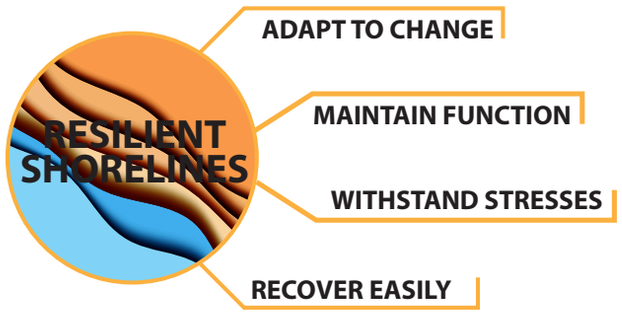
Shoreline Management on Long Island

Management for Resilient Shorelines

The most appropriate shoreline management option for your shoreline is determined by a number of factors, such as necessity, upland land use, shoreline site conditions, adjacent conditions, ability to be permitted, and others. Costs can be a major consideration for property owners as well. While the cost of some options is mostly for the initial construction, others will require short- or long-term maintenance costs; therefore, it is important to consider annual and long-term costs when choosing a shoreline management method.

In addition to any associated financial costs, there are also considerations of the impacts on the natural environment and coastal processes. Some options maintain and/or improve natural coastal processes and features, while others may negatively impact the natural environment. Resilient shorelines tend to work with nature rather than against it, and are more adaptable over time to changing conditions. Options that provide benefits to habitat or coastal processes are generally preferred by New York State agencies over options that interrupt coastal processes or destroy native habitat. Many of the options listed below are very site specific and may not work for your individual property.



Artwork by Loriann Cody

Proposed construction within the coastal areas of Long Island requires the property owner to apply for permits from local, state and federal agencies. This process may take some time and it is recommended that the applicant contacts the necessary agencies as early as possible. Property owners can also request pre-application meetings with regulators to discuss the proposed project. Depending on the complexity of the site or project, property owners can contact a local expert or consultant that can assist them with understanding and choosing the best option to help stabilize their shorelines and reduce upland risk. Proposed projects must also comply with local zoning or regulations, and be consistent with the local policies of the Local Waterfront Revitalization Program (LWRP), if applicable.

Resilience

The ability of a system to withstand shocks and stresses while still maintaining its essential functions.

