

Final Project Recommendations for:
Upper Township, Cape May County
Prepared by Thomas Flynn, Coastal Resilience Coordinator
The Nature Conservancy in New Jersey
March, 2016

This project report is a summary of the information provided by utilizing the Restoration Explorer and is a complimentary planning component during the initial steps of developing a living shoreline project with coastal communities in NJ. It is intended to help municipal decision-makers lay the groundwork for planning a successful project by providing key information necessary to move forward with living shoreline projects. Once a project has been identified, the information in this report can be used in consultation with engineers and ecologists during the initial planning stages of the project.

Please be aware that living shoreline techniques suggested by the Restoration Explorer will require Federal, State, and local regulatory approvals. The Nature Conservancy and its partners make no representation that potential projects will gain all required Federal, State or local approvals. Before engaging in design work, please contact New Jersey's [Coastal Land Use Office](#) and local building officials for more specific information and guidance about the permits or other approvals which may be needed.

For additional information on key next steps for implementing living shorelines projects, please refer to [NOAA's "Guidance for Considering Living Shorelines 2015"](#) which describes 12 guiding questions and answers for communities that can be used to determine the best approach to stabilize the shoreline and sustain coastal connections between land and water.

Municipal Shoreline Summary: The coast of Upper Township, NJ is predominately salt marsh, with 90% of the 170.9 miles of coastline populated by marsh habitat. Across the township, approximately 23% of the coastline has been experiencing low to moderate rates of erosion and seventy seven percent has been experiencing either no erosion or accretion. Despite a lack of severe shoreline erosion, some areas of the township such as Strathmere, encounter significant tidal inundation and shoreline loss. Thus, this area of the township is addressed in this living shoreline report. More information on the miles of shoreline that are suitable for different living shoreline techniques can be found within the Restoration Explorer. It can also be found via the Municipal Summary provided by the Restoration Explorer and attached to this report.

Project Locations: Two locations in Strathmere, Upper Township, are identified in this report as areas to consider living shorelines techniques to reduce the effects of tidal marsh edge erosion. The first location is along Ocean Drive, where existing coastal habitats are serving as priority conservation areas by buffering critical roadway infrastructure. The second project location seeks to reduce erosion and extend the nearshore habitat benefits associated with a previously proposed living shoreline project near a boat ramp on Bayview Drive.



Figure 1. Citywide view of project location.

Project Location 1 - Ocean Drive:

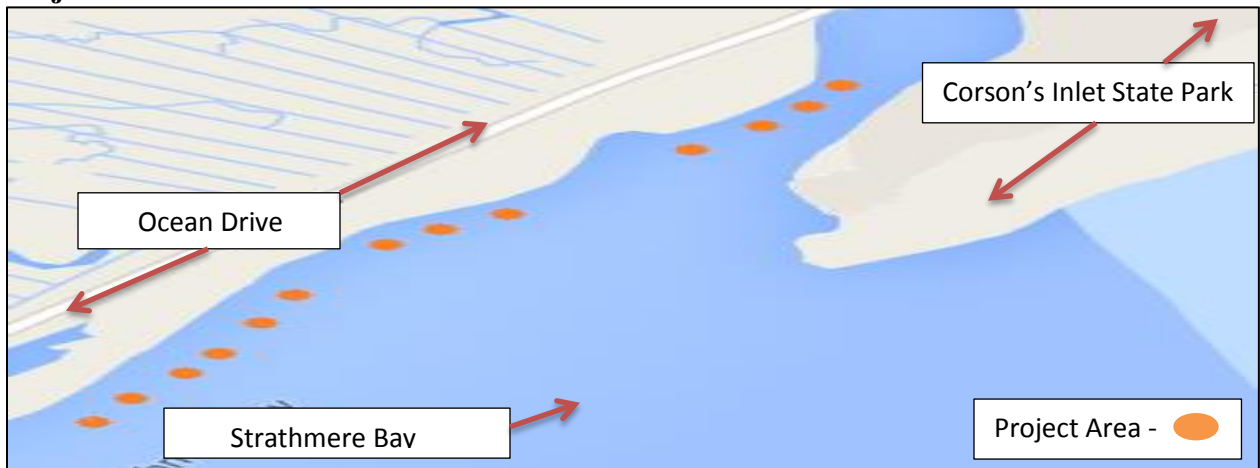


Figure 2. [Street Map](#)

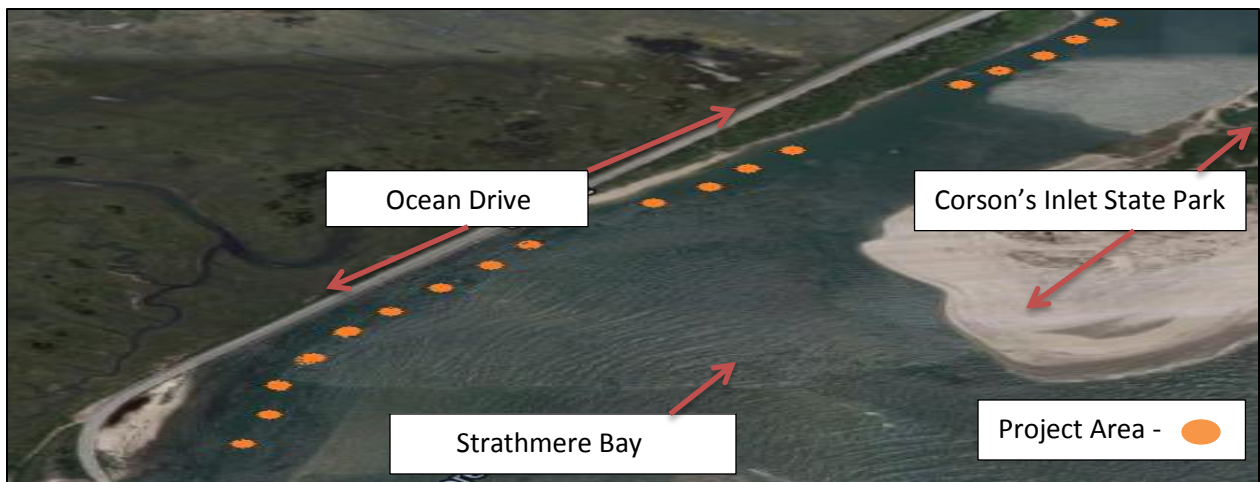


Figure 3. [3-D Aerial View](#)

Ocean Drive – Project Goals:

- Absorb wave energy and reduce shoreline erosion
- Increase aquatic habitat benefits
- Reduce nuisance flooding along the adjacent coastal evacuation route (Ocean Drive)

Project Summary: The project will seek to maximize resiliency efforts using a living shoreline technique in order to stabilize the coast, increase vertical accretion of the shoreline, and enhance aquatic habitat benefits along the coast of Ocean Dr. This road serves as a coastal evacuation route and is at risk of increased tidal inundation due to a loss of shoreline habitat as a result of erosion and sea level rise. A combination of living shoreline techniques that includes both a marsh sill and a breakwater could be appropriate for this project location.

