Application for Funding Under the Community Preservation Act

Town of Chatham - Electronic Application for Funding Under the Community Preservation Act

Project Title:	Field Studies to Preserve Open Space for Salt Marshes
Application Date	10/24/2024
Contact Person's First Name	Gerry
Last Name	Stahl
Phone Number	(215) 260-7467
Email Address	gerry@gerrystahl.net
Amount Requested from Chatham CPA	$140,000
Total Cost of Project	$140,000
Other Revenue Sources Including Private/Public/In-Kind	N/A
Name of Organization Applying to Chatham CPA	Co-Applicants: Energy and Climate Action Committee (ECAC) of the Town of Chatham and the Department of Natural Resources of the Town of Chatham
Address:	Chatham, MA
Website:	https://www.chatham-ma.gov/348/Energy-and-Climate-Action-Committee, https://www.chatham-ma.gov/QuickLinks.aspx?CID=75
Federal Tax ID Number (if non-profit)	*Field not completed.*

Names of Governing Board, Trustees and Directors	Robert Wirtshafter (Chair), Adrianne Lovuolo (Vice Chair), Gerry Stahl, DeeDee Holt, Sarah Griscom, Katherine McClellan, Brian Miner, Rachel Derrane, Martin Flusberg. Greg Berman (Director of Natural Resources).

Project Information

Which of the following goals of the CPA does this project address?	The acquisition, creation and preservation of Open Space.
Project Description including Specific Objectives	Project Background The Energy and Climate Action Committee (ECAC) of the Town of Chatham requests $140,000 for the next year of its long-term effort to plan for the preservation, creation and acquisition of open-space property to facilitate salt-marsh migration and preservation in response to predicted sea-level rise and climate change. Salt marshes are a major natural resource of Chatham. They provide much of the scenic charm of the town. They protect surrounding properties from the worst threats of storm surge and provide a wealth of ecological services to the flora, fauna, sea life and water quality. Important field studies are currently being conducted by ECAC at Forest Beach, Cockle Cove, Bucks Creek and Oyster River marshes with a previous grant from CPC. Significant efforts are also already underway to preserve some of Chatham's other major salt marshes, such as Muddy Creek, Jackknife Cove and Frost Fish Creek. Muddy Creek and Red River marshes are shared with the Town of Harwich. This project will coordinate with research already undertaken, avoid duplication of effort, and consolidate data already collected to support a systematic approach to preserving Chatham's marshes. Chatham's marshes will be at risk from increased flooding in the coming decades, and it is prudent to foresee that and prepare for it systematically. Interventions will take decades to target, plan, approve, permit, construct and adapt. Detailed data is needed for the urgently required long-term planning. The current proposed project takes necessary next steps in that direction through coordinated field studies in the following marshes (see map in Appendix): Champlain Creek, Cotchpinicut, Frost Fish Creek, Minister's Point, Morris Island, Muddy Creek, Nickerson Neck, Red River, Tom's Neck.

Salt marshes are threatened by escalating climate change, particularly sea-level rise. Recent federal studies show that the waters around Chatham are warming and rising even faster than in other parts of the world and faster than previously predicted. A new predictive model of local sea-level rise has recently been developed – see description in Appendix. This Massachusetts Coastal Flood Risk Model (MC-FRM) projects that sea levels will rise 2½ feet by 2050, and close to 8 feet by the start of the next century along the Cape (with a 5% chance that it could be even worse).

Salt marshes have two natural defenses to sea-level rise, assuming the marsh is healthy (filled with native salt-marsh grasses) and tidally unrestricted. One is to gradually rise in place by building up the substrate level through sedimentation. The other is to migrate to slightly higher land nearby via an available migration path. The alternative is for the marsh to drown, merge into the open sea, and lose much of its protective storm buffering and ecological value.

Project Description

The ECAC project will systematically examine Chatham's system of salt marshes to project likely futures. In particular, the project will use new and existing GIS (digital geographic information systems) data and models to project sea-level rise impacts at a fine scale within each marsh. It will then be used as a predictive tool to determine which marshes can withstand that sea-level rise, either by the marsh raising its floor or by migration to a nearby area through a migration path. In cases of potential migration, the project will look for possible barriers and issues, such as tidal restrictions or private ownership of land in the migration area and connecting pathways. Where there are such barriers and restrictions, the project will identify possible future acquisition or conservation restrictions for the parcels or partial parcels in question.