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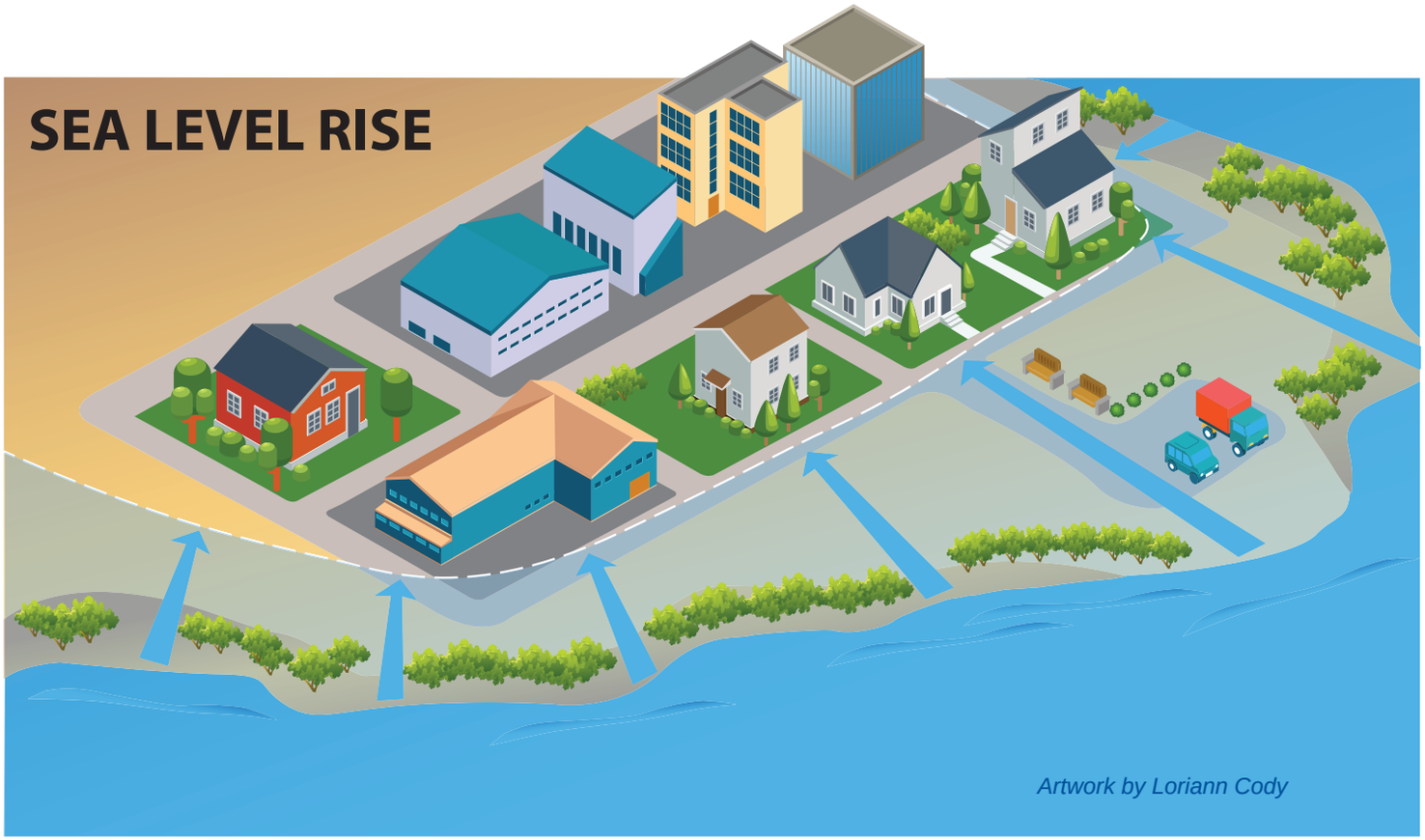
Coastal Processes on Long Island



As sea level rises, the shoreline and adjoining habitat will move inland. This natural process will continue unless obstructed by man-made structures.

Risks of Dynamic Shorelines

Long Island is composed geologically of sand, clay, and rock that has dictated our various shorelines, which range from sandy beaches, dunes, wetlands, rocky beaches, to large bluffs. However, this sediment composition makes shorelines vulnerable to erosion. Long Island's shorelines are a valuable asset that not only drive an important tourism industry, but also support many local residents. However, the close proximity of our communities to the shorelines have made us susceptible to flooding. Approximately 15%[i] of Long Islanders live within an area identified as a flood zone during a worst case hurricane (i.e., a Category 4 storm). In the face of climate change and as more infrastructure is built along shorelines and the value of property increases, residents are increasing their awareness of how to reduce impacts to their vulnerable assets.

Whereas the most damaging flooding is associated with large storms, it is becoming increasingly common for nuisance or sunny-day flooding to occur. As sea level rises around Long Island, flooding events associated with these higher-than-high tides will continue to impact coastal communities. According to the New York State ClimAID report, the medium range projection of sea level rise for Long Island is 11-21 inches by 2050. Shorelines will naturally migrate landward as sea levels rise. In an undeveloped location, beaches would be able to adjust to sea level rise and maintain their width. However, along our developed shorelines, erosion will continue until intercepted by built infrastructure, such as roads or buildings, and ultimately no more sediment will exist. In order to better prepare for the future, we must improve our resilience in the face of changing conditions.

Natural Resiliency Measures

Resilience[ii] is the capacity for a community and its ecosystem to withstand extreme events and other forces or risks; quickly recover the interconnected social, economic and ecological systems' structure and function in the aftermath of a disaster; and develop ongoing adaptability to rapidly changing environmental conditions and forces. Resiliency can be discussed in various contexts. For the purposes of this document, physical resilience to flooding and erosion events related to sea level rise and/or coastal storms is the focus.