Shoreline Condition: Along the shoreline of the proposed project area the Restoration Explorer shows that erosion rates are between 1ft.to 6ft. per year (Figure 4). Due to the rate at which the shoreline is eroding, the strong tidal energy associated with Strathmere Bay, and in an effort to reduce the frequency in which Ocean Dr. becomes inundated, hardened structural components such as stone are recommended to be included in this project in order to help ensure bank stabilization (see next section for recommendations).



Figure 4. Average erosion rate of project sites (from 1977-2012).

Recommended Technique: Marsh Sills (Figure 5) are low elevation structures (e.g., rocks or bagged oyster shell) that run parallel to the shoreline and are below water at high tide. The area between the sill and the marsh is often filled and/or planted with marsh vegetation to speed up shoreline stabilization. Marsh sills provide protection from wave energy and shoreline erosion. This living shoreline technique is utilized in low to moderate energy systems in order to help stabilize the shoreline through the accumulation of sediment in the area between the sill and the marsh.

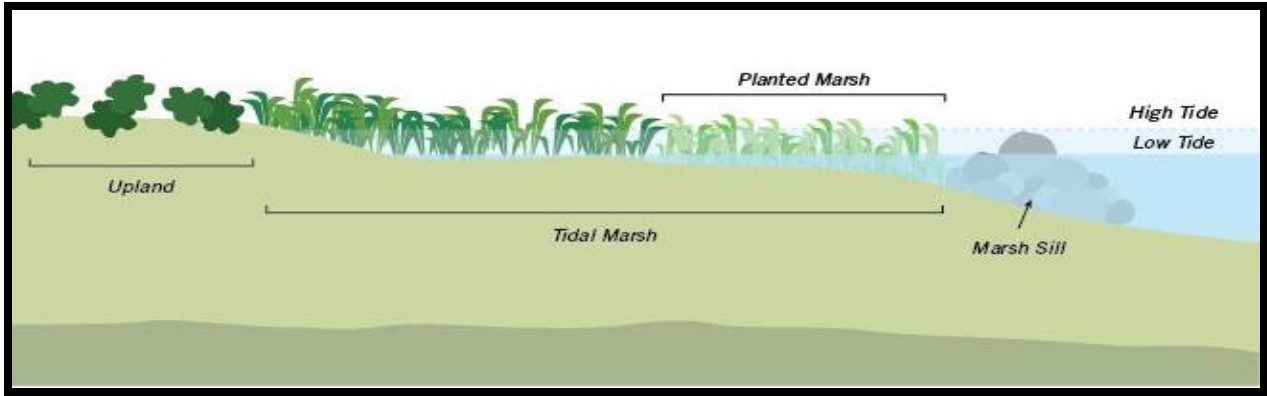


Figure 5. Graphic depiction of a marsh sill living shoreline technique.

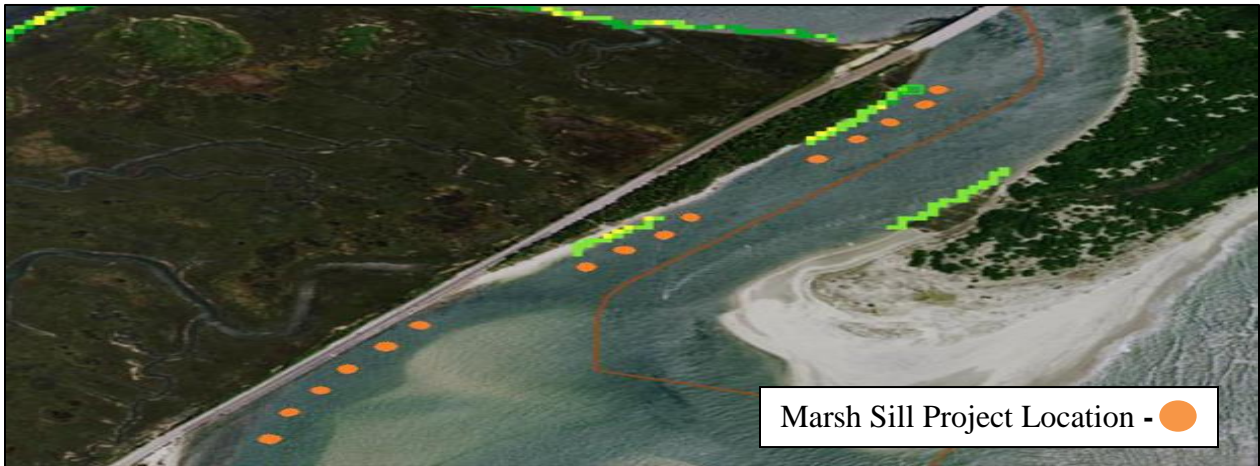


Figure 6. Restoration Explorer information on applicability of a marsh sill at the proposed project location.

Marsh Sill Environmental Conditions:

The implementation of a marsh sill along the selected project area meets key environmental conditions as outlined by the Restoration Explorer. A table describing the ways in which these considerations are met is included below.

Environmental Condition	Environmental Conditions met	Applicable Range for a Marsh Sill	Project location information
Shoreline Change Rate	Depends on selected 10x10 meter square	0 – 4ft./yr.	1ft. - 6ft./yr.
Tidal Range	No	0 - 4ft.	4.4ft.
Salinity	Yes	0 – >30 ppt.	31.9 ppt. – 32 ppt.
Wave Height	No	<1ft. - 3ft.	3.1ft.
Ice Cover	Yes	Low - Moderate	None
Shoreline Slope	Depends on selected 10x10 meter square	0 - 20%	2% - 26%
Nearshore Slope	Depends on selected 10x10 meter square	0 - 10%	1% - 11%

Rationale for a Marsh Sill

Marsh sills help to create a more natural transition between the tidal marsh edge and open water. This technique will attenuate nearshore wave energy and reduce erosion impacts on the shoreline. Additionally, marsh sills provide a sheltered environment for the protection of the tidal marsh behind the structure. Therefore, this technique safeguards the existing benefits associated with healthy tidal marshes, such as filtration of nutrient run-off and carbon storage. Tidal marshes promote biodiversity and can enhance near-shore aquatic habitat by creating additional shielded nursery areas for fish and bivalve recruitment.

Additional Recommended Technique: Breakwaters (Figure 7) are typically constructed parallel to the shoreline and designed to reduce the amount of wave energy experienced by the shoreline directly behind them. Sometimes a vegetated (typically marsh) shoreline is established behind the breakwater. Unlike marsh sills, they are constructed in deeper water with more energetic waves. They also tend to be slightly larger and are typically visible at high tide.

