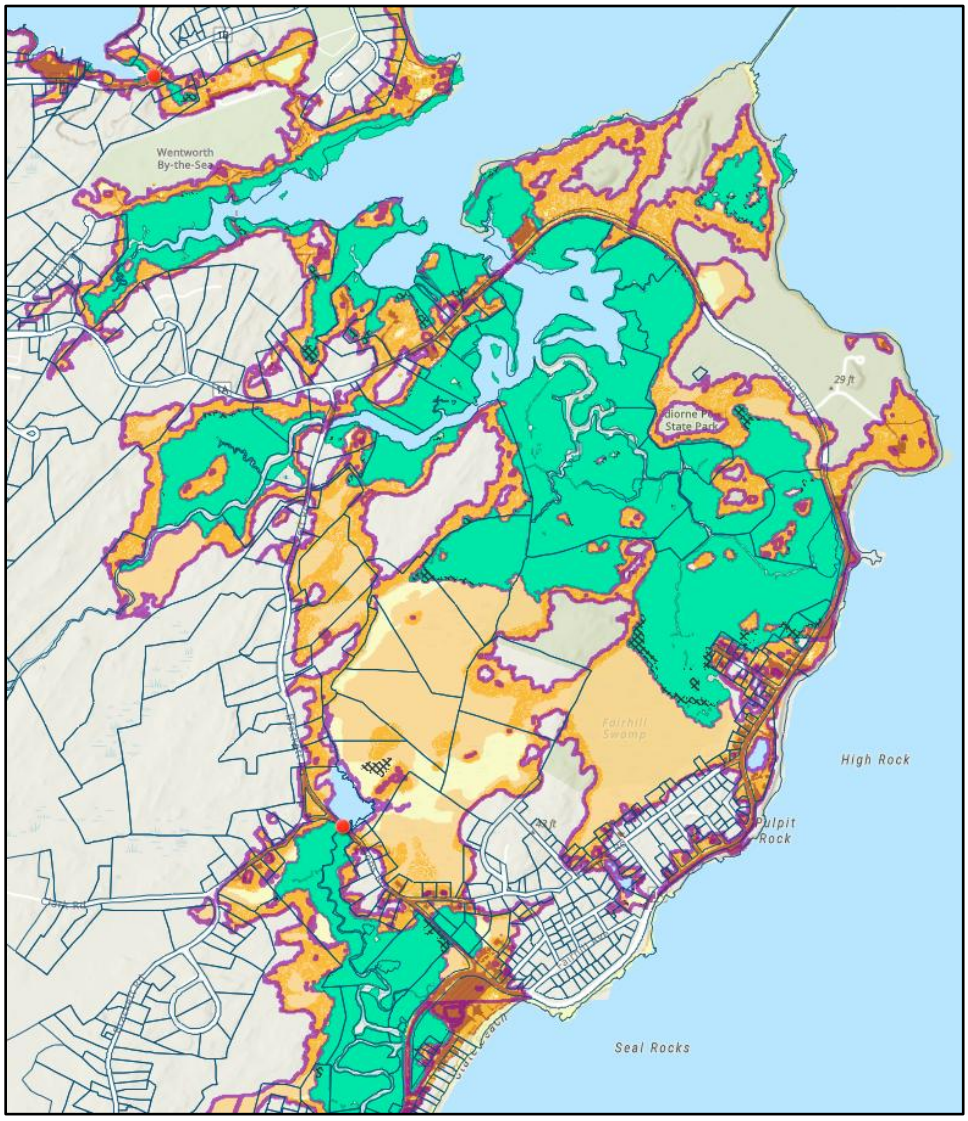
Opportunities for Protecting Salt Marsh Migration Corridors in New Hampshire:

A summary of the *Pathways to Salt Marsh Resilience Project*

Final Report | May 2025



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Opportunities for Protecting Salt Marsh Corridors in New Hampshire: A summary of the *Pathways to Salt Marsh Resilience Project*

May 2025

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Great Bay National Estuarine Research Reserve
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Opportunities for Protecting Salt Marsh Migration Corridors in New Hampshire: A summary of the *Pathways to Salt Marsh Resilience Project*

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EXECUTIVE SUMMARY

Project Overview

Salt marshes in New Hampshire are threatened by sea level rise and coastal development. Without the space to migrate inland, marshes may drown and get squeezed out of existence.

There is an urgent need to focus on the places, ecological processes, and management actions that can help salt marshes expand inland and migrate into adjacent upland areas as seas rise, thus supporting the long-term persistence of this important habitat.

This report summarizes the results of the Great Bay National Estuarine Research Reserve's (GBNERR) *Pathways to Salt Marsh Resilience Project*, whose goal was to identify and promote projects in coastal New Hampshire that protect pathways for salt marsh migration.

Over the course of the 18-month project, we consulted with 58 individuals from 30 partner organizations through a series of workshops and small meetings and asked them:

1. What **spatial, field and practical considerations** can help us identify promising areas to invest in marsh migration projects?
2. Given the spatial information we compiled and your local knowledge, ***where* should we invest** in marsh migration projects?
3. **What *specific strategies* should be promoted** in each priority location?

The Pathways to Salt Marsh Resilience Project included six National Estuarine Research Reserves and was funded by a National Fish and Wildlife Foundation America the Beautiful Challenge Grant (Award #78114). See the National Estuarine Research Reserve Association's Wetland Protection Pathways project website for more information on the national project.

Ways to Promote Salt Marsh Migration

Project partners helped us identify the following types of projects that can help protect marsh migration corridors:

- **Land conservation** that protects the upland areas where marshes will expand into as seas rise.
- **Restoration projects** that address impairments in existing salt marshes to increase their long-term resilience and ability to migrate.
- **Facilitated or assisted migration** into upland areas adjacent to current salt marsh, such as re-grading, planting, invasive species management, breaching berms or stone walls, or tree limbing.
- **Regional analysis and research** about topics, such as the role of historic stone walls or railroad beds that may block marsh migration.
- **Multi-parcel marsh migration projects** that benefit multiple properties, such as adaptive management of vulnerable school yards or neighborhood easements.
- **Outreach and technical guidance** for public and private landowners about how to proactively manage a changing shoreline and make space for marsh migration.

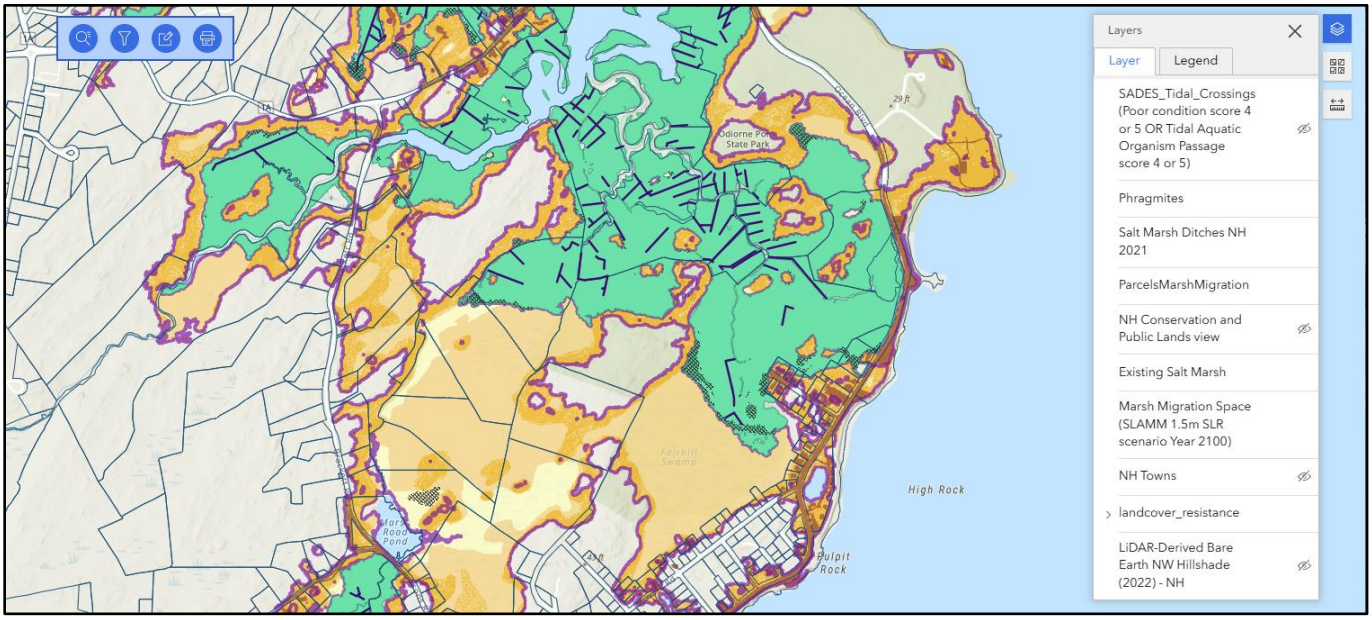
Partners brainstorming marsh migration ideas with large maps at the project kick-off workshop in October 2023.

Identifying Places for Marsh Migration

Building off of a University of NH literature review on marsh migration, we gathered partner input and determined that the following factors and resources are important to consider when deciding where to invest limited dollars to ensure that marshes have a pathway to migrate inland over time:

- ***Large migration space*:** Sea level rise projections, high resolution land elevation data, and spatial modeling were used to identify large, contiguous areas where marshes could expand as seas rise.
  - *Key resource:* Sea Level Affecting Marshes Model (SLAMM)
- ***High potential that the adjacent upland will transition to marsh:*** Generally, low-lying upland areas adjacent to marshes that have gentle slopes, fewer trees, and less development are expected to more easily transition to salt marsh.
  - *Key resource:* NH Fish & Game Landcover Resistance Spatial Analysis, which models how easily marshes could migrate into different areas, based on slope and land cover type
- ***Viable conservation opportunities:*** Land protection projects are often easier to fund and implement in areas with large, privately-owned parcels, close to other conservation lands, and, ideally, with potentially interested landowners.
- ***Healthy and connected marshes:*** Larger marshes that are in good condition (e.g., fewer invasives, less ditching, large high marsh zone), with good connectivity to other marshes and their migration space, are generally believed to be more likely to persist, adapt, and migrate.
  - *Key resource:* The NH Salt Marsh Plan
- ***Community and partner interest and momentum:*** Partners brought their knowledge of the areas and helped us identify places where there was community interest, current projects, and momentum that could help energize additional work to protect the migration corridors for salt marshes.
- ***Multiple ecological benefits:*** It could be easier to attract funding and justify investments in specific marsh migration pathway projects if they are perceived as valuable for many reasons, such as protecting unique plant or wildlife species, mitigating flooding, or offering aesthetic and recreational values.

