

MASTIC BEACH MARSH

RESTORATION BUILDS COMMUNITY RESILIENCE

CHALLENGE

Riviera Road is almost constantly flooded due to sea-level rise.

SOLUTION

Restoration will replace **1.75 acres** of roadway with high-quality marsh and reconnect 40 acres to regular tidal flow.

BENEFITS

The Mastic Beach community will receive **\$379,000** in ecosystem benefits each year, a return of \$15 for each dollar spent.

BACKGROUND

Mastic Beach, New York, a community of 12,000 within the town of Brookhaven on Long Island's Atlantic coast, sits on the front lines of climate change. With 45% of its area in the 100-year floodplain, the community faces the brunt of Atlantic storms with models predicting substantial risk from sea-level rise, tidal flooding, and storm surge. Though receiving some protection from patches of historic coastal marsh and from Fire Island just across Narrow Bay, the risk from Atlantic storms is substantial. In 2012, Superstorm Sandy unleashed intense flooding and surge directly on Mastic Beach. The resulting inundation stranded 100 residents and damaged more than 1,000 single-family homes, leaving about 70 uninhabitable and hundreds vacant a year later.¹ The storm also caused extensive erosion and damage to local beaches.

Following Sandy, the community searched for ways to increase resilience and reduce risk from rising seas and intensifying storms. The *NY Rising Community Reconstruction Plan for Mastic Beach and Smith Point*¹ identifies over 2,000 single-family homes that have "extreme" or "high" risk of flooding, with the risk increasing through the end of the century. One strategy of a multi-pronged approach to protect the community outlined in the reconstruction plan is leveraging and restoring tidal marshes as important, cost-effective natural barriers. Healthy, restored marshes provide protection and are also more likely to be able to naturally move, or "migrate," inland and upland as water levels rise over time.



Clapper Rail

Photo: Bill Dix/Audubon Photography Awards



Photo: Benjamin Maher/Audubon

RIVIERA ROAD REMOVAL AND RESTORATION

The removal and restoration of three road segments identified in the Riviera Road Removal and Restoration Plan (the "Project") provides a win-win proposal for the community and wildlife. The project will restore coastal marshes that birds rely on for food, nesting, and safe resting during migrations along the Atlantic Flyway, including the imperiled Saltmarsh Sparrow.

The Project will create 1.75 acres of new high marsh.

Coastal marshes flooded periodically during monthly high tides, in place of the existing road surface, will re-establish tidal connectivity with more than 40 acres of surrounding high and low marsh that has been degraded by restricted tidal flows for decades.^{2, 3}

Removal of the roadway will also relieve the Town of Brookhaven from more than \$100,000 in annual maintenance costs spent to fix the roadway that is now frequently damaged, not only by storms but often by high tides. The restored marsh is also expected to provide incremental storm protection for the surrounding community, though quantifying this benefit is challenging.



THE MANY BENEFITS OF MASTIC BEACH MARSH



RESILIENCE

Reduces the impact of flooding caused by storm surge from Atlantic storms and intense rainfall, thus protecting homes, businesses, and critical infrastructure.



HEALTHY ECOSYSTEMS

Provides low and high saltwater marsh habitat that is vital for local wildlife and migrating birds.
Cleans the air and filters nutrients and pollutants from runoff.
Captures and stores carbon from the atmosphere to help mitigate climate change.



COMMUNITY

Provides local opportunities for birding, walking, boating, fishing, and hunting that bring residents together.
Provides aesthetic beauty in the community that improves the quality of life and increases property values.
Provides opportunity for volunteer engagement and local jobs and business revenue associated with recreation and restoration.

HEALTHY MARSHES SUPPORT COMMUNITY RESILIENCE

Beyond its many ecological roles, a restored marsh will provide substantial economic value to the community of Mastic Beach and beyond. Ecosystem services represent the economic benefits that people and communities receive from nature. *Ultimately, new marsh created through the Project will provide more than \$73,000 per year in benefits to the community.*

In addition to the direct benefit of replacing the road with marsh, project planners anticipate improved tidal connectivity and functionality in the adjacent 40 acres of marsh previously cut off from regular tidal inflow by the road, called the “Improvement Area” here. The benefits from this area are estimated to increase by 20 percent or more, adding an additional \$306,000 in benefits to the project per year. Post-project ecological assessments will measure actual improvements over the coming years. Table 1 summarizes the anticipated benefits expected per year. It is important to note that economic methods and ecological data are only available for a fraction of the ecosystem benefits expected from the marsh. The true value will likely be much larger.

The Project is part of a larger plan, the *Ecological Restoration & Managed Retreat of Southern Mastic Beach*, to restore natural ecosystems and function of 147 acres along the local shoreline. This work will create another 5.25 acres of high-quality marsh and contribute an additional \$173,000 per year in a similar array of benefits to the community. Without these two restoration efforts, the Mastic Beach community would miss out on over \$550,000 of annual benefits in total.