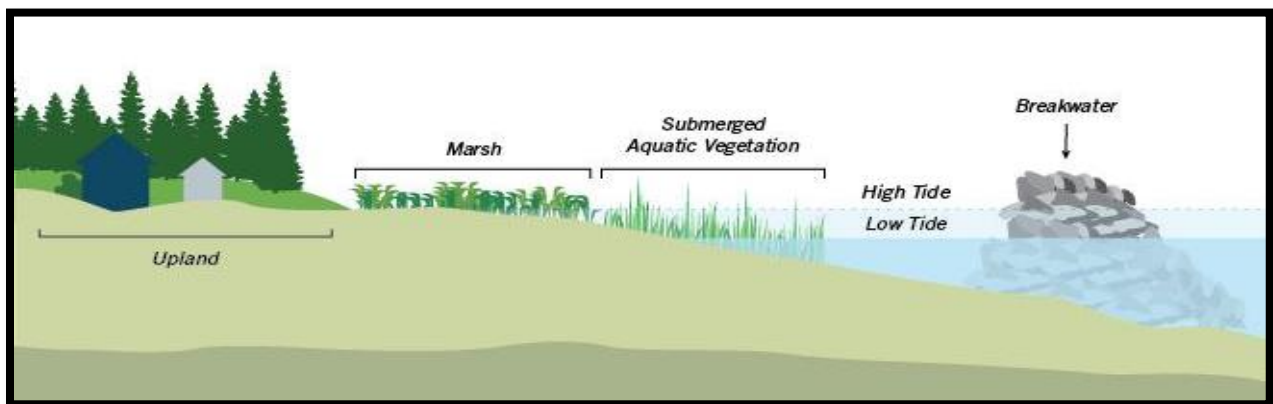


Figure 7. Graphic depiction of a breakwater living shoreline technique.



Figure 8. Restoration Explorer information on applicability of breakwaters at the proposed project location.

Breakwaters Environmental Conditions:

The implementation of breakwaters along the selected project area meets key environmental conditions as outlined by the Restoration Explorer. A table describing the ways in which these considerations are met is included below.

Environmental Condition	Environmental Conditions met	Applicable Range for Breakwaters	Project location information
Shoreline Change Rate	Yes	0 – >6ft./yr.	1ft. - 6ft./yr.
Tidal Range	Yes	0 – >6ft.	4.4 ft.
Salinity	Yes	0 – >30 ppt.	31.9 ppt.
Wave Height	Yes	<1ft. - >4ft.	3.1ft.
Ice Cover	Yes	Low - Higher	None
Shoreline Slope	Yes	0 - >20%	2% - 26%
Nearshore Slope	Yes	0 - 10%	1% - 10%

Rationale for Breakwaters

The shoreline abutting Ocean Dr. is eroding at a rate of 1ft. - 6ft. /year, and because Ocean Drive serves as a coastal evacuation route it’s important to consider a structural stabilization technique that can withstand the high energy tidal environment of Strathmere Bay. Breakwaters will help to attenuate strong wave action further from the shoreline and reduce the effects of erosion impacts. Additionally, stone breakwaters provide a hardened substrate for bivalves and organic material to accumulate. This can lead to an increase fish foraging and long-term primary production of nearshore aquatic habitat. This technique combined with a marsh sill can serve as a principle example of Upper Township’s ability to consider a range of nature-based solutions as a means for addressing community resilience.

Project Location 2 – Bayview Dr.

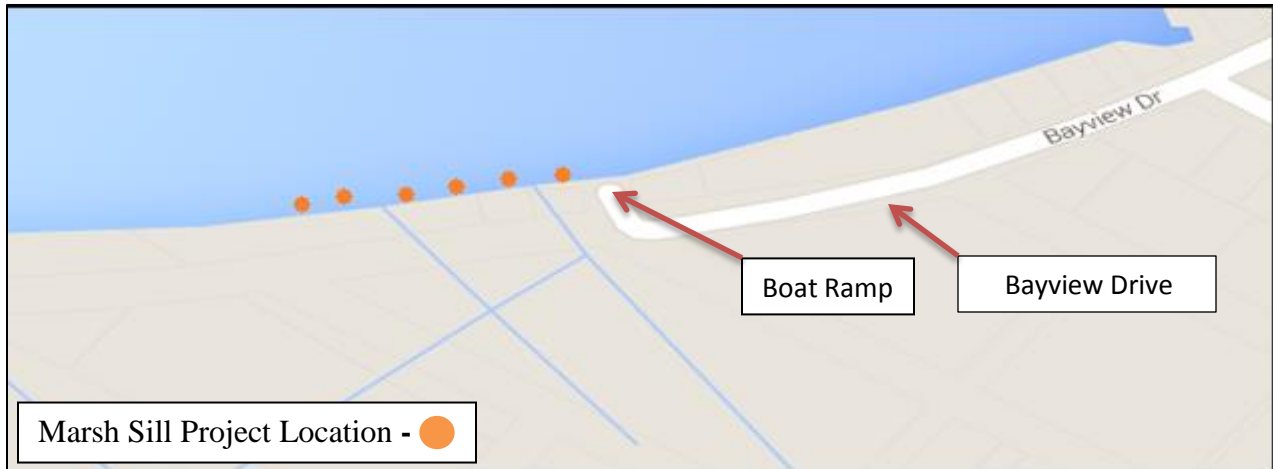


Figure 9. [Street Map](#)

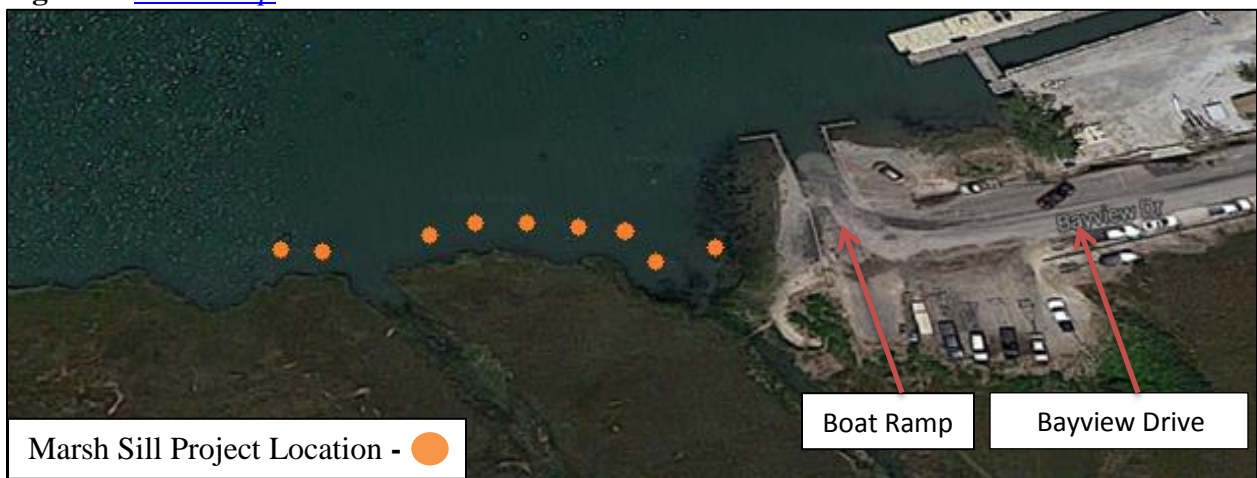


Figure 10. [3-D Aerial View](#)

Bayview Drive –Project Goals:

- Absorb wave energy and reduce shoreline erosion
- Extend aquatic habitat benefits of the already planned living shorelines project near the Bayview Drive. boat ramp.