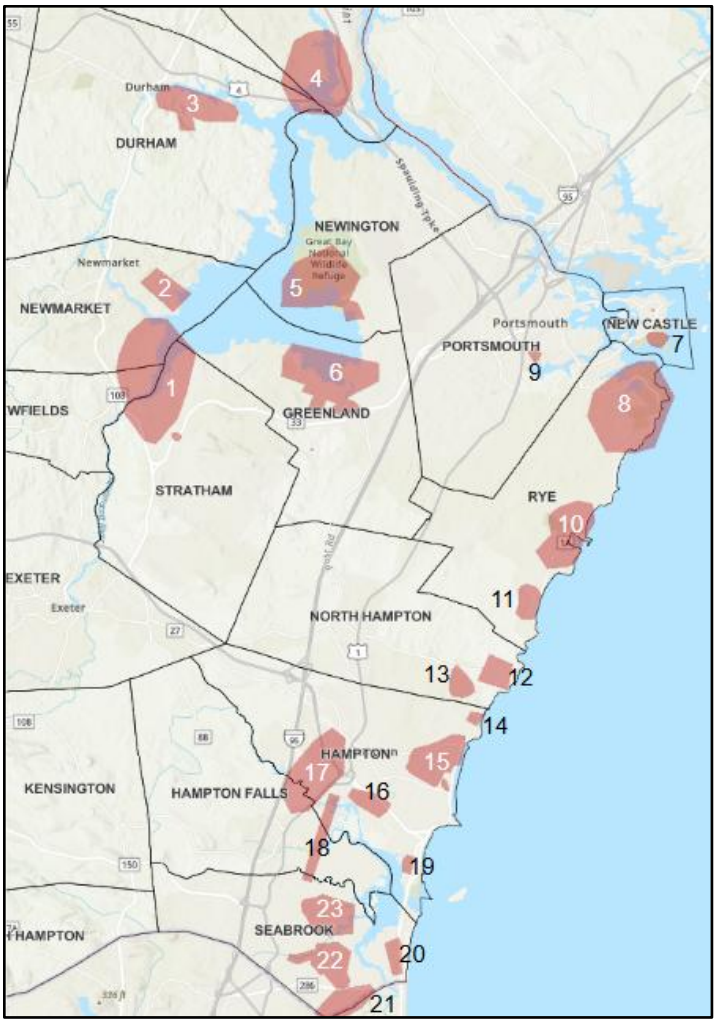
The NH Marsh Migration Mapping Tool was created for this project to pull together key spatial data, including layers cited here, to help identify promising locations for marsh migration projects.



Example screenshot of the NH Marsh Migration Mapping Tool created for this project, showing existing marsh (green) and the land cover resistance scores within the marsh migration space (yellow to orange).

Promising Areas for Marsh Migration

With the help of our online marsh migration mapping tool and a series of workshops and small meetings, we identified 23 promising areas in New Hampshire where we should invest in projects that will protect corridors for salt marshes to migrate inland as seas rise.



Promising areas for investing in salt marsh migration projects in coastal New Hampshire identified through this collaborative process. See Table 3 in the full report for details on these areas and suggested marsh migration project ideas.

Developing Site-Specific Strategies

After reviewing the 23 promising areas, we chose to scope out and explore site specific strategies for 12 projects where we felt we could advance work over the short-term; for example, by supporting a grant application, adding a new dimension to an on-going initiative, or jumpstarting action in a priority area.

For most of 12 project sites, we developed a summary product called a *Marsh Migration Opportunity Map - a* succinct project profile to support planning and implementation. These profiles offer an interpretation of maps and spatial data for the site and summarize local knowledge and ideas generated by partners. Appendix C includes all the Marsh Migration Opportunity Maps.

We found it important to consider the following attributes for each site to guide project planning:

- Amount and characteristics of **marsh migration space.**
- **Tidal restrictions** (e.g., undersized or dysfunctional culverts) that may need to be replaced to restore tidal flow and enable marsh migration.
- **Other barriers to migration**, such as berms or stone walls, that may need to be addressed to enable migration.
- **Invasive species,** such as *Phragmites*, which are known to thrive in the transition zone between fresh and brackish water and can impede establishment of native salt marsh plant marsh species.
- **Potential for in-marsh remediation**, such as ditch repair and managing megapools through runneling, to improve current condition and long-term resilience.
- **Potential for facilitated migration**, which could include changes in hydrological patterns to remove/deter *Phragmites* in transition zones, limbing or removing trees that are shading the marsh edge, or regrading adjacent slopes.
- **Implications for developed areas** in the migration space and considerations for protecting vulnerable neighborhoods and adjacent marsh habitats.

In addition to the mapping products, we also offered customized support to advance the 12 projects, including proposal writing assistance, convening partners to brainstorm strategies, and developing customized analyses. Although this project ends in 2025, GBNERR will continue to support priority projects and can offer technical assistance to organizations and communities that would like to explore ways to protect salt marsh migration corridors. To discuss a project concept or request a site-specific Marsh Migration Opportunity Map, you can reach out to Lynn Vaccaro at lynn.e.vaccaro@wildlife.nh.gov.

To learn more, visit: greatbay.org/science/habitat-science

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1.0 Project Overview

1.1 Introduction

Over the past ten years, the Great Bay National Estuarine Research Reserve (GBNERR) has been leading efforts in New Hampshire and nationally to monitor coastal habitat change, assess the resilience of salt marshes, and model the impacts of sea level rise. It has become increasingly clear that salt marshes in many parts of the country are threatened by sea level rise and coastal development. Without the space to migrate inland, marshes may drown and get squeezed out of existence.

"Marsh migration" is a horizontal shift in salt marsh into the upland habitat that neighbors it. Marsh migration is one important way that a salt marsh can survive sea level rise.

"Marsh migration corridors" or *"pathways"* are the upland areas that salt marsh can migrate into.

"Marsh migration projects" are investments in restoration, land protection, facilitated migration, land use planning, or other activities that promote marsh migration.

There is an urgent need to focus on the places, ecological processes, and management actions that can help salt marshes migrate into adjacent upland areas as sea level rises, thus supporting the long-term persistence of this important habitat. Building on the results of a recent literature review about marsh migration in New Hampshire[1] and the NH Salt Marsh Plan, we teamed up with five other reserves to identify and advance projects - including conservation, restoration and land use management - that can enable marshes to migrate inland as seas rise.

The following report summarizes the results of GBNERR's *Pathways to Salt Marsh Resilience Project*, and is intended to be used by partner organizations in New Hampshire to support investment in salt marsh migration corridors. The report includes an overview of the process of criteria development and collective prioritization that we completed with our network of 58 individuals from 30 organizations. This engagement process resulted in the identification of over 20 promising areas for investing in marsh migration projects in New Hampshire. For about half of these promising areas, we generated Marsh Migration Opportunity Maps, which include explanations of key criteria that make them promising areas and a summary of the discussions held about potential projects in those areas. These map products can support project planning for land conservation and restoration projects that incorporate marsh migration corridors and are available in the appendix.

[1] JG McKown and DM Burdick. 2024. Salt marsh migration into coastal uplands and application for conservation in New Hampshire. Prepared for Great Bay National Estuarine Research Reserve. Greenland, New Hampshire. 45 pp. Available for download at: https://scholars.unh.edu/jel/681/

1.2 About the National Project

The *Pathways to Salt Marsh Resilience Project* was funded by a National Fish and Wildlife Foundation (NFWF) America the Beautiful Challenge Grant (NFWF Award #78114), which began in July 2023 and is ongoing at the time of publication. GBNERR was part of a national team of six National Estuarine Research Reserves (NERRs) whose project goals were to:

- Create a pipeline of tidal wetland migration pathway projects in areas served by NERRs in the Northeast, Mid-Atlantic and Southeast;
- Assist communities with decision making related to protecting marsh migration pathways by providing science-based information that has been vetted by local partners;
- Lead collaborative processes to prioritize projects for implementation; and
- Share Information and lessons learned with all 30 NERRs and their partners, including a User Guide, to help other reserves prioritize marsh migration projects.

See the National Estuarine Research Reserve Association's Wetland Protection Pathways project website for more information on the national project.

1.3 Project Approach and Collaborative Process

The methodology used in New Hampshire for this project is outlined in Section 2.0 and was divided into two main phases (shown in **Figure 1**). During Phase 1, we identified areas in coastal New Hampshire where we predict salt marshes will migrate inland and that would benefit from investments in land protection, facilitated migration, or other restoration or land management actions (results of which are included in Section 3.1). Phase 2 focused on a smaller number of sites to develop strategies and project concepts for advancing marsh migration protection in those locations (results of which are also in Section 3.2)

Collaboration with partners was central to the *Pathways to Salt Marsh Resilience Project*. **Figure 1** highlights the various touchpoints that occurred during the course of this project with partners who work on land conservation, habitat restoration, and land use planning. These touchpoints included large workshops to brainstorm ideas and examine maps to identify potential projects, online work sessions with GIS-based mapping tools to focus on pertinent data for key marsh migration locations, and targeted consultations to discuss a particular area with one or two trusted partner organizations that have expertise and local knowledge related to that site.

Appendix A provides a list of the 58 individuals from 30 organizations who participated in at least one of the *Pathways to Salt Marsh Resilience* workshops, calls for input, meetings, or consultations. Many of these individuals attended multiple events and provided valuable insight over the course of the project. We would like to wholeheartedly thank this group of collaborators for volunteering many hours and contributing their expertise.

