

Final Evaluation Findings

Narragansett Bay

National Estuarine Research Reserve

July 2016 to September 2023

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Office for Coastal Management
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Summary List of Findings

The Coastal Zone Management Act requires the National Oceanic and Atmospheric Administration's Office for Coastal Management to conduct periodic evaluations of the performance of state programs participating in the National Estuarine Research Reserve System. This evaluation examined the operation and management of the Narragansett Bay National Estuarine Research Reserve by the Rhode Island Department of Environmental Management, the designated lead agency, for the period from July 2016 to September 2023. The evaluation focused on two target areas: program administration and protecting habitat and increasing coastal and community resilience.

The findings in this evaluation document will be considered by the NOAA Office for Coastal Management in making future financial award decisions concerning the reserve. The evaluation came to these conclusions:

Program Administration

Accomplishment: The Rhode Island Department of Environmental Management has successfully and strategically reorganized its structure. The Narragansett Bay Reserve manager position was reclassified as a division manager and the reserve is now viewed as a division within the department. These changes enhance the reserve's visibility in the department and improve communication, coordination, and credibility between the reserve and other department divisions.

Accomplishment: The Narragansett Bay Reserve staff demonstrated extraordinary resilience, flexibility, support for each other, and dedication in maintaining operations and continuing to meet the needs of their partners and stakeholders, while navigating challenges posed by both the loss of a beloved manager and the pandemic.

Accomplishment: The Narragansett Bay Reserve worked closely with the Rhode Island Department of Environmental Management to successfully hire a new manager and to obtain approval for a new senior maintenance technician position responsible for maintaining reserve infrastructure, equipment, and facilities.

Recommendation: The Narragansett Bay Reserve is encouraged to explore, with the Prudence Island Conservancy areas of mutual interest, the benefits of establishing a more formal relationship in which the conservancy functions as a reserve friends group and, within that context, to consider the need for a coordinated volunteer program.

Recommendations: As the reserve's leadership roles in coastal resilience work continue to grow and as more funding becomes available,

- The Rhode Island Department of Environmental Management and the Narragansett Bay Reserve leadership are encouraged to seek out and implement creative approaches that support staff retention, ease transition, and enhance staff morale, such as knowledge sharing and knowledge transfer plans, building in time for overlap of outgoing staff and new hires, continuing to provide professional development opportunities that enhance job satisfaction and augment staff member skill sets, and ensuring adequate year-round staffing.

- The Rhode Island Department of Environmental Management is strongly encouraged to support the Narragansett Bay Reserve in pursuing a balanced and manageable portfolio so that they can continue to succeed as a reserve contributing to a national system, and as a state leader in coastal resilience in alignment with the reserve mission and management plan.

Recommendation: The Rhode Island Department of Environmental Management and the Narragansett Bay Reserve are strongly encouraged to identify the breadth of the reserve’s operational and programming needs that would be addressed and efficiencies created by having alternative boat access and the type of vessel to best meet these needs.

Protecting Habitat and Increasing Coastal and Community Resilience

Accomplishment: The Narragansett Bay Reserve is commended for its ongoing leadership in and contributions to salt marsh restoration work. Through collaborative partnerships, the reserve and key partners continue to advance comprehensive assessment, restoration, and monitoring of salt marshes in Rhode Island, the region, and the nation. For example, a reserve-led collaborative conducted a first of its kind large, multi-reserve experiment to test the effects of sediment thickness, type, and elevation on thin-layer sediment placement as an adaptation or restoration tool for application on the East and West coasts of the U.S. Until this work, the effectiveness of thin-layer placement had not been tested beyond the Gulf of Mexico coast.

Accomplishment: The Narragansett Bay Reserve has been successful in collaborating and partnering with Rhode Island organizations and municipalities to provide creative, flexible, and potentially life-changing learning and skill building experiences that reach a variety of audiences, including previously underserved populations and the youth. For instance, to manage within the constraints posed by the ferry schedule and its impact on the amount of time a group can spend on the island, the education staff members work with the students at their school site to do pre-work to ensure that they get the most out of their experience during the educational program on the island. These reserve-led experiences connect people to their watersheds and estuaries and equip participants with awareness and capacity to enhance the resilience of their communities.