Table 1. Project Benefits (\$/Year)*

SERVICE	NEW MARSH	IMPROVEMENT AREA
 RESILIENCE		
FLOOD PROTECTION (RAINFALL/RIVERINE)	\$2,183	\$9,907
STORM PROTECTION (HURRICANE/SURGE)	\$25,690	\$100,655
 HEALTHY ECOSYSTEMS		
CARBON CAPTURE	\$7,082	\$28,806
HABITAT	\$5,315	\$24,125
WATER QUALITY	\$12,092	\$54,885
 COMMUNITY		
AESTHETIC BEAUTY	\$4,107	\$18,639
RECREATION	\$3,109	\$69,441
VOLUNTEER ENGAGEMENT	\$13,560	
TOTAL	\$73,138	\$306,457

* **Model Assumptions**

High/Low Marsh extent informed by the Sea Level Affecting Marshes Model (SLAMM 2055) using the high-mid results.

Assumes 10 percent increase in recreation visits due to marsh improvements.

Assumes 5-year establishment period for new marsh.

Assumes adjacent marsh improvement of 20 percent in ecosystem service provision.

A healthy marsh complex in the Long Island Sound Area
Photo: Benjamin Maher/Audubon

RESTORATION IS A GOOD BUSINESS PROPOSITION

The Riviera Road Removal and Restoration Plan will produce benefits over many years similar to any other type of built asset, like a building or bridge. This stream of benefits can be used to calculate an asset value and benefit-cost ratio for the restoration. This information helps decision-makers and funders compare this restoration project to other nature-based and gray infrastructure project alternatives that may also be under consideration.

- **ASSET VALUE** The asset value, benefits minus costs, of the marsh improvements will be \$6.7 million over a 35-year lifespan – a very conservative estimate for a marsh.⁵ This estimate accounts for projected sea-level rise and the resulting conversion of high marsh to low marsh within the project area.
- **BENEFIT-COST RATIO** Another way to assess the Project is to compare the benefits and costs of the project over time as a measure of the project's economic viability. A benefit-cost ratio of greater than 1.0 indicates that the benefits outweigh the costs and the project is a worthwhile investment. The Project has a benefit-cost ratio of approximately 15:1, meaning that each dollar invested will return more than \$15 in benefits, indicating a highly cost-effective project and a good use of funds. This is intended as a comprehensive comparison of benefits and costs. A ratio produced pursuant to federal guidelines would likely be lower, as FEMA and other agencies may only allow for consideration of a subset of these values.

Clearly, the Project offers significant economic value to the community. The Project is also expected to build social cohesion and community well-being by providing opportunities for residents to connect through volunteer activities and increased recreation at this new and improved marsh and associated amenities. The benefits in this analysis represent only a fraction of the project's value due to gaps in ecological data and economic methods. As understanding increases, so will the values. Through projects like the Riviera Road Removal and Restoration Plan, communities along the Atlantic Coast can apply similar methods to adapt to rising seas and rebuild the marshes that historically blanketed the coast from Maine to Florida.

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ENDNOTES

¹ NY Rising Community Reconstruction Program. 2014. NY Rising Community Reconstruction Plan for Mastic Beach/ Smith Point of Shirley. Prepared by the Mastic Beach and Smith Point of Shirley Planning Committee for the Governor's Office of Storm Recovery, New York, NY. Available online at: https://stormrecovery.ny.gov/sites/default/files/crpf/community/documents/masticbeach-smithpointofshirley_nyr-cr-plan.pdf.

² Wang, F., Eagle, M., Kroeger, K.D., Spivak, A.C., Tang, J. 2020. Plant biomass and rates of carbon dioxide uptake are enhanced by successful restoration of tidal connectivity in salt marshes. *Science of the Total Environment* 750: 141566.

³ Roman, C.T., Niering, W.A., Warren, R.S. 1984. Salt marsh vegetation change in response to tidal restriction. *Environmental Management* 8: 141-149.

⁴ Costanza, R., Pérez-Maqueo, O., Martinez, M.L., Sutton, P., Anderson, S.J., and Mulder, K. 2008. The Value of coastal wetlands for hurricane protection. *Ambio* 37:241-248.

⁵ This calculation requires a discount rate to account for (social) "time preference" – the fact that people typically value a dollar in hand more than a promised, future dollar. Discount rates can also account for the opportunity cost of capital and risk. The discount rate allows comparison of costs and benefits in future years to those in the present. A discount rate of 3 percent is used for these calculations, which is a widely accepted rate for investments that provide long-term social and environmental benefits. Federal programs, including FEMA, may require a higher rate of 7 percent, as set by the Office of Management and Budget in 1992.

