



PE7 Action: Nature-based Shorelines

2 Points

4 Points

8 Points

10 Points

12 Points

A. Why is this action important?

The Climate Smart Communities (CSC) program encourages communities to replace hard shoreline structures, where appropriate, with nature-based features to reduce risk where water meets the land along streams and riverbanks and along lake, estuarine, sound, and ocean shorelines. Climate change is increasing the intensity of storms, which can lead to increased flooding and erosion. Sea-level rise and stronger storms are increasing community impacts from erosion, flooding, and permanent inundation. However, if left undisturbed, banks and shorelines naturally move in response to erosion and deposition of sediment and they have the ability to adapt to changes, such as rising sea levels.

Actions taken to reduce erosion and flood damages along shorelines range from conserving natural shorelines and allowing nature to maintain a balance, to nature-based features, to “grey” or hard-engineered methods.

Traditional engineered hard (or “grey”) shorelines use materials like steel, wood, concrete or rock with no vegetation. They include sloped armoring (revetments), vertical armoring (bulkheads and cribbing), seawalls, and shore stabilization approaches such as jetties, breakwaters and groins. Grey infrastructure has traditionally been used to accommodate working waterfronts, reduce erosion impacts, or attempt to keep water out of an area entirely. While necessary in some locations, these types of structures often encourage development in risky areas and can lead to catastrophic consequences if they are overtopped or fail. In addition, because hard structures are often difficult to modify once built, their effectiveness is likely to diminish over time as water levels fluctuate, sea levels rise, and storms become more intense. They can also have negative impacts on adjacent properties and can alter or degrade habitat for plants and animals that use the shoreline or bank. For these reasons, conservation of natural areas and use of nature-based shoreline protection and bank stabilization measures are preferred, especially in areas with appropriate conditions, such as moderate to low wave energy environments.

Nature-based features (NBF) are constructed to mimic natural features and processes using living materials (often vegetation) alone or use a combination of structural elements and living materials to reduce erosion impacts (sometimes referred to as “living,” “bio-engineered,” or “green” shorelines or “soft structural measures”). In limited cases, they can also provide flood risk reduction. Nature-based treatments such as shellfish reefs, constructed wetlands, and re-vegetated banks provide habitat and other ecological functions. These techniques are designed to maintain or improve the existing coastal/riverine processes that exist at the site. Many of these solutions are more adaptable to changing conditions than traditional engineered hard methods.

NYS guidance [Using Natural Measures to Reduce the Risk of Flooding and Erosion \(PDF\)](#) outlines nature-based solutions as:

- Nature-based bank, beach, bluff, dune, floodplain, forests, maritime forest, nearshore area, non-tidal wetlands, riparian areas, shoal, stream, river, submerged aquatic vegetation (SAV), or tidal wetlands
- Nature-based coastal techniques (bank stabilization, sediment nourishment, in-water features, and floodplain reconnection)
- Nature-based stream techniques (stream bank stabilization, stream bed stabilization, floodplain reconnection, and stream daylighting)

It is important to acknowledge that an assessment of possible actions to reduce flood and erosion damage should first consider actions taken on the upland (or landward), away from the shoreline. These actions include site specific measures that do not attempt to control or redirect water, such as relocating buildings out of hazardous areas or elevating structures

Additionally, conservation of open spaces and shorelines should be considered in an assessment of flood and erosion reduction actions.

Note: communities can receive points for upland green infrastructure projects to manage stormwater through *PE7 Action: Green Infrastructure*.

B. How to implement this action

New York's coastlines and inland waterways are very diverse, with a variety of land uses, population densities and shoreline types, from sandy shorelines to rocky bluffs. Particularly as it relates to nature-based shorelines, there is no one-size-fits-all approach. It is important that each municipality understands the factors that must be considered when taking actions on the shoreline, such as the goal of the project, the site conditions, the upland use, and more. Nature-based shoreline projects in New York State (NYS), like other proposed shoreline activities, are required to follow the appropriate environmental permitting and review processes, including federal coastal consistency review where required. The three steps outlined here include ways to install, maintain, and monitor nature-based shorelines. Note that conservation of natural areas, including shorelines, is eligible for points under *PE7 Action: Conserve Natural Areas*.

Replace or reduce a hardened shoreline with a NBF project. As traditional shoreline management approaches center around hardened structures, many municipalities have existing shoreline structures that could be replaced or reduced in size. In some cases, these hardened structures may not be necessary or appropriate for a particular site, due to site conditions such as low wave energy, less development at risk, and/or adjacent open space or natural habitat.

While municipalities can conduct preliminary research on shoreline conditions (see the resources below in Section G), a shoreline engineering analysis is recommended to determine whether an existing structure could be replaced, wholly or partially, with a nature-based feature, or NBF. NBF are an alternative method of shoreline management that can provide erosion and flood risk reduction. They are designed to mimic natural processes and can provide co-benefits such as habitat provision and water quality improvements.