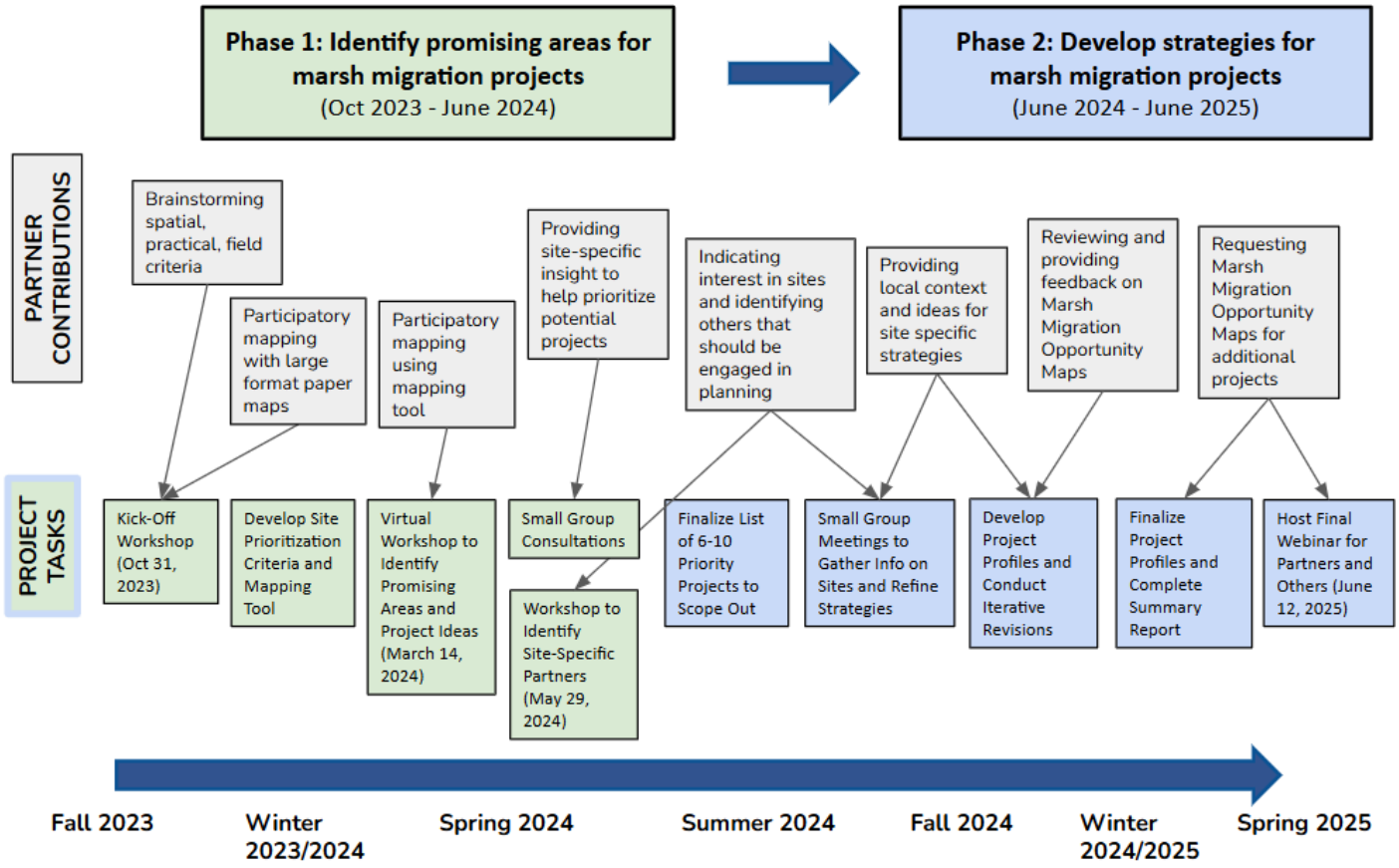

Figure 1: Pathways to Salt Marsh Resilience Project overview of tasks and general timeline, along with key engagement points with partners.

2.0 Methodology: Roadmap for Marsh Migration Project Planning

This section describes the steps that were taken in the *Pathways to Salt Marsh Resilience Project* to identify projects to invest in for marsh migration, as summarized in **Figure 2**. The intention for this section is to provide a roadmap for others in New Hampshire and beyond to guide planning for protection of salt marsh migration corridors. Links to important planning documents and geospatial data are included in this section to support the process. Refer to **Figure 1** for details on how we incorporated partner collaboration throughout this project. Results of this project are documented in Section 3.0.

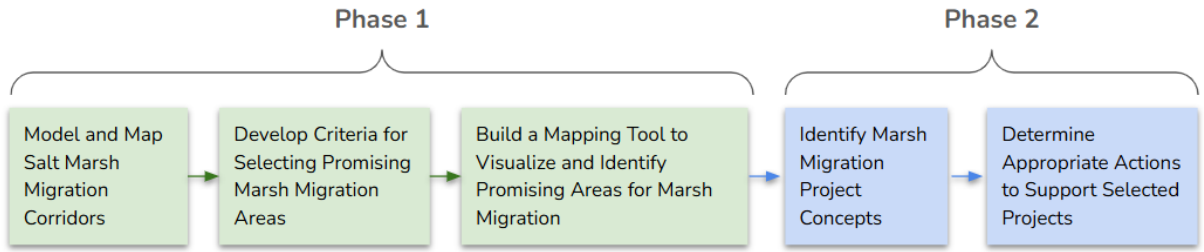

Figure 2: Main steps taken in the Pathways to Salt Marsh Resilience Project, described in Section 2.0.

2.1 Modeling and Mapping of Salt Marsh Migration Corridors

Logically, one of the first steps in determining where to invest in salt marsh migration is to understand where marshes are predicted to migrate in the future. We were fortunate to have a wealth of geospatial data for coastal New Hampshire at our disposal, including recently collected high resolution land surface elevation data (LiDAR), and 2022 modeling that identifies salt marsh migration pathways for the Great Bay and coastal New Hampshire based on different sea level rise scenarios. The model, referred to as SLAMM (Sea Level Affecting Marshes Model), is widely used by salt marsh scientists and managers. For this project, we selected a long-range sea level rise scenario of 1.5 meters by the year 2100 because this long time horizon would enable proactive planning of land protection projects that could conserve migration space and enable the long-term persistence of marsh habitats. Marsh migration is a slow process and this captures the greatest area that could potentially convert to salt marsh given the available sea level rise scenarios. The model output used for this project was a GIS layer that shows the inland extent of where salt marsh could be by the year 2100, measured from the edge of the existing marsh, an example of which is shown in **Figure 3**.

The NH SLAMM data layers can be downloaded from NH GRANIT to be used in GIS projects.

View different sea level rise scenarios of the SLAMM data to see predicted marsh migration in the NH Coastal Viewer.

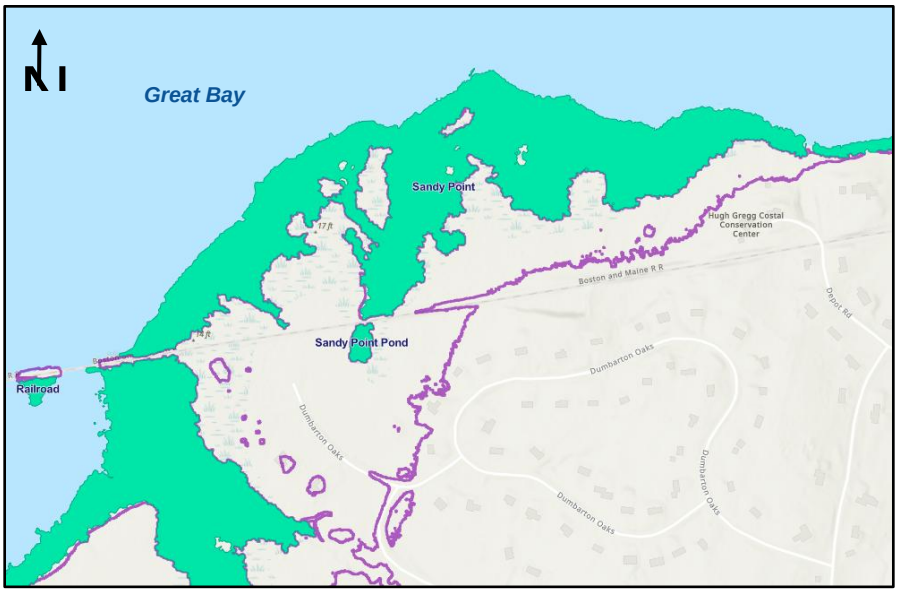

Figure 3: Example of the SLAMM results for the area around the GBNERR visitor center in Greenland, with the purple line showing the inland extent of salt marsh migration predicted with 1.5 meters of sea level rise by the year 2100. Existing marsh shown in green.

2.2 Criteria for Selecting Promising Marsh Migration Areas

Figure 4: Partners brainstorming around large maps of coastal NH at the project kick off meeting in October 2023.

The next step in the *Pathways to Salt Marsh Resilience Project* was to establish which criteria would be used to help hone in on promising migration areas. At the initial project Kick-Off Meeting in October of 2023, a large group of partners learned about existing research on marsh migration and brainstormed the possible spatial, field, and practical criteria that could impact a project designed to protect salt marsh migration corridors (**Figure 4**).

Understanding Current Research on Marsh Migration

To help determine relevant criteria, we reviewed an extensive literature review completed by University of New Hampshire researchers Grant McKown and David Burdick to understand the existing scientific research on salt marsh migration.[2] This included a review of biogeochemical drivers, response of the

[2] JG McKown and DM Burdick. 2024. Salt marsh migration into coastal uplands and application for conservation in New Hampshire. Prepared for Great Bay National Estuarine Research Reserve. Greenland, New Hampshire. 45 pp. Available for download at: https://scholars.unh.edu/jel/681/

vegetation community, impacts of anthropogenic alterations, and potential indicators of appropriate corridors for marsh migration. Research gaps were identified in the literature and future monitoring protocols and avenues of research were outlined with a focus on New Hampshire and New England.

The literature review had several key findings that are relevant to the identification of projects to protect marsh migration corridors in New Hampshire. First, they found that the rate and trajectory of marsh migration is strongly affected by the type of upland plant community. Areas of coastal forest or invasive species, (e.g., *Phragmites australis*) can be a barrier to migration, while marsh migration into open fields and other wetlands types was found to be less restricted. It was also found that historic agricultural features, such as ditches and embankments, may impede marsh migration. As described further below, these two factors, land cover in the migration space and presence of historic agricultural features, were selected as criteria to include in our prioritization process for marsh migration pathway projects.

