, making the entire structure more durable and reducing maintenance requirements. To allow for vegetation to grow within riprap, replacing the plastic geotextile layer used in standard riprap designs with either a layer of gravel and small stones or a natural fiber blanket is recommended. Plants should be installed directly into the riprap during installation, either using gaps between stones as planting pockets for container plants, or by installing live stakes, which are branch cuttings of quickly-rooted shrubs that are planted into the soil.

Regulatory Considerations:

Projects within the shoreland zone may require state permits under the Natural Resources Protection Act (NRPA) and municipal permits or approval under the local Shoreland Zoning ordinance. Planting projects may not require a permit if only native plants are used and less than one cubic yard of soil is overturned, the equivalent of 25 1-gallon potted plants. The other management options described in this report will require permitting. Through the state NRPA permitting process, an applicant can apply for either an Individual Permit or a Permit by Rule with a shortened application process and review period. Permit by Rule projects must comply with standards to minimize their environmental impact. Many shoreline stabilization projects using biodegradable materials and vegetation, like coir log slope interruptions or some living crib wall projects, will qualify for a Permit by Rule. Vegetated riprap toe protection may also use the Permit by Rule pathway for up to 125 linear feet of structure.

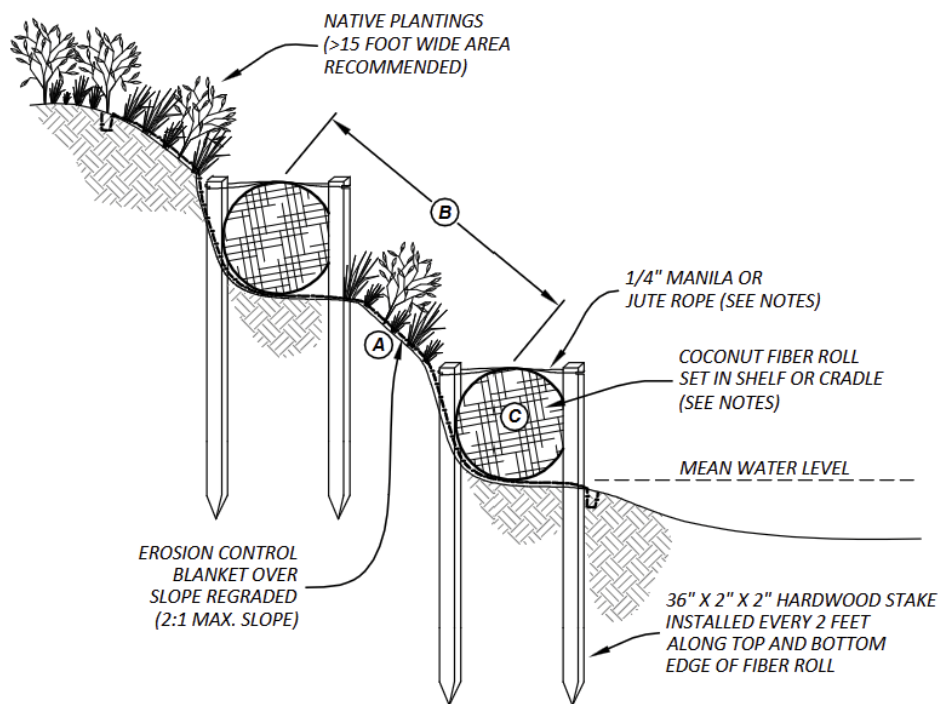
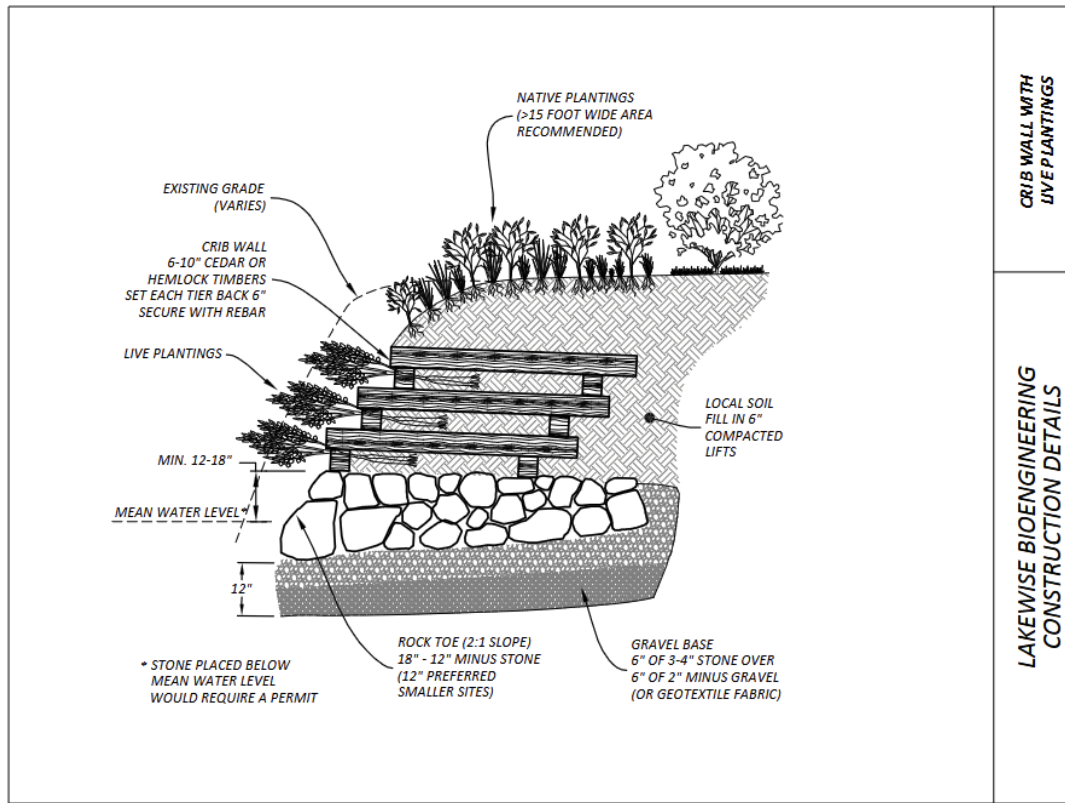