This project is an initial step in a long-range effort to preserve Chatham's salt marshes as part of the ECAC's charge to enhance the Town's continuing resiliency in the face of climate change. Preserving salt marshes ranked as the highest concern on the natural-resources risk assessment analysis by the Chatham Climate Action Network steering committee. ECAC's work on salt marshes is being conducted in collaboration with the Town's Natural Resources Department.

Previous CPA grant (FY 2024)

ECAC was awarded a CPA grant for the first year of its long-

range effort to acquire open-space property to facilitate salt-marsh migration in response to predicted sea-level rise. This was an initial step in ECAC's ongoing "Strategy to Acquire, Create, and Preserve Open Space for Salt Marshes in Chatham."

This grant funded a contract with the Center for Coastal Studies of Provincetown to study four salt marshes along the Nantucket Sound: Forest Beach, Cockle Cove, Bucks Creek and Oyster River. This was intended as an initial trial of studying the major factors of local salt marshes affected by sea-level rise and climate change. The study is producing high-resolution contour maps of each marsh, establishing baseline maps of marsh vegetation, and analyzing local sedimentation rates.

The collected data will be combined with recent digital maps (GIS) from the state to provide projections of where salt marshes will or will not be able to grow (through sedimentation and/or migration) fast enough to keep from being drowned by sea-level rise. It will help predict flooding of roads and properties by future storms and the ability of the marshes to protect from this.
Work under this grant is proceeding well. The field studies will be completed by the end of calendar 2024, and initial findings and recommendations will be publicly presented. Some grant funds remain to continue project work at the four marshes through Spring 2025 in response to initial findings.

Proposed CPA grant (FY 2025)

The current proposal would allow ECAC to extend similar studies to the remaining salt marshes in Chatham. This will provide high-resolution data on local conditions for Chatham's entire salt-marsh system. Drone studies will provide elevation mapping that is more detailed and up to date than state and federal sources. Sedimentation data – which is not currently available at all – will be collected for each marsh. An integrated GIS system will combine this data in visual map formats with local tidal data and with high-resolution storm/flooding projections for 2030, 2050 and 2070, released by the state this year (MC-FRM Level 1 and 2). This will help the Town prepare for sea-level rise and increasingly destructive storms. Interactive maps will be made available on the ECAC website to display projections in much greater detail than on existing county, state and federal websites.

This study will allow for analysis and planning of the future preservation of Chatham's salt marshes. It will provide data to support potential interventions for preservation and to suggest strategic properties for open-space acquisition by the Town or the local land trust. It will also provide baseline data and photos for comparing, computing and visualizing trends in future studies.

General Goals:

1. To establish baseline data defining the elevation contours, sedimentation rates and vegetative cover of all the major salt marshes in Chatham.
2. To project the future development of each of the salt marshes in Chatham, including areas likely to drown from sea-level rise and areas likely to migrate upland. This may indicate interventions necessary to preserve the health of the marshes and their fauna and flora, such as removing barriers to tidal flushing or supplementing sedimentation.
3. To provide data and projections for Town projects to mitigate climate change, such as modifying low-lying roads and siting utilities.
4. To inform the public about likely changes due to climate change, including at the level of detail of individual properties, at various times in the future.
5. To identify wetlands properties for donation or acquisition by the Town or land trust in order to facilitate future marsh migration or future Town interventions to preserve endangered areas of salt marsh.

Specific Objectives of this Proposal:

a. Map marsh **elevation** contours of the remaining nine major marshes in Chatham. (This data has already been collected for four of the marshes by the 2024 project.) Drone survey to acquire high-resolution elevation data (NAVD88). Conduct survey of each marsh area up to its 20-foot-contour boundaries, at appropriate tides to determine extent of marsh and to optimize elevation capture.
b. Map **vegetation** in each marsh in this study from drone photographs. Drone survey to produce a high-resolution map with automated identification of vegetation areas throughout project area. Conduct survey at appropriate tide(s). Distinguish at least the following area categories: open water, ditches, mud flats, low marsh vegetation, high marsh vegetation, phragmites, upland vegetation.
c. **Transects** to manually catalog the flora and fauna, including invasive species, at select locations to be specified in consultation with ECAC. This can be used to ground-truth interpretation of drone vegetation data. Physical quadrat and transect surveys to be conducted where most needed.
d. Collect samples to measure current marsh-elevation accretion (**sedimentation**) rates. Place at least four sediment traps (plates and/or tubes) in each of the nine marshes for quarterly deployments for one-week collection periods, including surrounding a spring tide and a neap tide. Compare pre- and post-storm current sediment accretion rates.
e. Collect core sedimentation samples to measure recent past and