In addition, the recently completed New Hampshire Salt Marsh Plan provided a framework and suite of spatial metrics related to marsh resiliency that guided discussions with partners. For example, the Plan offers an assessment of the adaptation potential of all marshes across NH, which is based on SLAMM as well as attributes of the shoreline and the connectedness of the marsh. This framework helped us identify relevant and accessible spatial data to use for this project and also helped us hone in on information gaps related to the quality and type of migration space next to marsh, which we were able to address.

Practical & Field-Related Criteria

After the Kick-Off Meeting and review of the SLAMM results, NH Salt Marsh Plan, and McKown and Burdick literature review, we tabulated and organized the suggested practical and field-oriented criteria, the full results of which are included in Appendix B. A synthesis of key practical considerations is provided in **Table 1**. We used these criteria while prioritizing marsh migration projects for near-term implementation, particularly during small group consultations with partners.

Table 1: Key practical/field-related considerations for selecting areas to invest in marsh migration. See Appendix B for a full list of criteria suggested by partners.

Practical/Field-Related Criteria	Considerations for Marsh Migration Projects
Land Ownership	-Public versus private land -Potential resistance from landowners and neighbors -Number of landowners in a project area -Possibility of working on portions of parcels that include migration space
Ecological/Restoration Needs	-Restoration needs for existing marsh health, including tidal restrictions that impact marsh migration and invasive species removal -Sediment supply -Upland area land cover type -Historic agricultural features (e.g., ditches, embankments, berms) -Stabilization needs for seaward edge of marsh

Practical/Field-Related Criteria	Considerations for Marsh Migration Projects
Easements/Legal Constraints	-Understand what is permissible if facilitated migration is being considered -Challenges finding an easement holder -Evolving easements to take into account sea level rise (e.g., for agriculture) -Put conditions on easements in migration corridors (e.g., restricting uses) -Bundling easements for small parcels or portions of parcels that are in the migration space, consider use of lot line adjustments
Land Use In Migration Space	-Managed retreat/assisted relocation options, including agricultural fields -Look for agricultural areas (e.g., NH Fish and Game easements) where sea level rise will impact the ability to farm -Change land management techniques that inhibit marsh migration (e.g., watering, mowing)
Project Partners and Leadership	-Projects need an interested lead organization -Outreach to towns about marsh migration -Creativity in terms of what partners to involve and at what stage
Possible Funding Sources	-Aquatic Resource Mitigation (ARM) Fund, NHDES -Regional Conservation Partnership Program (RCPP) -NRCS Wetland Reserve Enhancement Partnership (WREP) - North American Wetlands Conservation Act (NAWCA), U.S. Fish and Wildlife Service (USFWS) -National Coastal Wetlands Conservation Grants, USFWS -Bipartisan Infrastructure Law (BIL) funding, National Oceanic and Atmospheric Administration (NOAA) - limited time -Towns -NH Land and Community Heritage Investment Program (LCHIP) -NH Drinking Water and Groundwater Trust Fund, NHDES -Land Protection Transaction Grant Program, Great Bay Resource Protection Partnership -“Moose Plate” Program, Conservation and Heritage License Plate Program

Spatial Criteria & Landcover Resistance Analysis

For spatial criteria, the brainstorming session resulted in many suggestions. We consolidated this list to focus on spatial data layers that were: 1) determined to be the most pertinent to the identification of possible salt marsh migration project sites, and 2) readily-available. A full listing of the spatial criteria suggestions, as well as how we consolidated those recommendations, is included in Appendix B.

During the brainstorming process, one important data gap was identified: many partners indicated that it would be helpful to have a spatial data layer that would differentiate the relative *quality* of the salt marsh migration space. To address this data gap, GBNERR and the NH Department of Fish & Game conducted a new analysis of “landcover resistance” based on a previous study by The Nature Conservancy.[3] It combines detailed LiDAR elevation and NOAA C-CAP land cover data to provide relative scores for how easily salt marsh could migrate into a given area. The landcover resistance analysis filled a critical gap in knowledge to help planners, land conservation experts, and restoration practitioners

[3] Anderson, M.G. and Barnett, A. 2017. Resilient Coastal Sites for Conservation in the Northeast and Mid-Atlantic US. The Nature Conservancy, Eastern Conservation Science. http://www.nature.ly/TNCResilience

quickly differentiate the quality of marsh migration space in GIS. Review of this data can then prompt more detailed, on-the-ground field assessments of the migration space.

Access the Landcover Resistance GIS layer for all of coastal NH here.

Table 2 summarizes the spatial data that was determined by our collaborative, science-based process to be readily-available and important for identifying where to invest in salt marsh migration pathways projects.

Table 2: Summary of key spatial data used to assess and prioritize marsh migration pathway projects. See Appendix B for a full list of criteria suggested by partners.

Spatial Data Layer	Description	Source
Tidal Crossings	This layer shows a subset of the SADES (Statewide Asset Database Exchange) tidal stream crossing dataset. A tidal crossing is a culvert or bridge associated with a roadway that conveys two-way tidal flow. An analysis done by NHDES and TNC prioritized these areas based on their condition and their ability to support aquatic organism passage (AOP). The subset of tidal crossings displayed are the most likely candidates for replacement (poor condition, low AOP), which could open upstream areas to potential salt marsh migration. For more information, see the DES webpage on tidal stream crossings.	The Nature Conservancy and NHDES Coastal Program, 2019
Phragmites	This layer shows the extent of the invasive plant species, *Phragmites australis*, based on aerial imagery collected in 2013. Phragmites, and other invasive plant species, can outcompete native salt marsh plants and are known to thrive in the transition zone between fresh and brackish water.	NOAA Coastal Change Analysis Program (C-CAP). NH Salt Marsh Habitats 2013. NOAA-Office for Coastal Management, 2020
Salt Marsh Ditches	This layer shows the extent of ditches present. The ditches were created during historic agricultural practices and mosquito control activities, and have been shown to reduce the resilience of salt marsh habitat.	GBNERR, 2021
Existing Salt Marsh	This layer shows the existing salt marsh boundary in NH, divided into marsh units established as part of the NH Salt Marsh Plan. Includes detailed information from the NH Salt Marsh Plan for each marsh unit. Includes presence or absence of historical/archaeological resources for each marsh unit or adjacent migration space within 150 meters (Y=present, N=not present). Includes presence or absence of Species of Concern for each marsh unit or adjacent migration space within 150 meters (Animal, Plant, None).	NOAA Coastal Change Analysis Program (C-CAP). NH Salt Marsh Habitats 2013. NOAA-Office for Coastal Management, 2020

Spatial Data Layer	Description	Source
Marsh Migration Space (1.5m SLR Year 2100)	This layer displays the predicted, long-term salt marsh migration space by showing the extent of estimated salt marsh that could be possible with 1.5 m of sea level rise. Note that this model does not take into account existing development in the migration space.	SLAMM (Sea Level Affecting Marshes Model) Results, NHFG 2022
NH Conservation Land	This layer shows the boundaries of land that has been protected or conserved in NH.	NH GRANIT, 2023
NH Towns	This layer shows the town boundaries in NH.	NH GRANIT, 2023
Parcels in Marsh Migration Space	This layer displays parcels and includes information on the town, street address, parcel ID and size (in acres). Note: this layer has been clipped to show only parcels in the potential marsh migration area.	NH Department of Revenue Administration, 2023
Landcover Resistance	New analysis completed by NH F&G/GBNERR that combines detailed LiDAR elevation and NOAA C-CAP land cover data to provide relative scores for how easily salt marsh could migrate into a given area. Lighter colors represent easier migration pathways, while darker colors represent more resistant pathways (e.g., impervious surfaces).	NHF&G/GBNERR, based on Anderson et al., 2017[2]
LiDAR-Derived Bare Earth NH Hillshade (2022) - NH	This layer shows detailed elevation of the land surface with 1-meter resolution.	NH GRANIT, 2023

Additional Considerations

The brainstorming session of criteria also identified some "big picture" issues that are important to consider, including:

- Possible trade-offs of migration: what are you losing if salt marsh gains, what habitats will be lost, and who might be impacted by the habitat changes?
- The challenges of working on public versus private land
- Potential challenges of working and funding projects on private land
- Recognition that these projects should be multi-disciplinary and that careful consideration should be given to what parties should be brought to the table and at what stage in the planning process

Section 3.1 provides a summary of the key spatial and practical criteria determined to be the most important for assessing where to invest in salt marsh migration pathway protection.

2.3 Build a Mapping Tool to Visualize and Identify Promising Areas for Marsh Migration

Marsh Migration Mapping Tool

Once the essential spatial data was prioritized, an online mapping tool was created using ArcGIS Experience Builder (see **Figure 5**). The tool includes the curated suite of GIS layers outlined in **Table 2** to focus on the identification of promising areas for salt marsh migration projects. In addition, the mapping tool had editing features that allowed users to add points or outline areas of interest for marsh migration projects, along with text fields to annotate the added features.

Explore marsh migration in coastal NH by accessing a public version of GBNERR's *salt marsh migration mapping tool* here.