Resiliency is not something to think about after a storm hits, but rather should be considered a continuous process of adapting over time in order to be better prepared for future stresses, such as flooding impacts. Steps towards improved resiliency can be taken on an individual, community, or regional scale. By improving resilience to flooding, residents can decrease the amount of time it takes to recover from and the amount of damage caused by a flooding event. The following shoreline management approaches aim to stabilize shorelines and reduce flooding impacts through maintenance of natural processes and utilization of natural materials.

Dunes/Bluff vegetation and reshaping

Dunes and bluffs protect upland areas and supply sediment to fronting beaches. During times of high water, the dune acts as a barrier between the source of water and the inland. However, dunes can be overtopped during severe flooding events. In addition, if dunes are not continuous, floodwaters can move around the dunes into open space, thereby reaching inland areas. When waves cut away at the base of dunes or bluffs, stored sediment is released and becomes a natural source of replenishment to the beach and nearshore area.

A stable dune or bluff has native vegetative plantings, such as American Beach Grass, that bind the sediment and lessen the likelihood of erosion from sediment blowing away or slumping. Grasses will also trap windblown sand, which aids in sediment accumulation and dune/bluff growth. In order to achieve success with plantings, you should research the species' growing season. Sand fencing can be utilized in dune reconstruction as it assists in sediment accretion. Dunes can also be constructed by covering a geotube or sandbags with sediment and stabilizing with grasses. However, if a dune has a geotube or sandbag as it's core this would no longer be considered a non-structural approach. Dunes and bluffs are dynamic features and their natural movement must be considered; they cannot simply be constructed by building a large pile of sand and expecting it to protect from floodwaters.

Dune reconstruction site in Quogue.Image credit: Kathleen M. Fallon

Wetland restoration/protection

Tidal wetlands typically fluctuate between wet and dry conditions as the tides move up and down. Therefore, during flood events, wetlands act as buffers by temporarily storing flood waters. Tidal wetlands are also able to help attenuate waves, which decreases the wave energy before it reaches the shoreline. Creating or restoring a marsh not only protects upland features but it will add habitat that can be utilized by wildlife. Wetland restoration must be carefully designed in order to function properly as a healthy wetland that will provide risk reduction to upland properties. It is also important that you do not introduce non-native species to the area, which could disrupt the natural ecosystem.

Living shorelines

Property owners are becoming increasingly interested in shoreline management measures that minimize the impacts on natural habitats while still providing stabilization and risk reduction. Living shoreline options are constructed to mimic natural features and processes by utilizing native, living materials. As this is a fairly new approach in New York, professionals have a variety of definitions and names including nature-based shorelines, green infrastructure and sustainable shorelines; this article will refer to them as living shorelines. These shorelines can be either nonstructural (i.e., vegetation only) or a combination of structural elements with vegetation/habitat enhancement. Research has brought awareness to the potential negative impacts associated with hardened structures, such as increased erosion to adjacent areas, interruption of natural coastal processes, and loss of fronting habitat. The ultimate goal of a living shoreline is to be able to provide risk reduction benefits while also providing ecological benefits. Unlike structural methods, these shorelines are constructed to maintain or improve natural coastal processes and provide ecosystem services, such as habitat creation and water filtration. Living shoreline techniques are not suited for every waterfront property. Living shorelines tend to be more successful in areas that support marshes and are protected from high energy wave action, and where the shoreline naturally has a gradual slope. Living shoreline approaches tend to require annual maintenance, especially during the time when plants are becoming established. Maintenance tends to decrease over time.

Shinnecock CHRP Project of Spartina and Ammophila planting. Image credit: Cornell Cooperative Extension Marine Program