	historic marsh elevation accretion rates where appropriate. Collect **cores** (e.g., 3" diameter, approximately 6'- 9' deep) to measure historical rates and sources of sedimentation. Analyze historical layers using isotope dating. Compare with historical maps and aerial photos to document the evolution of each marsh. f. **Analyze** collected data and relate it to other available sources. Suggest possible interventions to help preserve marsh extent and to protect nearby properties from storm surge and flooding. Prioritize and map salt marsh areas where interventions are likely to help the marsh keep pace with sea-level rise. g. Compile the **analysis**, findings and recommendations in a written report with appropriate data, figures, charts, methods and sources. Present high-level analysis and main findings from the final report in a public meeting. h. **Follow-up** activities will include further public outreach, supplementary studies, preliminary acquisition costs or small-scale experimental marsh interventions.
Project action plan including starting date, anticipated milestones and the expected completion date, extending to a maximum of five years. Annual updates on progress and a final report are required.	Kick-off meeting June 2025 Planned project start a. **Elevation** August 2025 GIS maps of elevation for all marshes b. **Vegetation** Sept 2025 GIS maps of vegetation for all marshes c. **Transects** Sept 2025 Ground truthing of vegetation maps d. **Sediment traps** October 2025 GIS maps of current sedimentation rates e. **Sediment cores** October 2025 GIS maps of historic sedimentation rates f. **Analysis** December 2025 Report of findings with data g. **Report**. February 2026 Public presentation of findings h. **Follow up** activities March 2026 Initial follow-up activities Project completion June 2026 Expected project conclusion
How does the project impact Chatham's citizens and address a current need?	This project will help the Town preserve healthy salt marshes in Chatham, including facilitating their migration in response to sea-level rise in the coming decades. This will help to protect properties and infrastructure in Chatham from storm surge, flooding and increasingly severe storms. It will also provide increased sequestration of green-house gases (e.g., CO2 and methane) and multiple ecological services for local flora, fauna and sea life. This will benefit the Town of Chatham as a whole, particularly the many people who live near salt marshes. It will also help preserve the scenic beauty of the town for residents and visitors.
How will you measure the success of this project?	1. The project will be successful in the short-range project period if it produces detailed maps of Chatham, displaying MC-FRM Level 1 and Level 2 projections of flooding, tidal levels and wave surge for future decades (2030, 2050, 2070). 2. The project will be successful if it identifies and maps the

	major salt marshes of Chatham, including high-resolution elevation contours, vegetation cover and sedimentation rates throughout the marsh areas. 3. The project will be successful to the extent that it determines which salt marshes have reasonable potential for upland migration in response to sea-level rise and identifies associated migration paths. Also, if it determines marsh areas for interventions to support preservation and ecological health. 4. The project will be successful to the extent that it identifies target parcels or subdivided parcels for potential future acquisition, donation or conservation restrictions to facilitate future Town planning and action to preserve salt marsh as open space.
Budget Information	
Provide or attach an estimated and dated line-item budget for the overall project. What are the sources of information you used?	The following budget provides estimated costs and dates for each of the Specific Objectives listed above in the Project Description. The Objectives for the 2025 project are similar to those in the project that is currently underway in 2024. That project was put out for competitive bid and is currently on budget and on schedule. The new budget is based on the previous project's budget, adjusted for the data collection needs of the larger set of marshes to be studied. The 2025 project covers roughly twice the acreage of the 2024 project (1,176 vs 579 acres), but lowers certain costs through economies of scale and from generalization of the earlier findings. a. Elevation $30,000 August 2025 b. Vegetation $20,000 September 2025 c. Transects $10,000 September 2025 d. Sediment Traps $10,000 October 2025 e. Sediment Cores $20,000 October 2025 f. Analysis $10,000 December 2025 g. Report and Present $10,000 February 2026 h. Follow Up Activities $30,000 March 2026 --- Total amount of the project: $140,000
Are project costs being split with other Towns and, if so, what is the split?	No, no other towns are directly involved.
If this is a Town project, will it lead to increased ongoing expenses? If so,	No, there will not be any ongoing expenses.