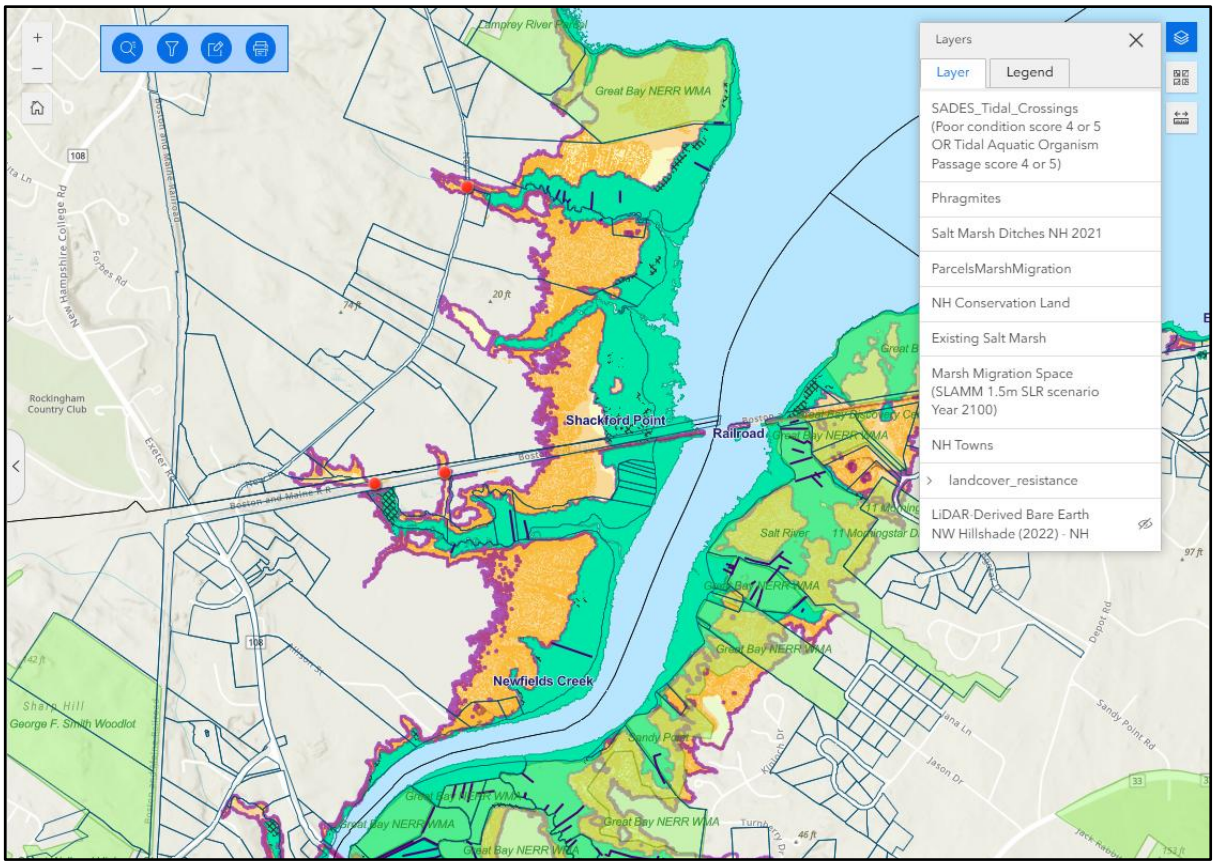

Figure 5: Screenshot of the Marsh Migration Mapping Tool created as part of the Pathways to Salt Marsh Resilience Project. This screenshot shows existing marsh (teal green) and marsh migration space (yellow to orange) for the area at the mouth of the Squamscott River.

Promising Migration Areas

As highlighted in **Figure 1**, the marsh migration mapping tool was used in participatory mapping exercises to gather insight from the planners, land conservation experts, and restoration practitioners that were part of the GBNERR partner network. For example, in March 2024, partners joined an online work session and were divided into breakout rooms to review the mapping tool. Each breakout room "team" was assigned a color and then the team worked their way around coastal New Hampshire in the online mapping tool, adding polygons of their color to different marsh migration areas based on the criteria developed earlier (see Section 2.2), as well as their local knowledge and experience. Their reasoning for selecting a given area was recorded in the attribute table of the polygon layer. The breakout room teams could see the polygons being added by other teams in real-time. The results of this participatory mapping exercise, shown in **Figure 6**, shows the various marsh migration areas identified, including areas that were highlighted by multiple teams, demonstrating high interest from partners and/or high potential for marsh migration.

See Section 3.1 of this report for the findings of the promising areas for marsh migration identified through this collaborative process.

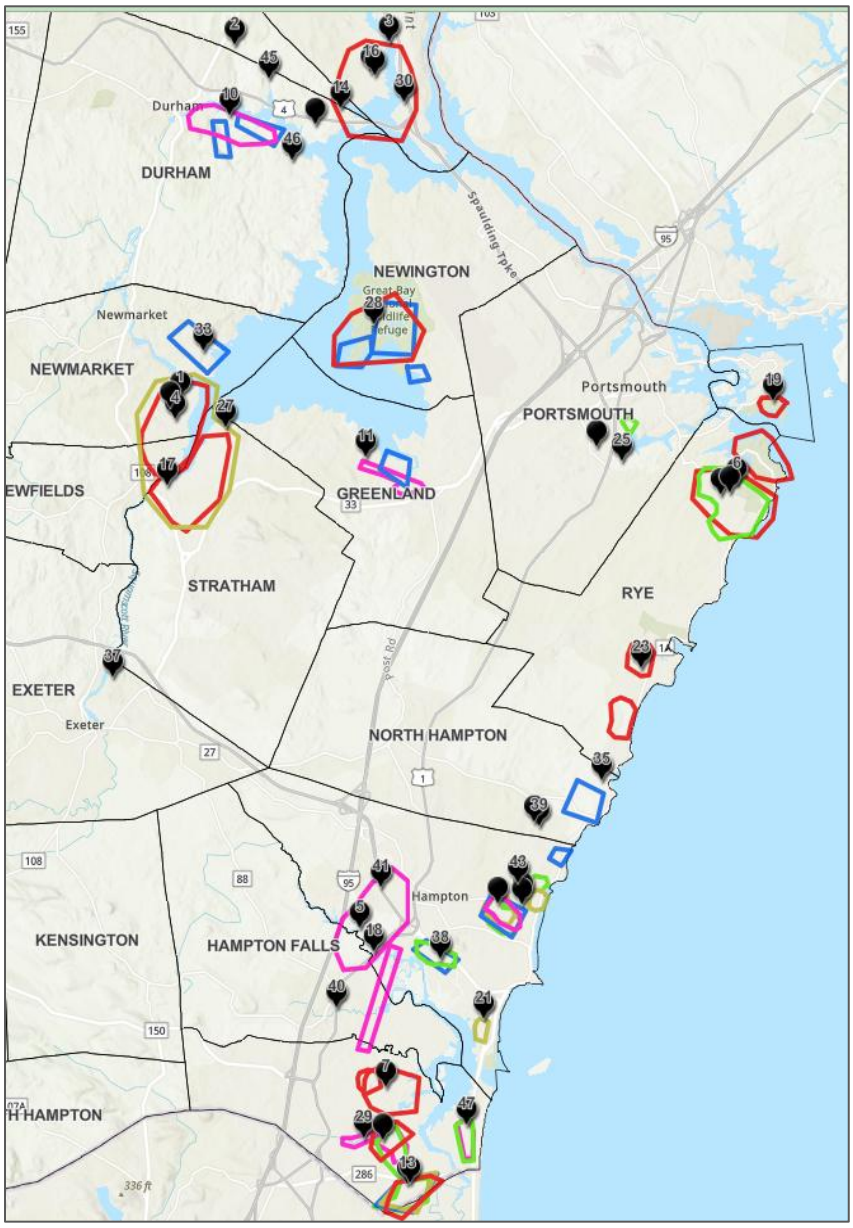

*Figure 6: Results of participatory mapping exercises, including project ideas (black points) and promising areas (polygons), which show areas of high interest and/or high potential for marsh migration. This information was used to develop the "promising areas" map shown in **Figure 7**.*

2.4 Identifying Potential Marsh Migration Projects

In conjunction with identifying promising areas for salt marsh migration projects, we worked with our partners to conceptualize the following *types of project concepts* that would promote marsh migration:

- **Land conservation** that protects migration space
- **Restoration of existing salt marsh** to support its current condition and thereby future resiliency and potential for migration
- **Facilitated or assisted migration into upland areas** adjacent to current salt marsh, e.g., through re-grading, planting, invasive species management, breaching berms, or tree limbing
- Outreach to municipalities, landowners, neighborhood associations, and other organizations to help them **anticipate and plan for expected habitat changes**
- **Researching and providing information to partners on thematic topics** that impact marsh migration across the region, e.g., the role of and strategies for historic stone walls that may be barriers in the migration space, or the role of historic rail beds in restricting marsh migration pathways
- Regional-scale marsh migration **projects that impact multiple parcels** or properties, e.g., adaptive management of school yards or development of neighborhood easements
- **Technical guidance** for public and private landowners about how to proactively manage a changing shoreline and make space for marsh migration
- Some combination of those listed above

It is important to note that in many cases, it is some combination of these project types that come together to promote protection of marsh migration space. As such, these projects typically involve multiple organizations, including land trusts, municipalities, restoration experts and scientists, land managers, and sometimes private landowners.

Once it was determined *where* to invest in salt marsh migration using the marsh migration mapping tool and *what* those projects might entail, we then narrowed down all the information provided by partners through multiple meetings, consultations, and online work sessions to identify 12 projects for near-term implementation. Practical and field-oriented criteria brainstormed earlier in the project were considered during this phase (see Section 2.2 and Appendix B). The following key practical factors went into deciding which projects to elevate:

- Willing and interested landowner(s),
- Project partners interested in developing projects within the next year,
- Potential funding sources available, and
- Diverse project concepts that could engage a variety of partners and funders and serve as interesting demonstration sites.

Section 3.2 provides detailed findings about the specific marsh migration projects selected and supported through the *Pathways to Salt Marsh Resilience Project*.

2.5 Determine Appropriate Actions or Deliverables to Support Selected Projects

The final stages of the *Pathways to Salt Marsh Resilience Project* involved determining what actions or products were needed to support the 12 selected marsh migration projects. We identified the following strategies for helping partners promote salt marsh migration:

- Development of Marsh Migration Opportunity Maps - a succinct project profile to summarize what is known about marsh migration for a site/area in a practical way that supports project planning for land conservation and restoration projects
- Convene meetings with interested parties - organize and host groups on a particular location or topic related to marsh migration
- Outreach - presentations to groups interested in learning about marsh migration for their town/area
- Grant writing support to incorporate marsh migration, including development of accompanying maps and data interpretation
- Information gathering from regional experts to support thematic marsh migration topics
- Connecting project concepts with potential funding sources
- Some combination of those listed above

The Marsh Migration Opportunity Maps developed for this project were an important starting place for conversations about marsh migration. (All maps are included in Appendix C and discussed further in Section 3.2.) These map products were included in meetings and outreach opportunities to help bring attendees up to speed on the subject. We found that it was best to be flexible as to what each project needed in order to provide the most impactful support. In several instances, more than one type of product or meeting was needed, or the Marsh Migration Opportunity Map format was adapted to meet a project's need. It is also important to note that given the timescale of many projects (e.g., often years for a land conservation project), support is ongoing and will evolve over time.