Wetland restoration efforts. Image credit: Wertheim National Wildlife Refuge

Beach nourishment

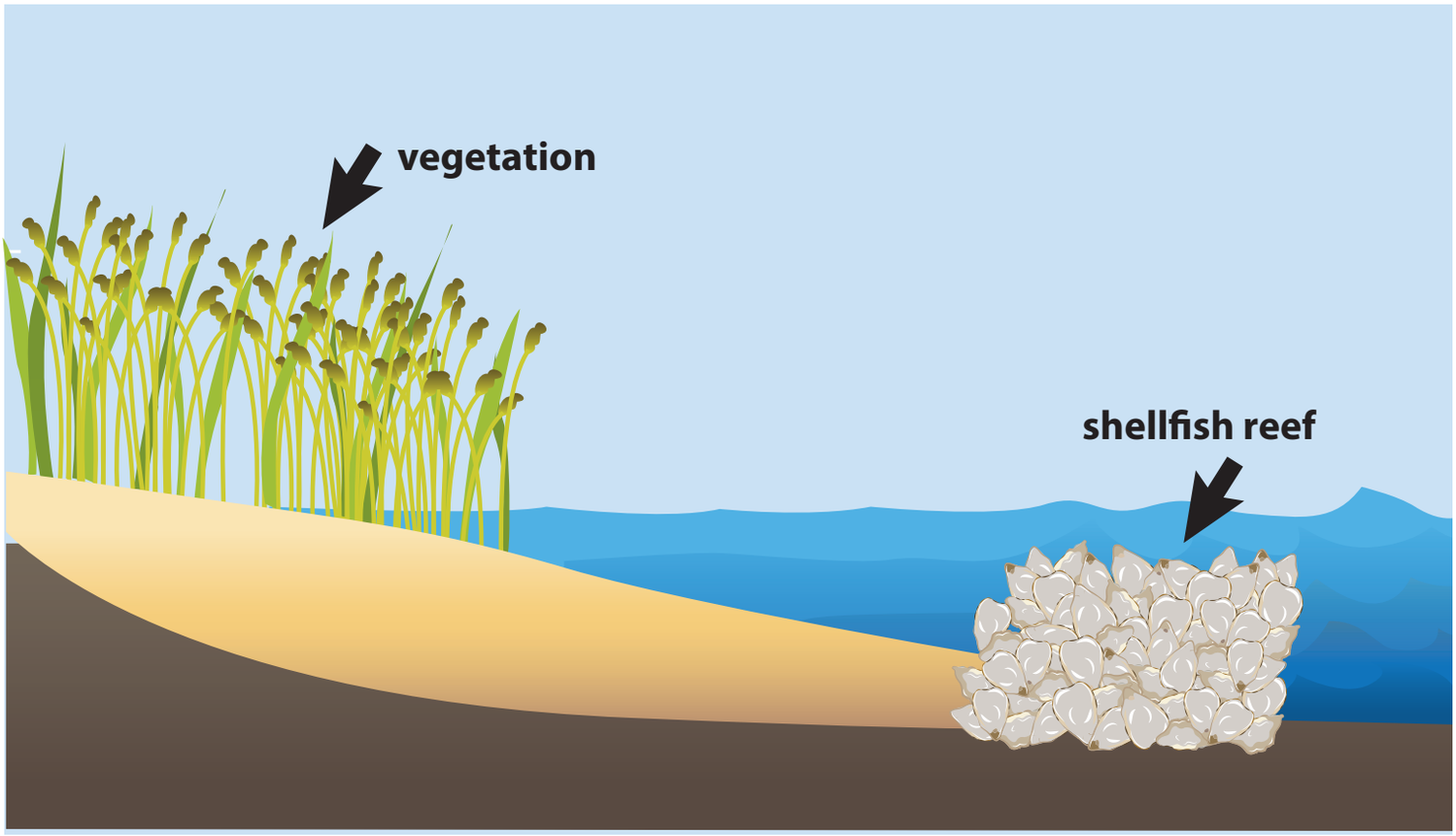
Beaches act as natural buffers between the water and dry land. Unfortunately, this means that beaches take the brunt of destructive storm waves and are extremely vulnerable to erosion. Beaches have the ability to recover after storm events, during calm periods, when swells bring sediment

During beach nourishment, an offshore supply of sand is pumped by a dredge onto the beach where bulldozers reshape the sediment. Image credit: US Army Corps of Engineers

back to the beach. Beaches can also be nourished, or restored depending on the property's history. Large-scale nourishment projects, such as those federally funded and completed by the US Army Corps of Engineers, are more common. This option is not as common on an individual property basis. However, some communities on Long Island have created special taxing districts to finance beach nourishment on a community-level scale. Beach nourishment requires the property owner to purchase sand and add it to an existing eroded beach. The right type (material and grain size) of sand must be chosen to match the existing sediment; on Long Island, many nourishment projects utilize dredged sand from inlets. Unfortunately, this option also requires a great deal of maintenance as time goes on. Sediment renourishment is typically thought of as a "band-aid"; erosive forces will continue to impact the property and eventually another nourishment project will be necessary. According to Coastal Erosion Management Regulations 6 NYCRR Part 505 an artificial beach nourishment project is considered an erosion protection structure.