how much and how will they be covered?	
Have all appropriate Town agencies, committees and commissions reviewed and commented on the project? Attach all relevant letters and approvals.	This proposal is being submitted by ECAC and the Town's Department of Natural Resources as co-applicants. This proposal was formally approved by the ECAC Saltmarsh Subcommittee on September 25, 2024, and by the Town's Energy and Climate Action Committee on October 15, 2024. The proposal was developed with the participation of the Town's Director of Natural Resources and the Town's Projects and Operations Administrator – who regularly participate in ECAC monthly meetings. The grant and project will be administered by the Town's Director of Natural Resources.
Are there any legal ramifications or impediments to this project?	No.
Is the project compatible with the Town's Comprehensive Plan?	Yes.
Attach Letters of Approval	*Field not completed.*
Attach Additional Comments & Documentation	Appendices to ECAC and DNR proposeal.pdf
Electronic Signature Agreement	I agree.
Electronic Signature	Stahl

You will receive an email copy of this form.

Appendices to "Field Studies to Preserve Open Space for Salt Marshes"

Appendix A. Description of "Massachusetts Coast Flood Risk Model" (MC-FRM)

The "Massachusetts Coast Flood Risk Model" (MC-FRM) is currently considered the most accurate representation of flooding risk in Massachusetts because it is (1) a dynamic model that includes the critical processes associated with storm-induced flooding (winds, waves, wave setup, storm surge, wave run-up and overtopping, etc.), (2) calibrated to historical storm events that impacted Massachusetts with observed high-water data and measurements, (3) high enough resolution to capture flood pathways in complex urban topographies, (4) a model that includes both hurricanes and nor'easters under changing climate conditions, and (5) able to capture the net effect of varying storm types, magnitudes, and frequencies.

Most competing approaches model the water levels to the shoreline while using "bathtub" approaches overland that ignore important processes like wave runup and overtopping, so are not an accurate prediction of where flooding ls likely to occur. Accurate storm-surge modeling requires accurate representation of the physical processes. MC- FRM also (1) includes updated sea-level-rise projections consistent with the state standard; (2) expands the storm sets used to include more historical and recent storms as well as hundreds of additional possible future storms; (3) includes dynamic wave runup and overtopping of coastal structures like seawalls; and (4) adds regular nuisance flooding by projecting future tidal benchmarks.