Project Summary: The proposed project will seek to stabilize the shoreline, reduce erosion, enhance existing habitat benefits, and increase vegetative marsh regrowth along the tidal marsh shoreline adjacent to the Bayview Drive boat ramp. In addition, the project seeks to extend upon the ecological benefits associated with a previously planned living shorelines project near the boat ramp. Building upon the previously planned living shorelines project would also help to create additional pleasing aesthetics and enhanced natural view-sheds for recreational opportunities such as, boating, kayaking, and birding.

Shoreline Condition: Along the shoreline of the proposed project area the Restoration Explorer shows that erosion rates are between 1ft.-3ft. per year (Figure 11). Due to the rate at which the shoreline is eroding and the strong tidal energy associated with the location, structural

components such as stone are recommended to be included in this project in order to help ensure bank stabilization (see next section for recommendations).

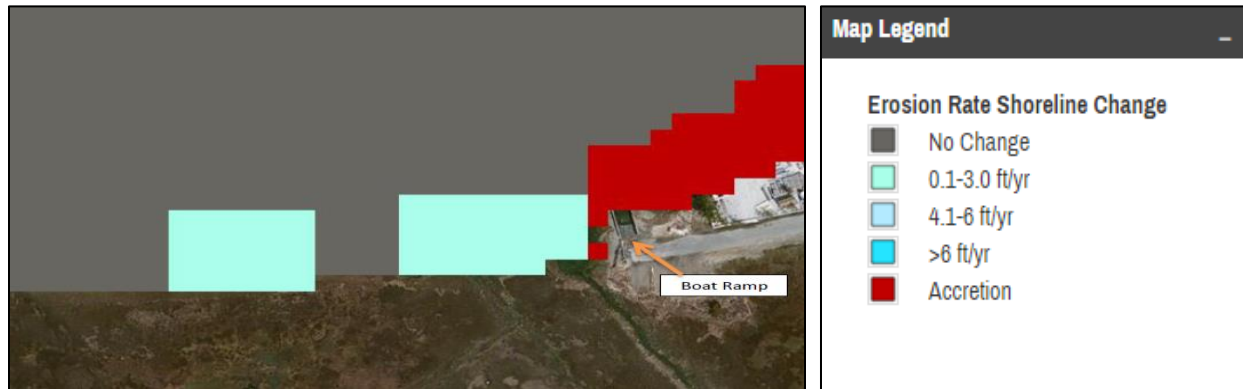


Figure 11. Average erosion rate of project sites (from 1977-2012).

Recommended Technique: Marsh Sills (Figure 12) are low elevation structures (e.g., small rocks or bagged oyster shell) that run parallel to the shoreline and are below water at high tide. The area between the sill and the marsh is often filled and planted with marsh vegetation to speed up shoreline stabilization. Marsh Sills provide protection from wave energy and shoreline erosion. This living shoreline technique is utilized in low to moderate energy systems in order to help stabilize marsh vegetation through the accumulation of sediment in the area between the sill and the marsh.

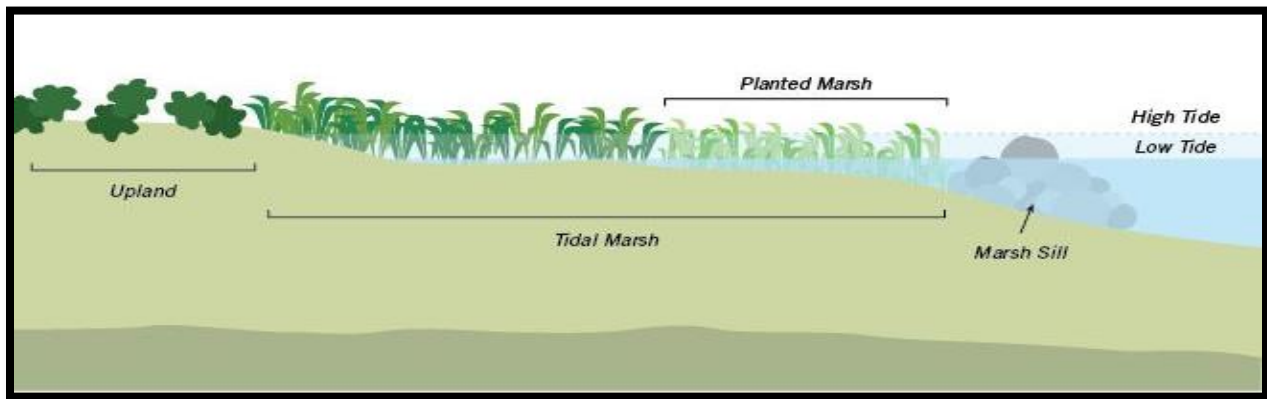


Figure 12. Graphic depiction of a marsh sill living shoreline technique.

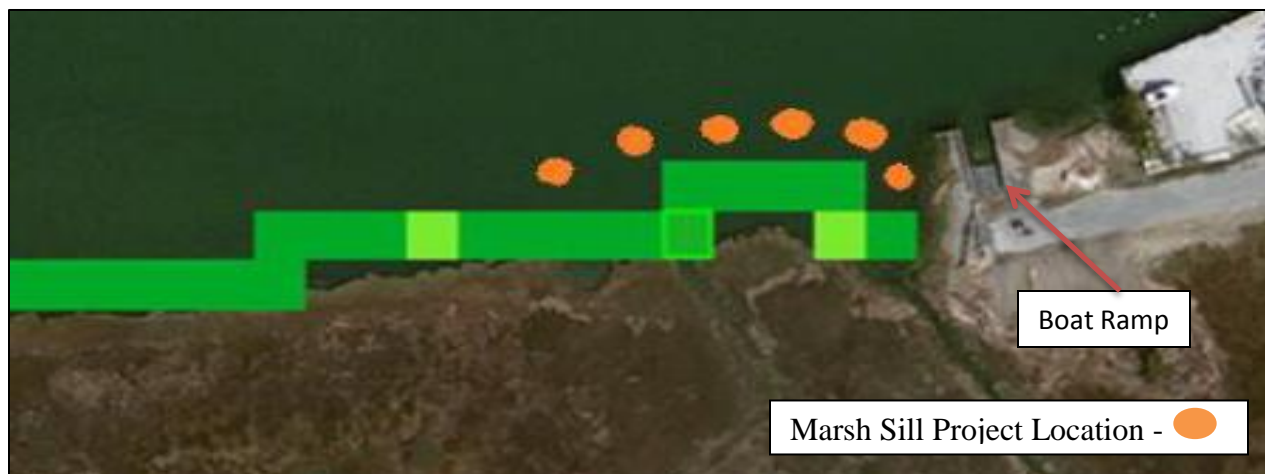


Figure 13. Restoration Explorer information on the applicability of a marsh sill at the proposed project location.