3.0 Findings: Promising Areas and Strategies for Protecting Migration Corridors

3.1 Promising Areas for Investing in Marsh Migration Projects in New Hampshire

The following factors emerged as particularly important to consider when evaluating where to invest limited dollars to ensure that marshes have a pathway to migrate inland over the long run:

- Large migration space that is hydrologically connected to existing salt marsh
- High potential that the adjacent upland will transition to marsh
- Viable conservation opportunities if upland is not already protected
- Current salt marsh is in relatively good condition ecologically
- Partners are interested in the site and there seems to be momentum
- Marsh is valued for multiple reasons, e.g., rare plants and animals, flood mitigation, recreation or aesthetics

Refer to Section 2.2 and Appendix B for a complete list of the criteria and data sources considered.

Based on the spatial information compiled and the local knowledge of partners, we identified over twenty promising areas for potential marsh migration projects in coastal New Hampshire. These promising areas are shown in **Figure 7**.

Table 3 summarizes information gathered from partners about these promising areas and potential salt marsh migration 23 pathway project concepts.

We encourage partners to review these project ideas and reference this report in future discussions and grant applications to demonstrate that the site and project concepts were identified through this science-based, collaborative prioritization process.

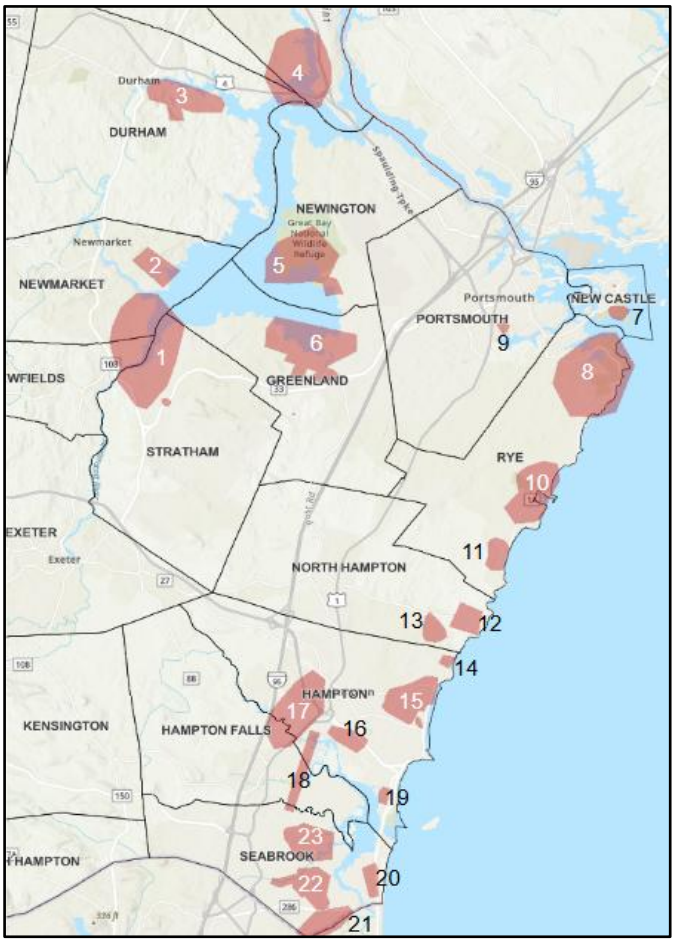

*Figure 7: Promising areas for investing in salt marsh migration projects in coastal NH. See **Table 3** for more information on each location. Locations are approximate.*

*Table 3: Promising areas for investing in salt marsh migration projects in New Hampshire and key information about each area. See **Figure 7** for locations (note that locations are approximate).*

Map Number (Fig. 5)	Promising Area Name	Rationale for Including this Area and Other Relevant Information Provided by Partners	Organizations Providing Input*
1	Mouth of Squamscott Area	-Many partners identified this as a high priority marsh migration area to protect -Large parcels with significant areas of migration space -Ideal area for marsh migration because of topography -Documented evidence that marsh migration is already happening in some sections -Adjacent to NH Fish & Game conservation lands -Many partners are interested in land protection projects for this area -Planned culvert replacements in this area will improve tidal flow and migration space -Existing research is going on in this area can support marsh migration -Saltmarsh Sparrow habitat -Restoration opportunities that could compliment land protection opportunities -Ongoing TNC oyster reef restoration project	EPA, SELT, TNC, NHDES Coastal Program
2	Lubberland Creek Area	-Restoration opportunities exist in the marsh and in migration pathway to improve condition and resilience -Landowner (TNC) is currently working with partners to pilot marsh migration monitoring protocols and to develop restoration plans -Upslope and upstream opportunities for marsh migration migration exist -Saltmarsh Sparrow habitat and rare plant species -Conservation opportunities (e.g., Arsenault property)	TNC, UNH, EPA
3	South Bank Oyster River Area	-Land conservation opportunities exist -High priority area for many partners for land protection -There are relatively few landowners, larger parcels, and other conservation lands nearby -NRCS is acquiring a conservation easement on Horsehide Brook in the marsh migration space -Opportunity for culvert replacement on Horsehide Brook -Vulnerable marshes and high development pressure so there is urgency to protect migration space -Mill Pond Dam is coming out and will impact hydrology in the region	SELT, NRCS, NHDES Coastal Program, TNC
4	Bellamy River Area	-Possibilities exist for land conservation -Large migration space areas that are mostly forested -Existing conservation lands nearby -Roadways block migration - culverts may need to be assessed -Work with land managers to promote migration where migration space already exists within conservation land -Consider facilitated or assisted migration techniques to address shading by forest that is impacting salt marsh at upland border	NRCS, UNH, NH GRANIT

Map Number (Fig. 5)	Promising Area Name	Rationale for Including this Area and Other Relevant Information Provided by Partners	Organizations Providing Input*
5	Great Bay National Wildlife Refuge (NWR) Area	-USFWS has been looking at migration in this area for a long time and has several project ideas -Evidence of salt marsh migration already happening, potential for monitoring of marsh migration -An important area to multiple habitats (e.g., eelgrass) -Stubbs Pond dam is impacting tidal flow -Could target conservation opportunities near NWR that are experiencing development pressure	USFWS, UNH
6	Winnicut River Area / Foss-Shaw Brooks Area	-Land conservation opportunities exist, could build on existing land protection efforts -In-marsh restoration needed: berms, open water management, multiple culverts that are impacting tidal flow -Foss/Shaw Brooks area could benefit from restoration including for fish passage, consider talks with NRCS for this area	SELT, NHDES Coastal Program, NRCS, SHEA
7	South New Castle Area	-Land conservation opportunities with restoration required (e.g., Phragmites removal) -Possible tidal restrictions -Potential location to implement salt marsh migration monitoring -Potential impacts from historical agriculture (e.g., ditches)	SELT, UNH
8	Fairhill Area / Berry's Brook	-Large, ongoing in-marsh restoration project with potential for marsh migration with facilitation (e.g., breaching berms) -Ongoing land conservation efforts and possible new opportunities with large parcels in migration pathway -Evidence of migration already happening, low landcover resistance in migration pathway -Phragmites to manage -Saltmarsh Sparrow habitat in this area -Public education opportunity with Seacoast Science Center -Need to engage landowners, there is development pressure on Brackett Road that could impact migration space -Berry's Brook area - marsh migration potential here with some facilitated migration (e.g., breaching stone walls)	USFWS, NOAA OCM, UNH, SELT, NHDES Coastal Program
9	Portsmouth High School Area	-High school fields: opportunity for adaptive management of school yards, would provide large migration space	SELT
10	Rye Harbor Area / Awcomin Marsh	-Multiple undersized culverts and tidal restrictions in this area, there is migration space upstream of three possibly BIL-funded culvert replacements -Good target because it is less developed than other areas, lower landcover resistance, near conservation lands -Upstream migration area is going into a high value freshwater wetland so this is an example of a trade-off -Stone walls may be impacting migration at Awcomin Marsh -Land conservation opportunities in migration pathway that could connect to Rye Town Forest	NOAA OCM, USFWS, NHDES Coastal Program, SELT
11	Eel Pond Area	-Marsh migration potential if tidal openings added, raised road may create tidal restriction -Acknowledgement that this area would be difficult because most of the migration space is on golf courses	GBNERR Research Team
12	Chapel Road North Hampton Area	-Interesting area for marsh migration identified by several partners -Adjacent to other restoration projects -Area is a mix of forested and private lands	USFWS, NHDES Coastal Program, PREP

Map Number (Fig. 5)	Promising Area Name	Rationale for Including this Area and Other Relevant Information Provided by Partners	Organizations Providing Input*
13	Little River/ Runnymede Area	-Potential for easements in area between existing marsh and houses on cul-de-sac -There are some embankments and stone walls at the end of the cul-de-sac that might be removed to promote migration -There is a privately-owned dam-like structure on the Little River that is restricting flow and is likely impacting salt marsh migration	NHDES Coastal Program
14	Huckleberry Lane South Area	-Potential culvert replacement needed that would impact migration space, water comes up and pools on the downstream side converting area to open water	NHDES Coastal Program
15	Meadow Pond Area	-Possibility to include salt marsh migration space in an assisted relocation projects -Area is flooding regularly and is susceptible to sea level rise. Hampton DPW has expended much time and energy trying to address flooding here. 2021 Hampton Flood Mitigation Analysis provided some flood mitigation strategies. -Explore bundling easements for parcels (or portions of parcels) on Kings Highway: "neighborhood marsh migration easement project" concept, consider use of lot line adjustments. -At the southern end of Meadow Pond, there is unfragmented, undeveloped land possible for conservation, the Hampton Natural Resources Inventory (NRI) reported this area had the best flood storage and highest natural resources -Substantial amount of Phragmites in this area to manage	NHDES Coastal Program, UNH, SHEA, SELT, USFWS Gulf of Maine Coastal Program
16	Landing Road Hampton Area	-Possible "neighborhood marsh migration easement project" for parcels that have migration space in this area, consider use of lot line adjustments -Fields at Winnacunnet High School are impacted by flooding and are a potential location to implement adaptive management of school yards -Phragmites and pepperweed has been documented in the area -This area is a focus for SHEA's land conservation activities because there are larger parcels and a lot of open space -Area might be a candidate to implement some facilitated migration techniques	SHEA, NHDES Coastal Program, RCCD, USFWS Gulf of Maine Coastal Program
17	Drakes River Area	-Possible "neighborhood marsh migration easement project" for multiple adjoining parcels with migration space, consider use of lot line adjustments -At Route 1 by the bridge in Hampton there has already been retreat of infrastructure due to flooding (solar field and manufacturing business) -Area is a conservation priority for SHEA due to its multiple values - prime wetlands and a large contiguous wildlife corridor - Towns of Hampton and Hampton Falls are also interested in this area for conservation -The Hampton Draft NRI indicates that there is a lot of unfragmented land adjacent to existing conservation land in this area -NHDES Coastal Program expressed interest in this area for marsh migration projects due to the presence of Saltmarsh Sparrows, room for expansion, relative lack of development, and proximity to the rail trail -Tidal restriction at Route 1 is likely impacting habitat and salt marsh, as well as migration space -There is Phragmites in the Drakeside/Taylor River area to manage	SHEA, NHDES Coastal Program, RCCD, USFWS Gulf of Maine Coastal Program