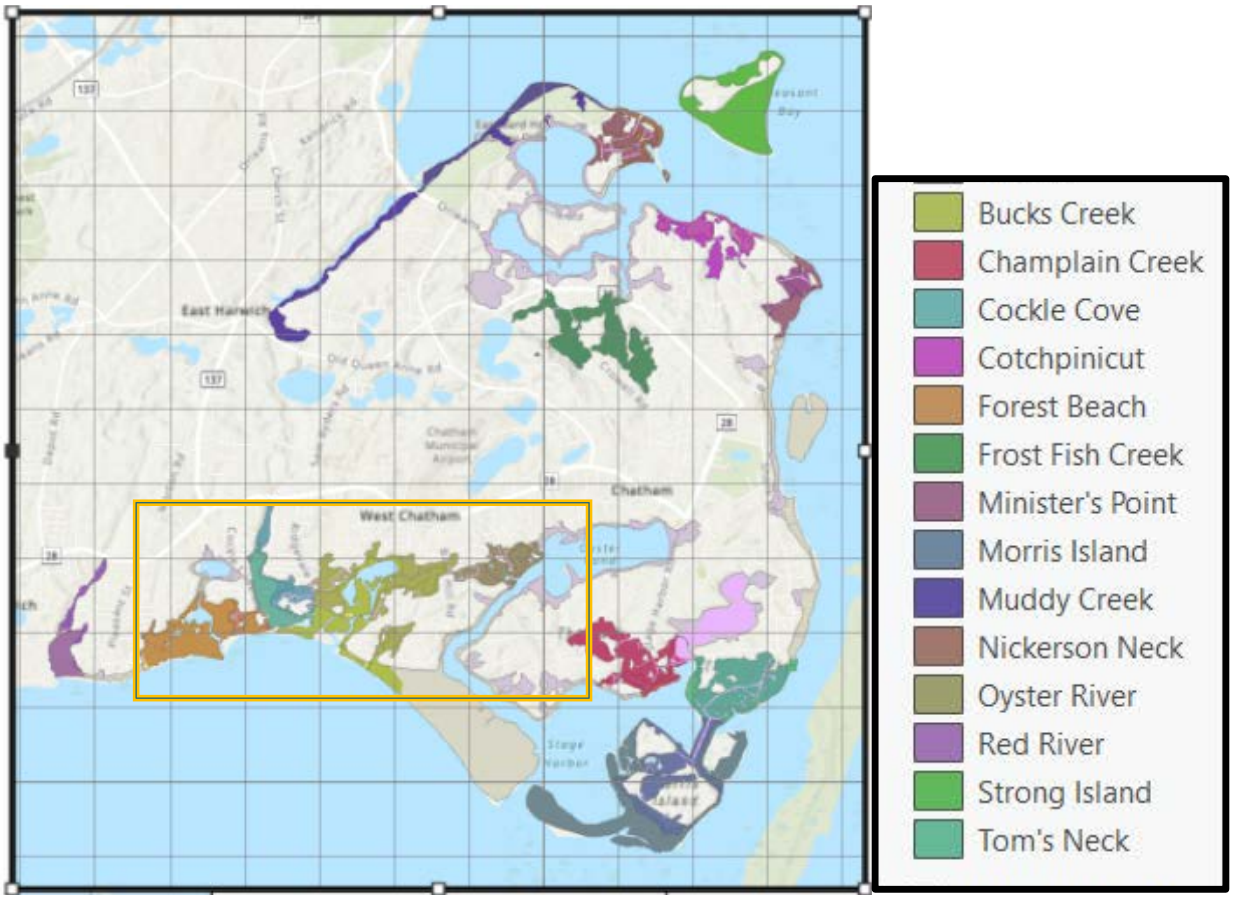
MC-FRM determines future projected chronic and storm-based flooding, including sea-level rise (SLR) associated with the "high" projections as recommended by The Massachusetts Office of Coastal Zone Management (CZM), MassDOT, and the University of Massachusetts. It was developed specifically for the Commonwealth of Massachusetts. This "high" scenario of SLR assumes that global greenhouse-gas emissions (GHG) continue in a similar fashion as today. However, as time progresses, the dates can be adjusted based on evolving trends and the MC-FRM maps can be used for the shifted dates.

The original (Level 1) MC-FRM maps of flooding were released in 2021. In 2024, Level 2 projections were released to show tidal heights and wave surges. In particular, the following maps will be applied to the individual marshes of Chatham for 2030, 2050 and 2070:

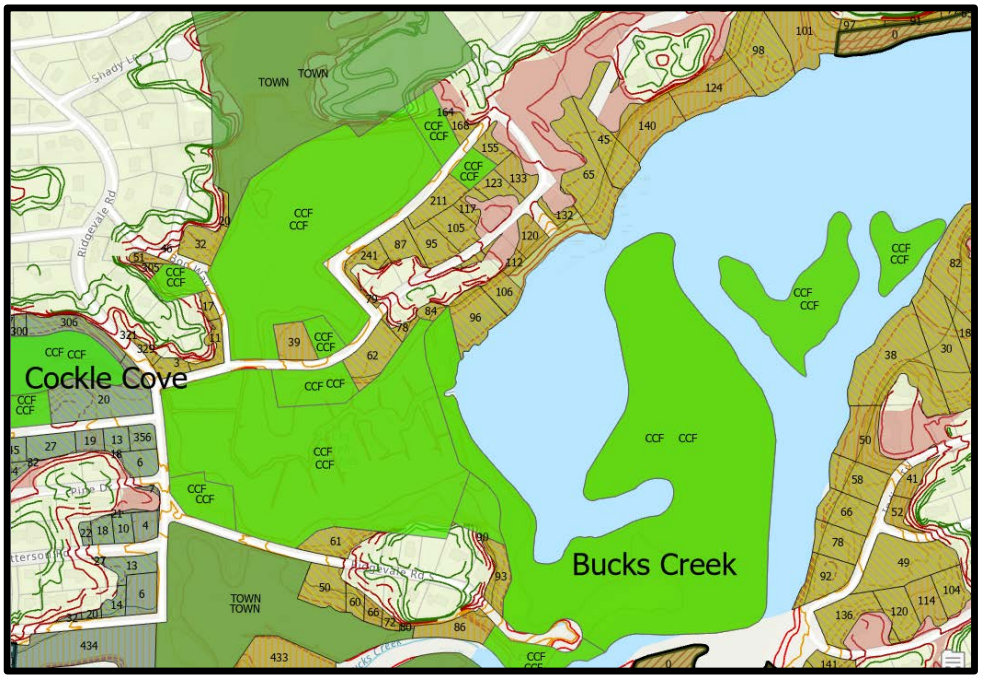
- Flooding depth (level 1) projections
- Probabilities of flooding
- Flooding depths with a 1% probability (hundred-year storm event)
- Flooding depths with a 0.5% probability
- Flooding depths with a 0.1% probability
- Tidal height (level 2) projections
- Wave surge depth (level 2) projections
- Wave depths with a 1% probability (hundred-year storm event)
- Wave depths with a 2% probability (50-year storm event)
- Wave depths with a 5% probability (20-year storm event)
- Wave depths with a 0.5% probability
- Wave depths with a 0.2% probability
- Wave depths with a 0.1% probability