Accomplishment: The Narragansett Bay Reserve continues to serve as an example and a resource for the Rhode Island Department of Environmental Management in employing community involvement to improve resilience. Examples include engaging stakeholders throughout the process of developing and implementing the Stormwater Training/Facilitated Planning Series on the mainland of Rhode Island, and the disaster planning and the community wildfire protection plan on Prudence Island.

This evaluation concludes that the Rhode Island Department of Environmental Management is adhering to the programmatic requirements of the National Estuarine Research Reserve System in the operation of the Narragansett Bay National Estuarine Research Reserve.

Program Review Procedures

Section 315(f) of the Coastal Zone Management Act of 1972, as amended (CZMA; 16 U.S.C. 1451 *et seq.*), and its implementing regulations at 15 CFR part 921, subpart E, require that a research reserve be periodically evaluated with regard to 1) its operation and management, including education and interpretive activities; 2) the research being conducted within the research reserve; and 3) adherence to the requirements of Section 315(b)(2) of the Coastal Zone Management Act.

The National Oceanic and Atmospheric Administration (NOAA) evaluated the Narragansett Bay National Estuarine Research Reserve in fiscal year 2023. The evaluation team consisted of Pam Kylstra, evaluation team lead, and Betsy Nicholson, north regional director, from the NOAA Office for Coastal Management; and Kevin O'Brien, Connecticut National Estuarine Research Reserve manager. The support of the reserve staff was crucial in conducting the evaluation, and this support is most gratefully acknowledged.

NOAA sent a notification of the scheduled evaluation to the director of the Rhode Island Department of Environmental Management and published a notice of intent to evaluate in the *Federal Register* on August 30, 2023. NOAA also notified members of Rhode Island's congressional delegation. On August 27, 2023, the Narragansett Bay Reserve posted a notice in the *Providence Journal* newspaper about the public meeting and the opportunity to comment.

As a part of the evaluation process, a review of relevant information was conducted, including annual federal financial assistance award reports, the previous evaluation findings, and information provided by the programs documenting how they are implementing their programs and addressing the programmatic requirements of the Coast Zone Management Act. A survey of stakeholders was conducted, and reserve sector leads were interviewed.

The information review and survey results informed the identification of two target areas for the evaluation: program administration, and protecting habitat and increasing coastal and community resilience. A virtual site visit was conducted, and the evaluation team held meetings with staff members and group discussions with stakeholders and program staff members to discuss the target areas. Meeting participants helped identify issues and workable solutions to maintain and improve the implementation of the reserve's programs. In addition, a public meeting was held on October 11, at 12:00 p.m. (Eastern); interested members of the public could attend online. The public meeting provided an opportunity for members of the public to express their opinions about the implementation of the program. Stakeholders and members of the public were also given the opportunity to provide written comments via email through October 20, 2023. There were no written comments received. The Office for Coastal Management then developed draft evaluation findings, which were provided to the Rhode Island Department of Environmental Management and to the reserve for review, and the department's comments were considered in drafting the final evaluation findings.

Final evaluation findings for the national estuarine research reserves highlight each reserve's accomplishments in the target areas and include recommendations, which are of two types:

Necessary Actions address programmatic requirements of carrying out the Coastal Zone Management Act's implementing regulations. These must be completed by the dates specified. Failure to address necessary actions may result in a future finding of non-adherence and the invoking of interim sanctions, as specified in the Coastal Zone Management Act and its implementing regulations.

Recommendations are actions that the office believes would improve the program but which are not mandatory. The state is expected to have considered the recommendations by the time of the next evaluation or dates specified.

Evaluation Findings

The Rhode Island Department of Environmental Management continues to successfully implement the federally approved Narragansett Bay National Estuarine Research Reserve. The department's commitment to and support of the reserve's mission remains constant.