Marsh Sill Environmental Conditions:

The implementation of a marsh sill along the selected project area meets key environmental conditions as outlined by the Restoration Explorer. A table describing the ways in which these considerations are met is included below.

Environmental Condition	Environmental Conditions met	Applicable Range for a Marsh Sill	Project location information
Shoreline Change Rate	Yes	0ft. – 4ft./yr.	1ft. – 3ft./yr.
Tidal Range	No	0ft. - 4ft.	4.4ft.
Salinity	Yes	0 – >30 ppt.	31.6 ppt.
Wave Height	Yes	<1ft. - 3ft.	1ft.
Ice Cover	Yes	Low - Moderate	None
Shoreline Slope	Depends on the Selected 10x10 Meter Area	0 - 20%	2% - 26%
Nearshore Slope	Yes	0 - 10%	4% - 5%

Rationale for a Marsh Sill

A marsh sill will help to create a more natural increase in vertical accretion and reduce the impact of shoreline erosion. This technique will attenuate nearshore wave energy and reduce erosion impacts along the shoreline. Implementing a marsh sill in this location will seek to extend the already existing habitat benefits of the tidal marsh and the previously planned living shorelines project near the boat ramp. A marsh sill will build upon the coastal stewardship of

Upper Township by extending the use of nature-based solutions as a means for responding to shoreline erosion, increasing coastal ecological connectivity, and enhancing nature-based recreational opportunities like birding and kayaking.

Municipal Planning

Incorporating living shoreline projects into municipal plans can help to facilitate project implementation by opening up funding opportunities and/or providing a community with the ability to budget for a future project. Updates and revisions to municipal coastal resilience measures, such as shoreline restoration and enhancement strategies, are becoming more easily adapted into local planning efforts. For example, the New Jersey Municipal Land Use Law (MLUL) requires each municipality in the State to review and update its local master plan regularly. This affords an opportunity to include shoreline restoration and enhancement strategies not only in Upper Township's master plan but also in municipal floodplain management and hazard mitigation plans.

Inclusion of living shoreline strategies into different municipal plans can also benefit Upper Township's ability to budget and apply for State and Federal funding opportunities including, but not limited to, opportunities from the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Assistance, Pre-Disaster Mitigation, and Flood Mitigation Assistance programs. Communities that participate in FEMA's National Flood Insurance Program's Community Rating System can also receive discounted flood insurance premium rates to reward community actions.

Recommendations for additional data collection

Breakwater and marsh sill designs are carefully engineered to take into consideration numerous factors such as the effects of wave action on adjacent shorelines and the angle of the coast. Additionally, careful attention needs to be placed on the already planned living shoreline along a boat ramp of Bayview Drive in order to ensure that the proposed marsh sill project will not cause scouring and negatively impact the previously planned project. Additionally, tidal creeks are important ecological corridors that should remain unimpeded. Working with ecologists and engineers will ensure the security of these important tidal areas. Moreover, the proposed projects need to be assessed based on a variety of other conditions like drifting sediments and accessibility to the locations. Thus, because the data provided by the Restoration Explorer is high-level, and should be considered a first best inference at on-the-ground conditions, part of the design process should include consulting with engineers and ecologists to verify the conditions at the project site and provide site-specific design recommendations including the verification of the tidal range, slope of the shoreline, and wave energy at the site, among other key design criteria. Stevens Institute of Technology has created [engineering guidelines](#) that can help to inform your design process.

The cost of a living shoreline project will vary based on size, location and complexity. The *average* cost data included in the table below are sample estimates for the *materials* of living shorelines (adapted from [Seachange Consulting, 2011](#), [Rella, A., & Miller, J. Ph.D., 2012](#), and [Hafner, S., 2012](#)). The cost information is presented to show how costs for one technique might compare relative to another technique and, therefore, should only be used as a guide. Additional research will be necessary to craft a full project budget.

- Engineering and design of project*
- Labor associated with the construction of the living shoreline;
- Shipping of materials;
- Accessibility and procurement of bagged shell, oyster castle material, and stone,
- Annual or bi-annual project maintenance (e.g., additional vegetation plantings, removal of debris at the project site, possible repositioning of structural project components)

*The design cost is also heavily dependent on the amount of site specific information provided to the engineering firm, and the complexity of the proposed project. Please consult engineering and design firms for more accurate estimates.

Living Shoreline Technique	Estimated Cost	Additional factors to consider
<i>Marsh Sill</i>	\$75.00-\$150.00 per linear ft.	Factors to consider include: stone work, site preparation, procurement of stone, (potentially marl or lower fill material), and vegetation. Although marsh sills are able to function in a wide array of energy environments it's important to consider site specific conditions which might lend to an even more natural form of restoration technique, such as, nature-based living shorelines.
<i>Breakwater</i>	\$90.00-\$150.00 per linear ft.	Implementation of rock breakwaters in higher energy wave environments requires a scrutiny of the lower soil substrate conditions. Breakwaters will reduce wave energy but careful attention should be placed on monitoring bottom scour, which can result in negative unforeseen consequences effecting neighboring coastal areas.
<i>Bulkhead</i>	\$80-\$1,200 per linear ft.	Hard armoring traditional approach. (<u>Non-nature based technique</u>). Wave energy is reflected and not absorbed, which can result in bottom scour and loss of vegetation. Natural shoreline is eliminated, resulting in a loss of upland and shallow water habitat.

Potential Funding Sources

Although project funding can't be guaranteed, resources are available for communities to explore. An initial list of potential grant opportunities is provided below. Additional information can be found by following the hyperlink for each program.

- [NOAA Regional Coastal Resilience Grants Program](#) - The NOAA Regional Coastal Resilience Grants Program is centered on helping communities increase preparedness and improve coastal resiliency measures. This program is applicable to nonprofit organizations, institutions of higher education, regional organizations, private (for profit) entities, and local, State, and tribal governments organizations that work toward resiliency strategies for land and ocean use, disaster preparedness, environmental

restoration, and hazard mitigation projects benefiting coastal communities in one or more of the 35 U.S. coastal States or territories. In addition, awards range from \$500,000 to \$1 million for projects lasting up to 36 months.