Map Number (Fig. 5)	Promising Area Name	Rationale for Including this Area and Other Relevant Information Provided by Partners	Organizations Providing Input*
18	Hampton RR Corridor	-There are four culverts constraining tidal inundation along the railroad in this area that are likely impacting marsh migration - There are plans to convert this rail bed to a rail trail, which is an opportunity to address these tidal restrictions -Many partners noted that working on railroad projects is complex due to regulatory and political roadblocks -Partners indicated that they thought this railroad was now owned by NHDOT and it would be worth having a conversation with them about the rail trail and marsh migration. -There are some concerns about the rail trail's potential impact on the salt marsh ecosystem where the rail trail crosses the marsh. A hydrodynamic model is in development and will help partners understand bridged sections. -Funding to implement the rail trail project is a few years off (maybe 2028/2029), but Rockingham Planning Commission is developing preliminary engineering and designs. The tidal restrictions are part of an RPC grant, expected in 2026. -There are ongoing salt marsh hydrology restoration projects just north of Depot Road on NH Audubon lands. -Partners noted that there are some parcels that would be good candidates to pilot facilitated migration techniques.	SHEA, NHDES Coastal Program, USFWS Gulf of Maine Coastal Program
19	Hampton Harbor Area	-The Hampton Beach Village District and Hampton Harbor area experience roadway and property flooding during extra high tides, and low-lying areas throughout Hampton flood when water levels reach 10 feet above mean lower low water (MLLW). These flooding conditions, along with added flooding impacts from storm surge, are anticipated to increase in frequency and magnitude due to sea level rise. Additional information on Hampton flooding can be found on the NH Coastal Adaptation Workgroup (CAW) website. -The Town of Hampton is developing a Voluntary Elevation, Property Acquisition, and Relocation (VEPAR) Program that could help many people in this area who are experiencing routine flooding. Voluntarily vacated properties in the Hampton Beach area may provide the opportunity for the creation of salt marsh migration space. -The National Fish and Wildlife Foundation (NFWF) has funded NH partners in the past to investigate potentially working with willing property owners on acquisition of property. -It was noted that if municipally-owned properties in the migration space have to be vacated due to flooding (e.g., Hampton Department of Public Works property), the land could be re-naturalized to promote marsh migration.	NHDES Coastal Program, NH Sea Grant Extension
20	Seabrook Beach Area	-The Seabrook dunes area is already largely owned by the town. It was identified as a place to study the process of marsh migration because the back dunes/maritime forest will likely be converting to salt marsh over time. -It was noted that this would be a good location for public education given that a lot of people live near there. -Partners noted there are opportunities for ditch remediation behind Seabrook Dunes.	NH Sea Grant Extension, NRCS, SHEA, UNH
21	South Main Street Seabrook Area	-This area is promising for land conservation because of large parcels, interest from various partners, and lower landcover resistance. Some partners were particularly interested in any back-marsh parcels that may be available for conservation, as well as bundling in-marsh restoration with land conservation. -There is a culvert upgrade on South Main Street that is designed and permitted. Restoration planning associated with this has been proposed by TNC and NHDES Coastal Program. -Partners were interested in conserving land upstream of the South Main Street culvert -The Seabrook Wastewater Treatment Facility is in this area and is fairly vulnerable to the impacts of sea level rise. The facility may get moved at some point which could enable opportunities for salt marshes to expand and migrate. -Water seems to be ponding on the marsh surface in places and not properly draining off the marsh, which leads to vegetation dying and potential for subsidence. Excessive standing water could be addressed through restoration techniques such as runneling. -Restoration has been proposed by TNC and DES to go with the South Main Street culvert replacement.	SELT, SHEA, NHDES Coastal Program, USFWS Gulf of Maine Coastal Program

Map Number (Fig. 5)	Promising Area Name	Rationale for Including this Area and Other Relevant Information Provided by Partners	Organizations Providing Input*
22	Cains Brook Area	-This area is promising for land conservation because there are large parcels with relatively low landcover resistance in the migration space. -Seabrook School provides opportunities for partnership on land conservation, possible adaptive management of school yards project and public education about marsh migration. -Another entity to involve would be the Seacoast Science Center. -NHDES Coastal Program/RCP is working on ownership identification of some parcels in this area. -Walton Road area: NRCS has active projects nearby and it would be good to factor the Walton Road migration space into land conservation planning. SHEA also noted that the Walton Road area has been identified by the Seabrook Conservation Commission because of historic arches. There is local interest and energy for conservation there. -Along Cains Brook, it was noted that there are multiple perched culverts and a dam so there are opportunities for in-stream barrier removal that could improve tidal flow. -Partners noted that there are opportunities for in-marsh remediation in the area.	USFWS Gulf of Maine Coastal Program, UNH, NRCS, SHEA, NH Sea Grant Extension, NHDES Coastal Program
23	Beckmans Island Seabrook Area	-Several partners were curious about potential for land conservation in this area due to the lack of development and significant migration space. -The large circular parcel is part of the Seabrook Nuclear Power Plant. Partners noted this is a different type of landowner that could be interesting to engage in discussions about how marsh migration could affect land management. -Partners noted that this area is suitable for marsh hydrology restoration that could provide enhanced pathways for marsh migration.	USFWS Gulf of Maine Coastal Program

**Partner organization acronyms: EPA = Environmental Protection Agency, USFWS = U.S. Fish & Wildlife Service, UNH = University of New Hampshire, NRCS = Natural Resources Conservation Service, SHEA = Seabrook-Hampton Estuaries Alliance, NHDES Coastal Program = NH Department of Environmental Services Coastal Program, TNC = The Nature Conservancy, RCCD = Rockingham County Conservation District, SELT = Southeast Land Trust of NH, NOAA OCM = National Oceanic and Atmospheric Administration Office for Coastal Management, RCP = Rockingham Planning Commission, PREP = Piscataqua Region Estuaries Partnership*

3.2 Site-Specific Strategies to Advance Salt Marsh Migration

From the promising areas identified through our collaborative process, outlined in Section 3.1, we developed site-specific strategies to support marsh migration pathways for 12 projects, which are shown on **Figure 8**. We chose to focus on these locations because we felt our efforts to scope out project concepts would yield short-term benefits; for example, for a specific grant application or to add a new dimension to an on-going initiative. In other cases, we hoped to jumpstart action or explore a new type of project that could serve as an example for other locations.

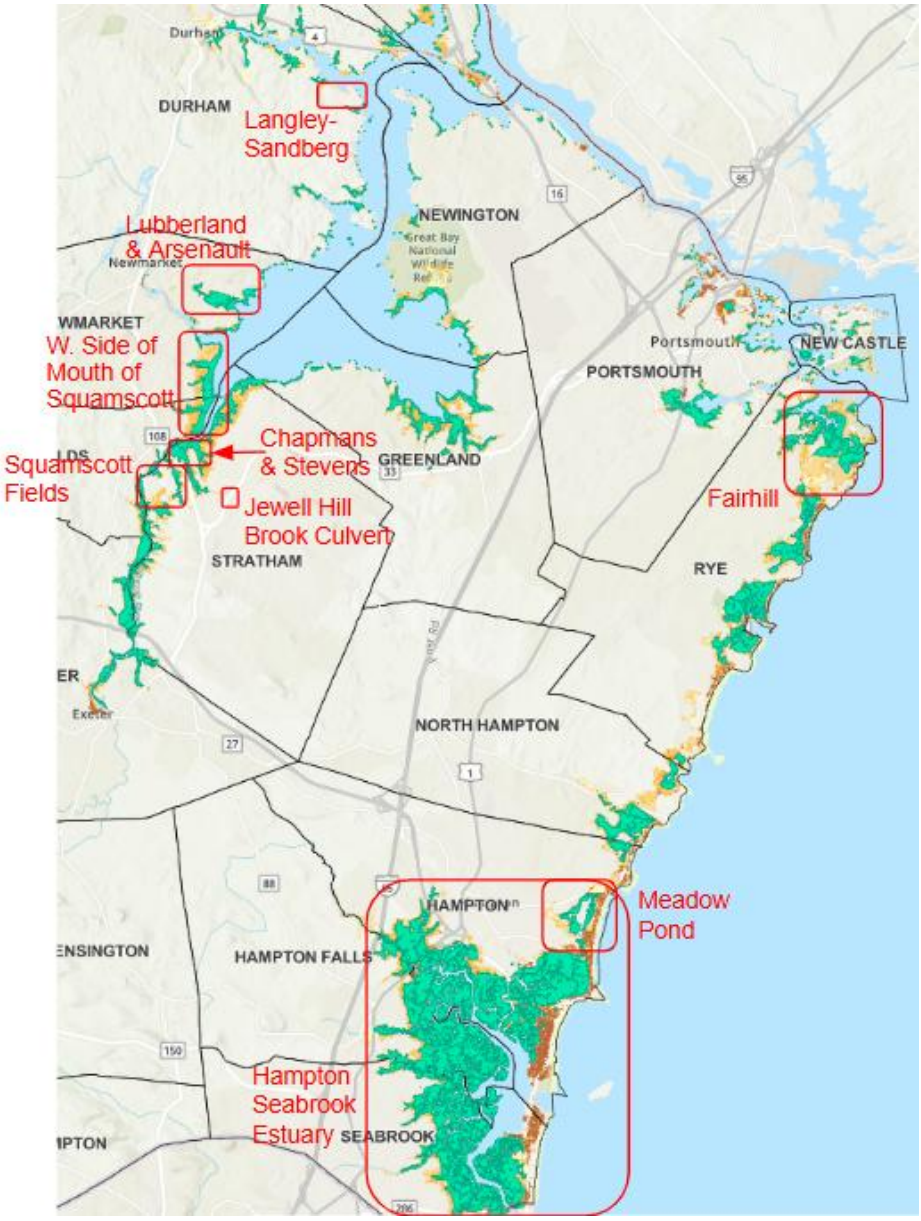

Figure 8: Locations of projects selected by GBNERR to advance marsh migration pathway protection. See ***Table 4*** *for a full description of the projects, including those that are regional, or impact multiple parcels, and are therefore not shown on this map.*

For each of the 12 selected projects, we considered a range of actions and strategies to advance marsh migration, drawing upon available spatial data, the New Hampshire Salt Marsh Plan, and the interest, local knowledge and recommendations of partners. Refer to Section 2.4 for a detailed description of the process we used for conceptualizing how to most efficiently invest in marsh migration. **Table 4** lists the selected projects and provides a short explanation of the concepts that were generated for each site to advance resilience and enable marsh migration.