Shellfish reef

Offshore reefs (see graphic page 6) help protect coastlines by reducing the destructive force of large waves before they reach the shore. This is true of all reefs, even ones close to shore and composed of shellfish rather than corals. Installation of a shellfish reef can help disperse wave energy, increase sediment deposition, and create new habitat for marine life. A bonus of utilizing shellfish is that these creatures are filter feeders and will work towards improving water quality. A shellfish reef can also be utilized in a living shorelines approach to help protect natural wetlands from erosion.



Oyster reefs (see page 5) break up wave energy allowing for sediment deposition and plant life to thrive. Artwork courtesy of Loriann Cody

Traditional Structural Options

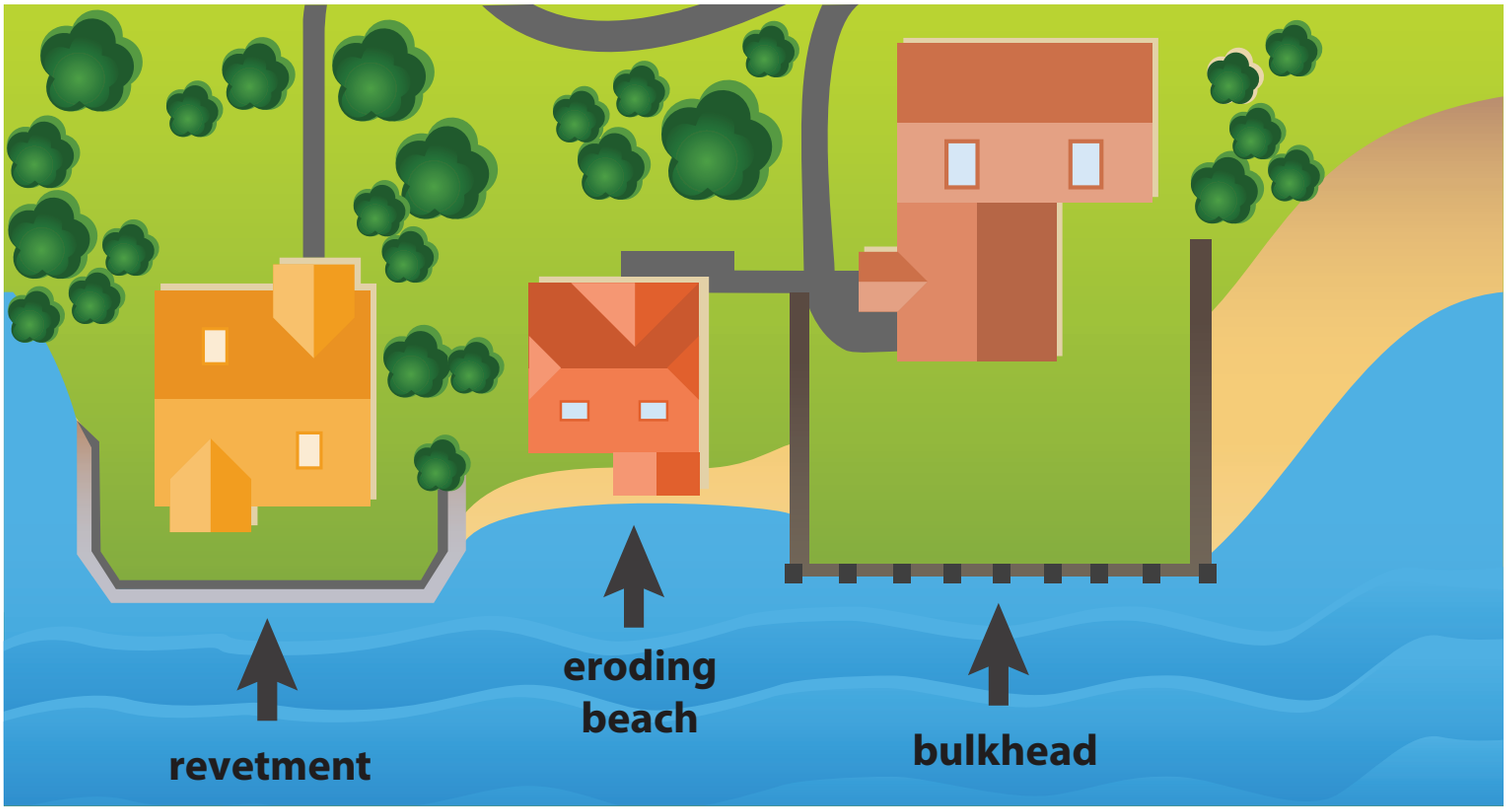
There are cases where natural resiliency measures cannot adequately address concerns for safety, loss of life, or protection of significant public infrastructure. In these cases, hard structural measures (see graphic page 7) may be appropriate and necessary. If hard structural measures are required, there may be opportunities to include components that enhance their ecological value or ecosystem services in the design.