- [The Department of the Interior Fish and Wildlife Service, Coastal Program](#) – The Department of the Interior Fish and Wildlife Service, Coastal Program utilizes the tax revenue from hunting, boating, and fishing in order to reinvest in conservation and coastal wetland ecosystems. A primary goal of the program is centered on seeking to help mitigate flooding and increase water quality. Most recently this program has helped to provide \$21 million dollars in grant funding in order to help improve more than 11,000 acres.
- [U.S. Environmental Protection Agency \(EPA\) Urban Waters Small Grants Program](#) – The U.S. EPA funding opportunity addresses urban runoff pollution to best serve community health benefits, with emphasis on underserved communities with award amounts of up to \$60,000. The proposed project must take place entirely within one of the [Eligible Geographic Areas](#). This program helps to influence how healthy and accessible urban waters can help to grow local businesses and enhance educational, recreational, and social and employment opportunities.
- [New Jersey State Department of Environmental Protection \(NJDEP\) - Shore Protection Grants and Loans program](#) - In an effort to protect existing development from sea-level rise, this NJDEP funding opportunity offers a cost share program whereby 25% of the cost is municipally funded & 75% of the cost is State funded. Loans are available from the State for the 25% of the cost owed by the municipality. For additional questions regarding qualification for this program contact the [NJDEP-Office of Engineering and Construction](#),
- [The New Jersey Corporate Wetlands Restoration Project](#) -The New Jersey Corporate Wetlands Restoration Project is a public-private partnership that works to help fund a multitude of restoration work including living shorelines. The project must be located in New Jersey, have a Federal partner, and meet a request for funding generally below \$25,000.00. Each project will need to include the submittal of the NJCWRP Project Executive Summary Sheet and include a project location map. For examples and templates of submittal forms [click here](#).
- [Environmental Solutions for Communities Initiative](#) - Wells Fargo and NFWF are providing grants ranging from \$25,000 to \$100,000 to localities for sustainability projects. Wells Fargo and NFWF are supporting engagement with at least 4-8 neighborhoods with the goal of helping these communities become more sustainable through conserving critical land and water resources, improving local water quality, and restoring and managing natural habitat, species, and ecosystems.

Project Permitting

All living shoreline projects in New Jersey are subject to state and federal permitting requirements. It's recommended to consult with relevant permitting agencies early in your planning process (prior to the completion of formal designs) to ensure that the potential project

can be permitted. Should there be any issues with conceptual designs, representatives from the state and federal agencies can provide recommended changes to the project design to help ensure a smooth permitting process.

State Permitting Requirements: [N.J.A.C. 7:7 Coastal Zone Management Rules](#). This regulation enables living shoreline projects to be implemented under the State of New Jersey Department of Environmental Protection Division of Land Use Regulation. Lawfully this provision is recognized as Coastal General Permit 24 (N.J.A.C. 7:7-6.24.) With questions or concerns regarding regulations and permitting contact the NJDEP [Coastal Land Use Office](#).

Federal Army Corps of Engineers (USACE) Permit: Depending on the goals and design of a living shoreline project, it will need either a “nationwide” or “individual” permit before construction can begin. [Nationwide Permit 13 \(NWP-13\)](#) is centered on shoreline bank stabilization. A Pre-Application Meeting Request Form is required to be completed *before* the NWP-13 application. In addition, the Individual Permit Application Submittal Form is a complementary procedure and only should be completed if the Nationwide Permit is not applicable for a specific project. For more information on the different permits and necessary forms, visit the [USACE webpage](#).

NJ Bureau of Tidelands Licensing Requirements: The State of New Jersey has ownership of Tidelands public lands. Tidelands are considered to be land currently and previously flowed by the mean high tide of a natural waterway. Written permission from the State and a fee are required in order to use these lands. A [Tidelands license or lease](#) is required for submerged structures that are constructed off shore, and are situated anywhere from the tidelines line landward (i.e. Breakwaters, Living Reef Breakwaters).

Additional Considerations

- Additional factors are discussed in the [Stevens Institute of Technology \(SIT\): Guidelines to Living Shorelines](#).
- Consider the feasibility of public access in relation to developing a project with a goal of enhancing economic development.
- Impacts to adjacent properties should be considered when identifying living shoreline project areas. Shifts in wave energy and bottom scour can result in negative unforeseen consequences to neighboring locations if not examined properly.
- Careful attention should be placed on the nature and quality of fill during project construction in order to ensure that restoration occurs utilizing the most ecologically conducive material.
- Project planners should engage State officials early in preparatory project stages when considering to plant and/or seed commercial shellfish species.
- All living shoreline projects also require a letter of approval from the land owner or land manager. Make sure to discuss property boundaries and relevant local concerns with local municipal officials.

Next Steps

Local conservation organizations can be helpful advisors to municipalities that are interested in pursuing a living shoreline project. It's most useful to consult with local conservation groups and

State permitting officials early in the planning process for a living shoreline project to ensure the highest likelihood of success: An effective planning process should include the steps below. These are not necessarily in order, but each is important to address at some point in your planning process.

- 1. Engage property owner.** The owner of the property should be included in the planning and implementation of a living shoreline project from the outset to both minimize conflict and maximize project success.
- 2. Set project goals.** Goal setting should take priority in the planning process. Determine what the project seeks to achieve and note the existing environmental conditions (e.g., eroding shoreline, etc.) If shoreline stabilization is a goal of the project then design and monitoring should be centered on meeting that goal.
- 3. Determine a timeline.** Understanding time constraints for permitting and construction will heavily determine the factors for timing. Be sure to note all fixed dates for funding applications and consult with conservation groups about the best time of year to start a project to avoid disrupting migratory birds and fish.
- 4. Identify project partners.** Project partners can assist with design, implementation and maintenance of the site. This can include conservation groups as well as community organizations.
- 5. Determine permitting requirements.** Consult with municipal and State officials in order to best assess how project recommendations can be implemented and permitting requirements fulfilled. It is highly recommended to work with the NJDEP [Coastal Land Use Office](#) and the [U.S. Army Corps of Engineers](#) during the early planning stages of the project, while applying for permits, and through the on-the-ground implementation stages of the of the project.
- 6. Develop your project budget and potential funding sources.** Establishing a project budget will determine the size of your project. Contact funding sources and determine the most applicable possibilities, as well as timelines for proposal submission, etc.
- 7. Determine site conditions and develop project design.** Work with engineers and marine contractors to develop specific project designs. The RE data should only be used as a screening tool. Collecting site specific information is critical to engineering and design.
- 8. Develop a monitoring plan.** For guidance on developing a monitoring plan you can refer to “A Framework for Developing Monitoring Plans for Coastal Wetland Restoration and Living Shoreline Projects in New Jersey,” which can be found at the [Coastal Resilience Resources webpage](#).
- 9. Plan for project construction.** Contact marine contractors to determine a construction schedule, access to materials, and pricing. Also, conduct site visits during preparation stages to monitor conditions and establish an on-the-ground layout of the project using GPS coordinates and visual markers. In preparation for the installation of the project, work with local conservation organizations to best coordinate volunteers, the construction schedule, preliminary site work, tools, access to the site, and to galvanize media attention.