Program Administration

The Narragansett Bay National Estuarine Research Reserve staff members are respected in the region and community as experts. The evaluation team heard consistent support for the reserve and the value it brings to partners, stakeholders, the broader community in Rhode Island and the region, and the national system. Reserve staff members are recognized as being dedicated, knowledgeable, collaborative, and trusted as a part of the community, providing critical information and expertise for decision-making. Stakeholders and partners describe the reserve staff members as the “dream team” that has the technical skills as well as the ability to connect with the community. This view of the reserve has persisted and strengthened even in the face of immense challenges the reserve staff experienced from the pandemic and loss of a beloved manager and friend. The reserve is a tremendous example of resilience.

Management Plan

As with each reserve, regular management plan updates are required. During the current evaluation period, the Narragansett Bay Reserve successfully submitted a draft of the 2022–2027 plan, satisfying the necessary action in the prior evaluation findings that were published in December 2017. The Office for Coastal Management is committed to completing the steps necessary to advance the draft through to final approval.

Partnerships That Support Program Administration

During the previous evaluation period, when the reserve was housed in the department's Division of Planning and Development, although the manager reported directly to the associate director of the Bureau of Natural Resources, concerns about lack of visibility of the reserve were central in several stakeholder, staff, and partner meetings during the evaluation team's site visit. While the reporting chain remains the same, the reserve is no longer located within a bureau division, but now functions similarly to a division. Additionally, as a part of the department's revisioning of the reserve, the reserve manager position was reclassified to function as a division chief, enabling the reserve manager to foster a closer connection with leadership peers of the other divisions in the department.

The result of this new organizational structure is increased visibility of the reserve and its contributions to science and policy in Rhode Island and has led to greater coordination, collaboration, and credibility between the reserve and other department divisions. This enhanced connection has enabled the reserve and the department to share equipment, to assist with facility maintenance, and to build stronger mutually beneficial partnerships. For example, the reserve has been able to establish a positive and effective relationship with the Department's Office of Management Services. This office has committed to becoming conversant with NOAA awards, state match, and the agreement with the Audubon Society of Rhode Island and is supportive of contributing to the success of the reserve. Leadership of the office

and the reserve hold monthly meetings and foster open lines of communication that have enabled the reserve to focus on their programming while the Office of Management Services handles the fiscal responsibilities.

Another positive effect of the elevation of the reserve and department's vision in the reclassification of the reserve manager position in the department's structure has been that those in other divisions across the department are now aware of the expertise the reserve has to offer to department planning activities and initiatives. For example, the stewardship coordinator was invited to participate in the Division of Forest Environment's discussions about planning prescribed burns within the state, and the reserve's education program was asked to take part in the department's pilot of the Rising Environmental Leaders Program.

The ongoing partnership with the **Audubon Society of Rhode Island** was cited by staff and partners as a highly successful model that, through a cooperative agreement, allows hiring and purchasing flexibility for the reserve where the state's processes are less agile. It allows greater ease in reconfiguring the reserve staff as the reserve's staffing needs evolve and grow. Reserve staff members who are Audubon Society of Rhode Island employees and those who are department employees serve alongside one another.

The partnership with the **Rhode Island Coastal Resources Management Council** has also improved in part as a result of the reserve's relocation within the department. An additional factor contributing to the strengthening of the partnership is that the current reserve manager came to that role with 13 years of experience as a policy analyst with the council, bringing a unique awareness of the strengths of the council as well as established relationships with organizations that also partner with the reserve. The reserve and the council work in partnership on coastal and estuarine habitat monitoring, assessment, and restoration and continue to seek ways to provide mutual benefit. For example, during this evaluation period, the reserve and the council worked closely together to develop a proposal to support a full-time project coordinator position to develop and manage Bipartisan Infrastructure Law related proposals and projects that will improve project coordination and management capacity at both organizations, furthering their mutual interests of coastal habitat restoration and land acquisition. This hire was through the cooperative agreement with the **Audubon Society of Rhode Island**, and is one of the first, if not the first instance within the National Estuarine Research Reserve System of staff hiring supported through a fiscal year 2023 Bipartisan Infrastructure Law Capacity Award. The role also represents the first in an effort to build a team of personnel at the department to develop and manage projects that improve coastal community and ecological resilience. Furthering the visibility, communication, and credibility of the reserve within the department, the reserve manager and the council provide a biweekly report to the governor regarding Bipartisan Infrastructure Law and Inflation Reduction Act investments.