The flooding depth and wave surge maps will indicate how the flood plain will change in Chatham as a result of sea-level rise and climate change (e.g., storms). The tidal height will indicate how salt marshes may be preserved by comparing high tide to ground level (elevation, adjusted by sedimentation). This will be important information for private property owners and for public policy.

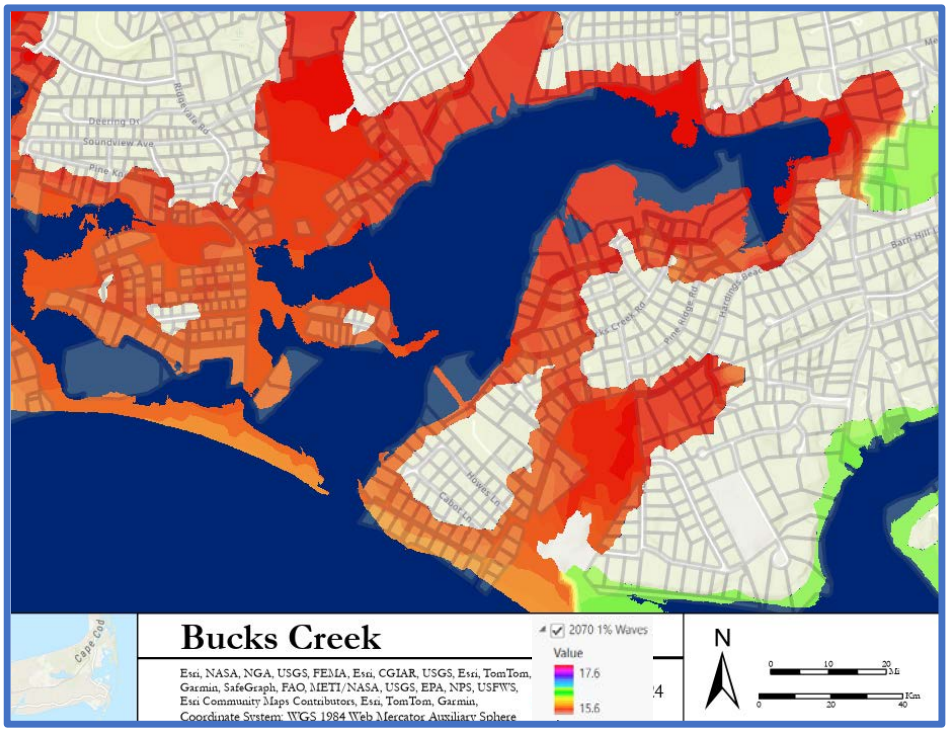
Appendix B. Sample Maps of Chatham Salt Marshes



Overview of the 14 salt marshes in Chatham, as defined by the 2014 FEMA floodplain. Strong Island is not included in this project. Four marshes were included in the 2024 field studies (see orange rectangle). The remaining nine marshes will be studied in the proposed project.



Close-up of properties in wetlands around Bucks Creek. Shows current elevation contours in the floodplain. Dark green properties are Town owned; bright green properties are in the land trust.



2070 hundred-year wave heights (MC-FRM Level 2 projections). Predicts wave heights (in feet) around the marsh during a very severe potential storm in 2070.