Revetments

Revetments are typically sloped, composed of rocks or concrete units, and are built to protect a shoreline from erosion and flooding. The rocks reflect the wave action and reduce the impact on the land directly behind it, however, these structures can increase erosion rates at adjacent lands. Typically the neighboring property will either need to continue the hard structure or maintain their shoreline at more frequent intervals.

Ecosystem Services[iii]

Goods and services that are of value to people, provided in entirety or in part by ecosystems. Examples include water, flood damage reduction, and recreation opportunities.



Hardened shorelines protect property but leave neighboring areas susceptible to further erosion. Artwork courtesy of Loriann Cody

Bulkheads/Seawalls

Bulkheads and seawalls are vertical structures placed parallel to the shoreline and primarily function to hold the land in place, while protecting the upland area from wave action. Bulkheads are typically composed of wood and may require repairs if they are damaged by objects being slammed into the structure by powerful storm waves; whereas seawalls are usually constructed of concrete and are permanent structures. During times of extreme tides, these structures can be overtopped by flood waters. In order for these structures to function properly they must be maintained. It is likely that if a bulkhead or seawall is installed, the adjoining shoreline will erode since the structure is reflecting wave energy and preventing sediment transport. Eventually the ocean water will interact directly with the structure and the shoreline and habitat will disappear. The installation of a bulkhead or seawall can cause damaging erosion to alongshore properties.

Sediment Transport

On natural sandy beaches, sediments move on and off shore and along the shoreline. Due to the acting forces, and given room to move, natural beaches will maintain their profile in the face of extreme events and rising seas. Building erosion control structures typically disrupts natural forces and can result in accelerated rates of erosion at the site and nearby locations.

Permitting Considerations

Constructing any shoreline management option will require permitting. Make sure to consult with federal, state and local government acencies early in the planning process.

In New York State, one application is used to apply for permits from all state and federal agencies for projects that affect coastal areas. Instructions for filling out the application and the form itself are linked to the right.

If you have questions, contact any of the agencies listed on the application, New York Sea Grant, or South Shore Estuary Reserve.

New York State Joint Application Form Instructions
http://www.dec.ny.gov/docs/permits_ej_operations_pdf/jntappinstruc.pdf

New York State Joint Application Form
http://www.dec.ny.gov/docs/permits_ej_operations_pdf/jointapp.pdf

References

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ii. NYS Department of State, New York State Coastal Management Program and Final Environmental Impact Statement; https://www.dos.ny.gov/opd/programs/pdfs/NY_CMP.pdf

iii. National Ecosystem Services Partnership, Federal Resource Management and Ecosystem Services Guidebook; https://nespguidebook.com/

Millennium Ecosystem Assessment, Ecosystems and Human Well-Being: Synthesis; https://www.millenniumassessment.org/documents/document.356.aspx.pdf

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