Examples of NBF include but are not limited to constructed/restored dunes, shellfish reefs, constructed wetlands (with or without a sill), and re-vegetated banks. An NBF solution that replaces or reduces a hardened structure should be designed and constructed in such a way that improves shoreline conditions, such as improved habitat and coastal/riverine processes. If a structure is not being replaced completely by a nature-based feature, it is important to design the project in such a way that the existing structural elements will not negatively impact the nature-based project elements (e.g., increased erosion downdrift). Early consultation with the appropriate regulatory agencies is recommended; it can provide valuable information on shoreline management approaches and permitting requirements.

Note: no points will be awarded for construction of a new NBF that does not replace a hardened shoreline.

Maintain existing NBF projects. Shoreline management measures all require some level of maintenance over time. Maintenance costs for restored and nature-based features may be higher than for hard structural features early in the project life to ensure that vegetation is well-established. However, with proper maintenance, costs can decrease as vegetation takes hold, spreads and strengthens the shoreline, if environmental conditions remain favorable at the site and adjacent areas.

NBF tend to require on-going maintenance, especially during early plant establishment. Maintenance activities could include removing litter, re-planting, invasive species control, and protecting seedlings from grazing waterfowl. A maintenance plan can help identify specific activities, along with a plan for implementation. Maintenance activities can provide an opportunity for community involvement and education about NBF approaches. See Appendix D in NYS guidance [Using Natural Measures to Reduce the Risk of Flooding and Erosion \(PDF\)](#) for more information on construction, maintenance and adaptability costs of NBF, and further information below in Section G.

Monitor an existing NBF project. Monitoring NBF in terms of performance can help identify whether project goals are being met and can inform an adaptive management plan. As NBF are more dynamic to changing conditions over time, monitoring how they are performing is important. For example, monitoring performance as it relates to ecological function and hazard mitigation can inform potential design or maintenance modifications to ensure continued performance.

In NYS, there are currently two programs that are available for communities to choose from: [Statewide Monitoring Framework](#) and the [Hudson Rapid Assessment Protocols](#), in addition to any regulatory requirements for ecological and/or

hazard mitigation monitoring. Municipalities can select which “protocols” they will monitor from each program, or undertake all of the protocols, depending on their project objectives and existing capacities. The Statewide Framework includes 17 monitoring protocols that capture ecological, hazard mitigation/structural integrity, and socio-economic performance of shoreline projects and was designed to be applicable to projects in the coastal regions of the state. The Rapid Assessment protocols are designed to assess the physical and ecological performance of nature-based shoreline projects along the Hudson River, but can be adapted to other areas.

If there are monitoring requirements as part of a permit for a specific shoreline project, that monitoring program must be followed. Both monitoring as well as an adaptive management plan should relate back to the project objectives (e.g., shoreline stabilization, flood risk reduction, habitat enhancement, recreational access).

Monitoring efforts can range from seasonal or post-event photographs of a site to more in-depth monitoring using survey-grade equipment. An adaptive management plan describes the thresholds or triggers for adaptive management and possible measures to be taken in these circumstances. In some cases, adaptive management plans are part of permit conditions. The following are elements that could be considered as part of an adaptive management plan (adapted from USEPA/USACE (2003) Compensatory Mitigation Plan Checklist):

- Party(ies) responsible for adaptive management.
- Identification of potential challenges (e.g., flooding, drought, erosion, sea level rise, invasive species) that pose a risk to project success. Discuss how the design accommodates these challenges.
- Discussion of potential remedial measures in the event the project does not meet performance standards.
- Description of procedures to allow for modifications of performance standards if projects are meeting goals, but in unanticipated ways.

C. Timeframe, project costs, and resource needs

Designing and implementing a nature-based feature (NBF) project to replace or reduce a hardened shoreline structure may take over a year, depending on the complexities of the site, permitting requirements and processes, and appropriate construction windows. The expertise of consultants, engineers, landscape architects, and regulatory staff will be needed. Implementing a monitoring plan can last the lifetime of the project. Maintenance activities can be shared with educational or volunteer groups. Depending on the extent of monitoring, the timeframe, costs, and resources needed can vary.

D. Which local governments implement this action? Which departments within the local government are most likely to have responsibility for this action?

This action is applicable to all types of local governments. The departments or people responsible for public works, parks, planning, and engineering are most likely to be responsible for this action. For this effort to be successful, cross-department involvement and support are recommended. Municipal committees such as CSC task forces, conservation advisory councils, waterfront advisory committees, and regional watershed groups may also be involved. Maintenance and monitoring can likely be performed by public works or parks staff; however, volunteer groups may also be able to conduct these activities.