Figure 9: Example cross-section of coir logs installed for slope interruption from the Vermont Bioengineering Manual.



Figure 10: Example of a living crib wall from the Vermont Bioengineering Manual.



Plan design: Watershed Consulting Associates, LLC.

Figure 11: Example cross-sectional plan of a living crib wall from the Vermont Bioengineering Manual.

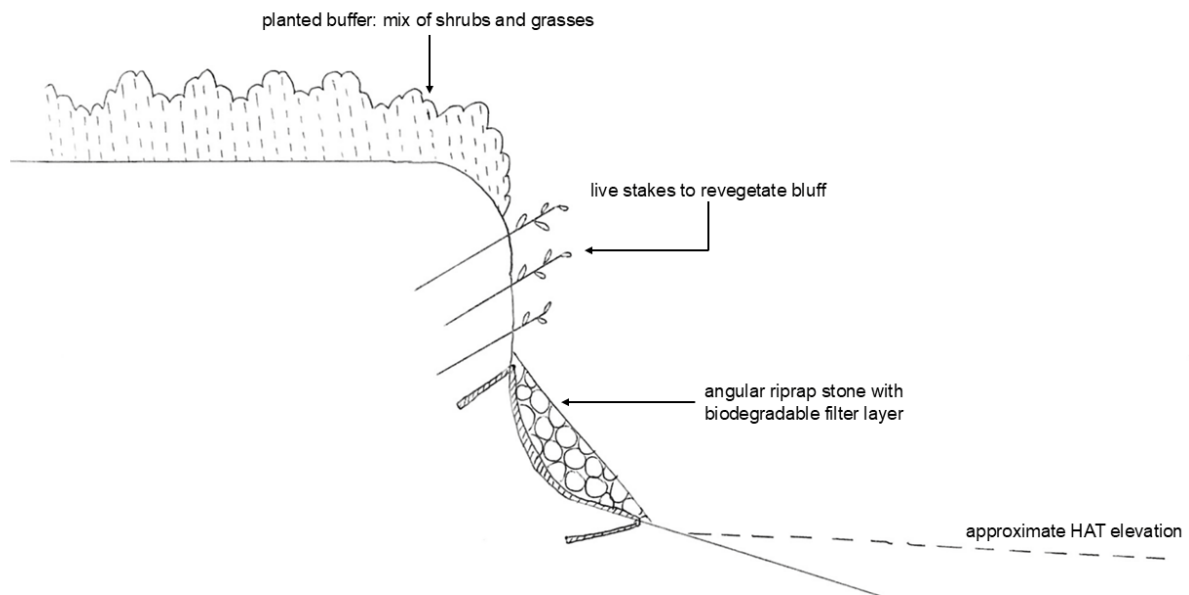


Figure 12: Example cross-section of slope stabilization using a riprap stone toe combined with vegetation on the bluff face and buffer.

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