For most of the projects, we developed a summary product called a *Marsh Migration Opportunity Map* to spark ideas, inform project planning, and support proposal development. All Marsh Migration Opportunity Maps are included in Appendix C. These map products provide context on the location and illustrate the potential for salt marshes to migrate inland. Information is provided about the site, including an interpretation of the map and a summary of all of the ideas, recommendations, and project concepts generated by partners interested in that location. The following factors are summarized in the Marsh Migration Opportunity Maps:

- Amount and characteristics of **marsh migration space.**
- **Tidal restrictions** (e.g., undersized or dysfunctional culverts) that may need to be replaced to restore tidal flow and enable marsh migration.
- **Other barriers to migration**, such as berms or stone walls, that may need to be addressed to enable migration.
- **Invasive species,** such as *Phragmites*, which are known to thrive in the transition zone between fresh and brackish water and can impede establishment of native salt marsh plant marsh species.
- **Potential for in-marsh remediation**, such as ditch repair and managing megapools through runneling, to improve current condition and long-term resilience.
- **Potential for facilitated migration**, which could include changes in hydrological patterns to remove/deter *Phragmites* in transition zones, limbing or removing trees that are shading the marsh edge, or regrading adjacent slopes.
- **Implications for developed areas** in the migration space and considerations for protecting vulnerable neighborhoods and adjacent marsh habitats.

Table 4: List of salt marsh migration projects scoped out by GBNERR, including types of support provided. This information is updated through April 2025. Note that many of these projects are ongoing. Marsh Migration Opportunity Maps are provided in Appendix C.

Project Concept Name	Description of Project Concept	Type of Project Support Provided by GBNERR	Amount of Salt Marsh Migration Space Potentially Impacted (approx.)
Chapman's Landing and Stevens Property, Stratham	-Restoration planning and implementation to increase marsh resilience, address increasing standing water and vegetation death on marsh plateau, and support Saltmarsh Sparrow nesting -Design strategies to facilitate marsh migration, such as re-grading through an experimental design	-Contributed grant writing -Convened multiple meetings with partners -Created Marsh Migration Opportunity Maps to support restoration projects and grant writing -Created online mapping tool for the project and user-friendly metadata	Chapmans: 1.1 acres Stevens: 22 acres
Lubberland Creek Preserve, Newmarket	-Restoration planning and implementation to increase marsh resilience -Goal is to gather/collect robust baseline data, and to have collaboratively developed restoration goals, engineering designs, pre and post monitoring plans, and permits in place for in-marsh restoration and/or activities to facilitate marsh migration	-Contributed grant writing -Convened multiple meetings with partners -Created Marsh Migration Opportunity Map to support restoration projects and grant writing -Created online mapping tool for the project and user-friendly metadata	27 acres
Arsenault Land Protection, Newmarket	-Opportunity to protect lands that are hydrologically connected to the Lubberland Creek Preserve	-Created Arsenault Land Protection Marsh Migration Opportunity Map for use in land conservation meetings and future grant applications to protect this parcel adjacent to Lubberland Creek Preserve	1.8 acres
Regional Land Protection Initiative	-Multi-parcel land conservation grant application spearheaded by the Southeast Land Trust of NH (SELT), including multiple parcels that contain salt marsh migration space	-Grant writing support for 2024 NRCS Regional Conservation Partnership Program application -Completed parcel analysis and summary for migration space potential	Not estimated
Langley-Sandberg Land Protection, Durham	-Land conservation opportunity for two parcels on the Oyster River	-Contributed grant writing to LOI for 2024 Competitive BIL -Created Langley-Sandberg Marsh Migration Opportunity Map to demonstrate potential impact on migration space for grant applications and outreach	4.6 acres

Project Concept Name	Description of Project Concept	Type of Project Support Provided by GBNERR	Amount of Salt Marsh Migration Space Potentially Impacted (approx.)
Squamscott Fields Land Protection, Stratham	-Project seeking to secure a conservation easement for the buffer zone surrounding Stuart Farm	-Contributed grant writing to LOI for 2024 Competitive BIL -Created Squamscott Fields Marsh Migration Opportunity Map to demonstrate potential impact on migration space for grant applications and outreach	24 acres
West Side of Mouth of the Squamscott River Land Conservation, Newmarket & Newfields	-This area has significant migration space, large parcel sizes, and many partners that are interested in land protection. In addition, 8 of these parcels have been identified as Priority 1 for land conservation by the Great Bay Resource Protection Partnership (GBRPP)	-Convened meeting with partners to discuss marsh migration and land conservation opportunities in this area -Created West Side of Mouth of Squamscott River Marsh Migration Opportunity Map to demonstrate potential impact on migration space for grant applications and outreach -Created annotated map of land ownership for parcels in the area	125 acres
Fairhill Marsh Restoration, Rye	-Multi-stage restoration project focused on in-marsh restoration of the existing salt marsh - Restoration techniques may include salt marsh ditch remediation and managing megapools through runneling -Future restoration may include breaching embankments and other techniques to support salt marsh migration	-Created Fairhill Marsh Migration Opportunity Map to demonstrate potential impact on migration space for grant applications and outreach	55 acres
Opportunities in the Hampton-Seabrook Estuary (HSE)	-Elevating the concept of protecting marsh migration pathways across the Hampton-Seabrook Estuary	-Gave presentation on marsh migration at the Town of Hampton Coastal Hazards & Adaptation Team (CHAT) meeting -Created Hampton-Seabrook Estuary Marsh Migration Opportunity Map to support marsh migration protection planning and held meeting with interested partners to gather feedback and additional project concepts	1,300 acres
Meadow Pond Marsh Migration Opportunities in Support of Flood Resilience, Hampton	-Information sharing and partnership building around the concept of how marsh migration pathways can be incorporated into ongoing efforts to build flood resilience in the Meadow Pond area	-Created Marsh Migration Opportunity Map to support marsh migration protection planning -Convened meeting of interested partners to review the location and quality of marsh migration corridors in the area and how their protection could tie into ongoing efforts at building flood resilience and potential future voluntary property buyouts	170 acres

Project Concept Name	Description of Project Concept	Type of Project Support Provided by GBNERR	Amount of Salt Marsh Migration Space Potentially Impacted (approx.)
Coastal NH Culvert Replacement Support, including Jewell Hill Brook	-Culvert replacements for locations with known tidal restrictions that would improve tidal flow for marsh migration pathways	-Convened meetings and conducted analysis to review culvert replacement priorities that have potential to impact marsh migration space -Created Marsh Migration Opportunity Map for the Jewell Hill Brook Culvert Site in Stratham to demonstrate potential impact on migration space for grant applications and outreach	Jewell Hill Brook Culvert: 33 acres
Historic Agricultural Features	-Increase understanding of how stone walls and other historical agricultural features should be addressed during salt marsh restoration projects that incorporate marsh migration space	-Information gathering with Save the Bay-Narragansett Bay, Parker River National Wildlife Refuge, and NHDES Coastal Program -Created summary of regional consultations describing how historical agricultural features are managed in salt marsh restoration projects to share with NHDES and regional partners. This document can be requested from Lynn.E.Vaccaro@wildlife.nh.gov.	n/a

4.0 Summary & Next Steps

The Great Bay National Estuarine Research Reserve's mission is to practice and promote the stewardship of estuaries through integrated and innovative research, education, resource management, and training in the Great Bay Watershed and throughout coastal New Hampshire. The information in this report is intended to summarize our *Pathways to Salt Marsh Resilience Project* and, in doing so, provide guidance and resources for partners in coastal New Hampshire who are interested in investing in salt marsh migration pathway protection. This report also documents the results of the collaborative process used to identify promising areas for marsh migration, which can be referenced by partners to demonstrate the potential of these areas for protecting marsh migration corridors.

Despite the conclusion of this project, our efforts to support marsh migration in coastal New Hampshire are ongoing and expanding. GBNERR will continue to support the 12 projects shown on **Figure 8** summarized in **Table 4**, and additional support can be provided to organizations and communities that would like to explore ways to protect salt marsh migration corridors. Those interested in receiving technical assistance from GBNERR to bolster a salt marsh migration pathway project, such as creation of a site-specific Marsh Migration Opportunity Map like those in Appendix C, grant writing support, or help pulling together interested parties for a meeting, should reach out to the Training and Engagement Coordinator, Lynn Vaccaro at lynn.e.vaccaro@wildlife.nh.gov.

To learn more, visit: greatbay.org/science/habitat-science/

Appendices

Appendix A: Names and Organizations of Project Participants

Appendix B: Spatial and Practical/Field Criteria for Identifying Salt Marsh Migration Projects

Appendix C: Marsh Migration Opportunity Maps

C.1 Arsenault Land Protection Project
C.2 Chapman's Landing-Stevens Properties
C.3 Lubberland Creek Preserve
C.4 Jewell Hill Brook-Route 33 Culvert Replacement Project
C.5 Fairhill Restoration Project
C.6 Langley-Sandberg Land Conservation Project
C.7 Squamscott Fields Salt Marsh Resiliency Project
C.8 West Side of the Mouth of the Squamscott River
C.9 Hampton-Seabrook Estuary Overview
C.10 Meadow Pond Area