E. How to obtain points for this action

Points for this action are tiered based on completion of the projects described below. All must have occurred within 15 years prior to the application date.

	<i>POSSIBLE POINTS</i>
Replace or reduce a hardened shoreline structure with an NBF project (50% minimum length of hardened shoreline)	8
Maintain an existing NBF project according to a maintenance plan	2
Monitor an existing NBF project with a monitoring/adaptive management plan that measures 3 or	

F. What to submit

To be eligible for points for this action, a local government must submit documentation of the action taken within the past 15 years. Each separate point tier requires different documentation.

For the NBF project, submit documentation of the decision process, including any engineering or technical reports that indicate the appropriateness of the NBF approach at the site. Approved permitting documents for any shoreline construction should also be submitted, including design/description of NBF and location. Submit before and after photographs of constructed NBF.

For maintenance, submit the maintenance plan and photographs and descriptions of completed maintenance activities. Applicants can receive points for maintenance of NBF projects that were installed more than 15 years ago, as long as the maintenance itself took place within the last 15 years.

For monitoring, submit the monitoring plan and evidence of implementation, including results in the form of photos, field sheets, or other data. Monitoring must cover at least 3 “protocols” from the Statewide Monitoring Framework, the Hudson Rapid Assessment Protocols, or any regulatory requirements for ecological and/or hazard mitigation monitoring. Applicants can receive points for monitoring of NBF projects that were installed more than 15 years ago, as long as the monitoring itself took place within the last 15 years.

All CSC action documentation is available for public viewing after an action is approved. Action submittals should not include any information or documents that are not intended to be viewed by the public.

G. Links to additional resources or examples

NBF Project Examples

- [Hudson River Sustainable Shorelines Project Demonstration Network and Case Studies](#)
- [Artificial reef installation along Long Island Sound](#)

General NBF/Shoreline Management Resources

- [NYS Using Natural Measures to Reduce the Risk of Flooding \(PDF\)](#)
- [NYS DEC, Hudson River National Estuarine Research Reserve, Hudson River Sustainable Shorelines](#)
- [NYS DEC, Shoreline Stabilization Techniques](#)
- [NYS DEC, Tidal Wetlands Guidance: Living Shoreline Techniques in the Marine District of New York State](#)
- [NYS DOS Geographic Information Gateway Living Shorelines Story Map](#)
- [Hudson River Sustainable Shorelines Publications & Resources](#)
- [A Comparative Cost Analysis of Ten Shore Protection Approaches at Three Sites Under Two Sea Level Rise Scenarios \(PDF\)](#)
- [Engineered Approaches for Limiting Erosion along Sheltered Shorelines \(PDF\)](#)
- [Economic Tradeoffs between Shoreline Treatments: Phase I – Assessing Approaches \(PDF\)](#)
- [Sustainable Shorelines Designs Webinar Series](#)
- [The Guide to Ecologically-Based Stream Restoration in New York’s Coastal Watersheds:](#)
- [Green Shorelines on Long Island presentation](#)
- [Bioengineering for Streambank Erosion Control](#)
- [Naturally Resilient Communities, Using Nature to Address Flooding](#)
- [Living Shorelines Engineering Guidelines](#)
- [Erosion Management for New York’s Great Lakes Shorelines](#)
- [The Shoreline Stabilization Handbook for Lake Champlain and Other Inland Lakes](#)
- [Systems Approach to Geomorphic Engineering Brochure](#)
- [Engineering with Nature](#)
- [Streambank and Shoreline Protection, Engineering Field Handbook](#)

Permitting

- [NYS DEC General Environmental Permits](#)
- [NYS DEC, Waterways, Coastlines & Wetlands Permits](#)
- [NYS DOS Coastal Consistency](#)
- [United States Army Corps of Engineers Regulatory Program](#)

Monitoring/Adaptive Management

- [Hudson River Sustainable Shorelines Rapid Assessment Protocol Manual](#)
- [Statewide Shoreline Monitoring Framework](#)
- [Compensatory Mitigation Plan Checklist](#)

Shoreline Mapping/Data

- [U.S. Great Lakes Hardened Shorelines Classification](#)
- [New York Tidal Areas Environmental Sensitivity Index \(includes shoreline typologies for coastal areas of the State\)](#)
- [Lake Ontario Natural and Nature Based Feature Opportunities Mapper](#)
- [DEC 6 NYCRR Part 490, Projected Sea-level Rise](#)
- [Scenic Hudson Protecting the Pathways: Marsh migration on the tidal Hudson River, NY](#)
- [DEC Hudson River Estuary Program CSC Video: Nature-based Shorelines](#)

H. Recertification Requirements

The recertification requirements are the same as the initial certification requirements.