Living Shoreline Snapshot

Upper Township, Cape May County

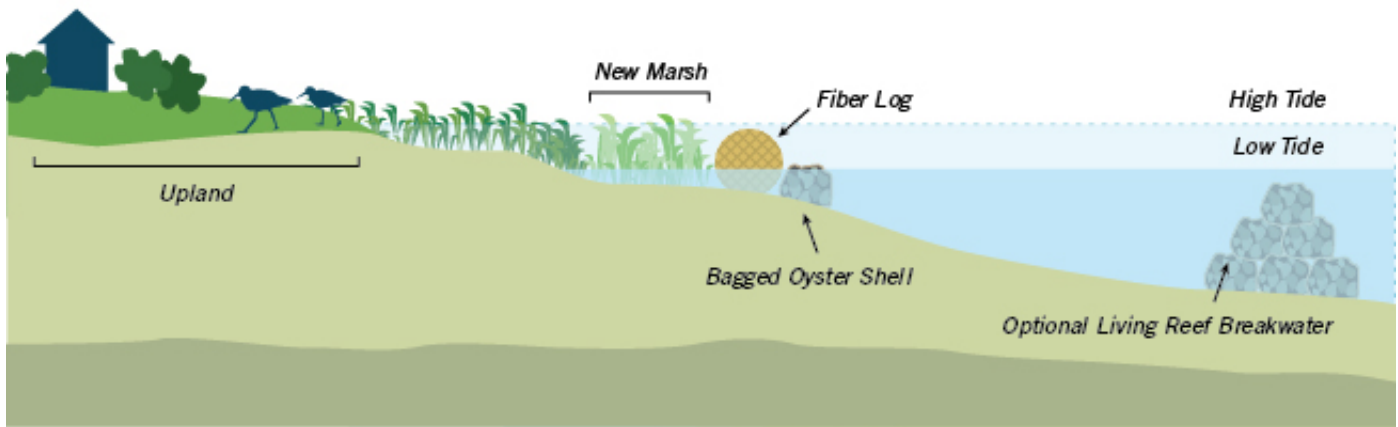
What is a living shoreline?

A living shoreline is a nature-based alternative to bulkheads to address coastal erosion by providing for the protection, restoration or enhancement of these habitats. As indicated by NJDEP, this is accomplished through the strategic placement of plants, stone, sand, or other structural and organic materials. **Natural living shorelines** include natural vegetation, submerged aquatic vegetation, fill, and biodegradable organic materials (see graphic below). **Hybrid living shorelines** incorporate natural vegetation, submerged aquatic vegetation, fill, biodegradable organic materials, and low-profile rock structures such as segmented sills, stone containment, and living breakwaters seeded with native shellfish. **Structural living shorelines** include, but are not limited to, revetments, break-waters, and groins. Additional information on different types of living shorelines can be found on the NJDEP [webpage \(PDF\)](http://www.nj.gov/dep/cmp/docs/living-shorelines-engineering-guidelines-final.pdf). (<http://www.nj.gov/dep/cmp/docs/living-shorelines-engineering-guidelines-final.pdf>)

DISCLAIMER: Living shoreline projects have a variety of ecological and engineering requirements and can often be mixed and match to tailor projects designs to local conditions. It is important to consult with ecologists and engineers to determine the specific design requirements for any proposed project. It is also important to consult with federal, state and local officials regarding permitting requirements. Resources are listed below.

Nature-Based Living Shoreline

Nature-based living shorelines are best in low-energy areas. "Biological enhancements," like biodegradable fiber logs (which also provide habitat for ribbed mussels) or Christmas trees, are placed along the tidal marsh edge to provide a contained area for sediment to accumulate and marsh vegetation to grow. In more moderate energy areas, it might be possible to use a hybrid approach that pairs nature-based living shorelines with living reef breakwaters.

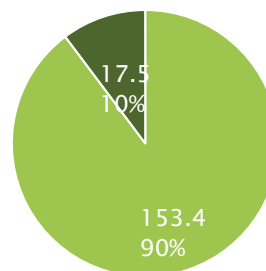


Coastal Shoreline Condition

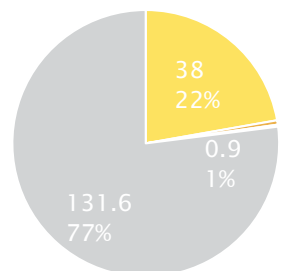
Identifying how the shoreline is changing and how fast provides important background for a living shoreline project and can help to ensure a living shoreline project's success. Understanding existing shoreline environmental parameters helps to better conceptualize enhancement techniques that can be applied.

Shoreline Length (Miles)

Total: 170.9



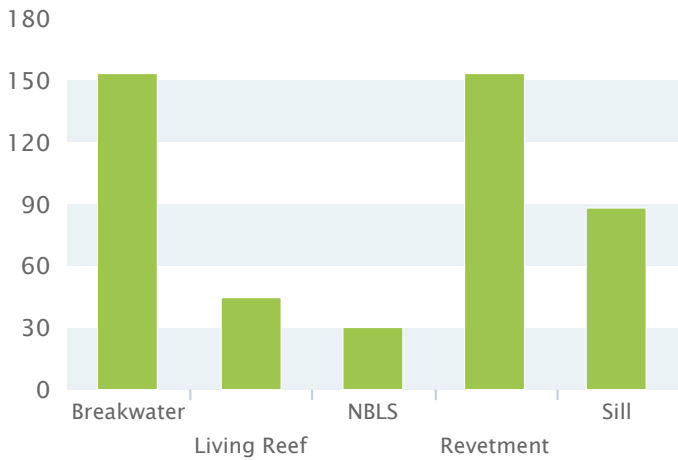
Erosion Rates (Miles)



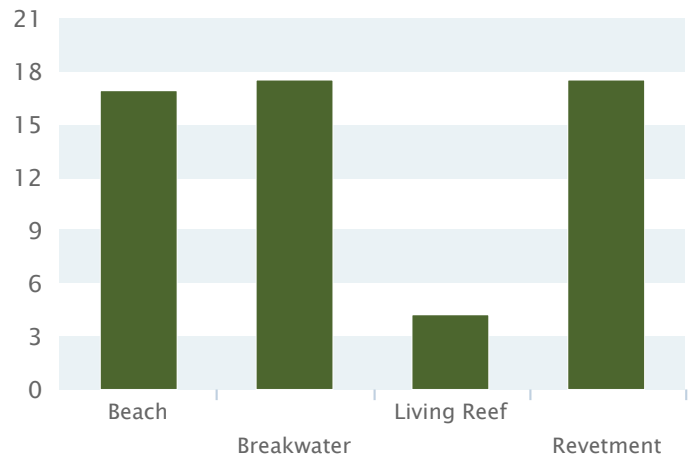
Promoting The Most 'Natural' Solution

Determining which living shoreline techniques are applicable for a given area is based on ecological and engineering requirements. Each technique varies in both design and implementation. The graphs below highlight the applicability of each shoreline enhancement technique per the available miles of coastline. When suitable, the more 'natural' solutions will provide communities with the multiple benefits associated with healthy coastal habitats, including wave attenuation, improved water quality and increased habitat for important fish species. For instance, when applicable, the greatest environmental benefit is achieved through the implementation of a Nature-Based Living Shoreline instead of an Ecologically Enhanced Revetment. Click [here \(http://coastalresilience.org/\)](http://coastalresilience.org/) to learn more.

Miles of Marsh Technique (153.4 miles total)



Miles of Upland Technique (17.5 miles total)

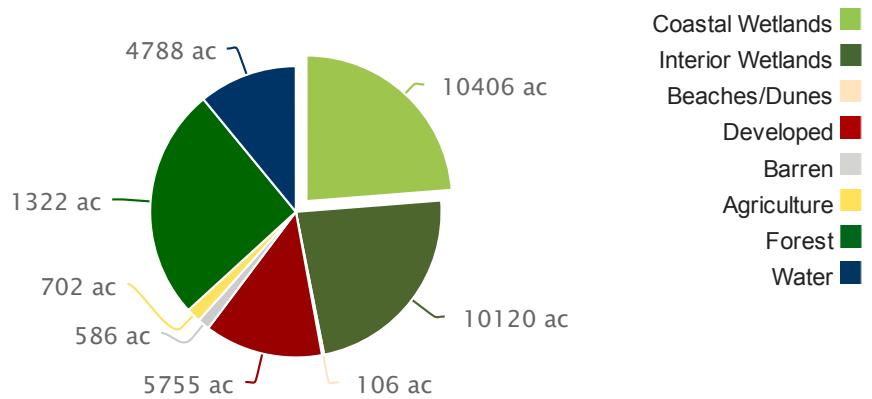


What Habitat Exists?

Coastal habitats provide important storm and flood buffering benefits as well as serve as critical wildlife habitat and public open space

While our tidal marshes have some protection from dredging, filling and development by New Jersey's pioneering Coastal Wetlands Protection law of 1970, some loss still occurs. Between 1986 and 2012, **423 acres** of tidal marsh have been lost in **Upper Township** due to human development and/or natural processes.

Amount of Land Use/Land Cover (acres) Total: 43785 ac



Implementing Living Shoreline Projects

The Restoration Explorer is an on-line decision support tool designed to help community leaders during the initial steps of planning a living shoreline project. The Restoration Explorer helps users to identify nature-based coastal resilience techniques to stabilize New Jersey's shorelines. Community leaders can utilize the Restoration Explorer and other applications on the Coastal Resilience tool as a platform to discuss the ways in which local concerns can be addressed through the implementation of living shorelines.

However, please be aware that living shoreline techniques suggested by the Restoration Explorer may require Federal, State, and local regulatory approvals and The Nature Conservancy makes no representation that potential projects will gain all required Federal, State or local approvals. Before engaging in design work, please contact New Jersey's [Coastal Land Use Office \(http://www.nj.gov/dep/lum/lup.htm\)](http://www.nj.gov/dep/lum/lup.htm) and local building officials for more specific information and guidance about the permits or other approvals which may be needed.

Next Steps

Not all restoration techniques are applicable for every community. It is important to recognize that the success of a living shoreline project is contingent upon recognizing relevant ecological and engineering considerations, funding requirements, and municipal planning scenarios.

- 1. Contact local conservation groups and engage engineers.** Working closely with conservation organizations is a good way to ensure that all ecological considerations are well addressed. Conservation organizations can help to provide ecological expertise along with advice regarding permitting and construction ([Click here \(http://delawareestuary.org/living-shorelines\)](http://delawareestuary.org/living-shorelines) to view the Partnership for the Delaware Estuary's webpage about working with living shorelines). It is also important to consult with engineers to determine specific design requirements for living shoreline techniques recommended by the Restoration Explorer. [Click here \(PDF document\) \(http://www.nj.gov/dep/cmp/docs/living-shorelines-engineering-guidelines-final.pdf\)](http://www.nj.gov/dep/cmp/docs/living-shorelines-engineering-guidelines-final.pdf) to find out more about engineering requirements.
- 2. Identify potential funding sources.** State, Federal, or locally sourced funding depends upon the availability of grants and programs centered on coastal restoration and enhancement. Federal opportunities include: [NOAA Regional Coastal Resilience Grants Program \(http://coast.noaa.gov/resilience-grant/\)](http://coast.noaa.gov/resilience-grant/), and [Department of the Interior Fish and Wildlife Service - The Coastal Program \(http://www.fws.gov/coastal/CoastalGrants/\)](http://www.fws.gov/coastal/CoastalGrants/), opportunities from the State of New Jersey include: [Shore Protection Grants and Loans – State of N.J. Department of Environmental Protection \(http://www.nj.gov/dep/grantandloanprograms/nhr_spql.htm\)](http://www.nj.gov/dep/grantandloanprograms/nhr_spql.htm).
- 3. Identify how to incorporate projects into existing municipal plans.** The Restoration Explorer is meant to work with existing municipal plans, and function as a guideline for preparing your own unique project(s). Living shoreline projects can be integrated into existing community plans by noting their ability to enhance natural habitats and strengthen shorelines. Integrating living shorelines into municipal plans offers a governmental means by which projects can be organized and implemented through carefully thought out policies relevant to a localized community.

Additional Resources

- **The Nature Conservancy (TNC) – New Jersey Chapter** (<http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/newjersey/>) TNC resources can help planners better understand coastal ecological benefits associated with living shoreline projects.
- **American Littoral Society (AmLS)** (<http://www.littoralsociety.org/>) AmLS provides resources for project planners about habitat restoration and overall environmental health.
- **Barnegat Bay Partnership (BBP)** (<http://bbp.ocean.edu/pages/1.asp>) BBP can help planners better understand the ways in which community outreach can help projects gain support.
- **Partnership for the Delaware Estuary (PDE)** (<http://www.delawareestuary.org/>) PDE provides resources for planners centered on project implementation and scientific research.
- **Stevens Institute of Technology (SIT): Guidelines to Living Shorelines (PDF document)** (<http://www.nj.gov/dep/cmp/docs/living-shorelines-engineering-guidelines-final.pdf>) SIT can help planners to better understand the engineering parameters of living shoreline implementation.
- **Rutgers University Center for Remote Sensing and Spatial Analysis (Rutgers)** (<http://crssa.rutgers.edu/>) Rutgers CRSSA can be a useful resource to learn about geospatial information sciences and how mapping can be an effective tool for planning a project.
- **NJ Department of Environmental Protection (NJDEP)** (<http://www.nj.gov/dep/landuse/activity/livingshore.html>) NJDEP can assist planners in better understanding State regulations concerning living shoreline management and permitting.
- **National Oceanic & Atmospheric Administration (NOAA)** (<http://www.noaa.gov/>) NOAA resources can help planners better understand habitat zones and living shorelines treatments.