While the level of engagement between the **Prudence Island Conservancy** and the reserve has fluctuated over the years, the Prudence Island Conservancy has served, to some degree, as an informal friends group for the reserve. Members of the Prudence Island Conservancy have volunteered with the reserve in numerous ways, including invasive species eradication. The two organizations have co-sponsored educational programs, the conservancy has been a key partner in facilitating land acquisition for the reserve, and the conservancy maintains reserve trails. Formalized friends groups of reserves

support a reserve's priorities and mission through activities such as providing outreach and advocacy for the reserve's work, assisting with fiscal needs, and coordinating volunteers, among other things.

The reserve is interested in having more opportunities for volunteers to assist with various aspects of the reserve, such as raising awareness about the reserve's mission and its impact on the region, assisting with research, monitoring, and stewardship fieldwork, and growing the opportunities for citizen science, but with a small staff, does not have the capacity to administer a formal volunteer program. It seems that there is currently interest from Prudence Island Conservancy members in exploring what a more coordinated volunteer effort could do for the reserve and the conservancy. The reserve is encouraged to explore with the conservancy areas of mutual benefit of formalizing the relationship to function as a friends group.

Accomplishment: The Rhode Island Department of Environmental Management has successfully and strategically reorganized its structure. The Narragansett Bay Reserve manager position was reclassified as a division manager and the reserve is now viewed as a division within the department. These changes enhance the reserve's visibility in the department and improve communication, coordination, and credibility between the reserve and other department divisions.

Recommendation: The Narragansett Bay Reserve is encouraged to explore, with the Prudence Island Conservancy areas of mutual interest, the benefits of establishing a more formal relationship in which the conservancy functions as a reserve friends group and, within that context, to consider the need for a coordinated volunteer program.

Staffing

Reserve staff hold significant regard and respect for one another. In navigating their way through the loss of a beloved manager and friend, as well as the challenges posed by the pandemic, this staff team banded together and propped each other up. As a result, they maintained operations despite the challenges during that time. Safe onsite educational programming was delivered during the pandemic. The coastal training program coordinator and the research coordinator served on a rotating basis in the acting manager role and the other staff members stepped up, often working beyond the scope of their positions, to support reserve operations. System-wide Monitoring Program (SWMP) data continued to be submitted on schedule. Staff members continued to invest in relationships with partners and in the reserve by collaborating with partners in writing proposals and publishing scientific papers. Through these efforts of the staff team, when the new manager started in 2020, she was well positioned to make forward progress rather than having to get things in working order.

The reserve now, once again, has a full complement of staff for the first time since 2019. This is a result of both the support of the reserve by department leadership for the addition of a new state full-time equivalent position for a senior maintenance technician responsible for maintaining reserve infrastructure, equipment, and facilities, as well as the ongoing cooperative agreement with the Audubon Society of Rhode Island.

The evaluation team heard from partners and stakeholders including those within the department that the reserve staff is well regarded, valued, and respected for the contributions their work makes to the region and local community. They also expressed concern that, while they depend on the assistance and

expertise the staff members offer, the role and contribution of the reserve staff members is outsized given the number of staff and is likely beyond a sustainable capacity. Potential for burnout or departure to positions that fit work-life needs better would mean a loss of highly regarded program skills, relationships, and knowledge, which are all critical to the success of the reserve and their partners.

The need for reserve expertise to aid coastal resilience efforts is anticipated to continue to grow in light of current projects and potential funding opportunities. To accommodate this, the reserve will need greater capacity to maintain the strength of the program and implement its management plan successfully. Retention of newer and seasoned staff as well as support from the department for pursuing a balanced and manageable portfolio are both essential elements of the solution. The department and the reserve are encouraged to seek out and implement creative approaches that support staff retention and identify staffing opportunities. Partners, stakeholders, and reserve staff members identified a number of priority areas to consider. These include professional development to improve job satisfaction and augment staff member skill sets in areas like conflict resolution (as demand continues to grow for assistance with building community support for resilience efforts), adequate staffing levels to control workloads, and positioning the reserve for staff transitions. The reserve's practice of hiring seasonal assistance for summer educational programs and maintenance of reserve grounds and facilities is essential. However, also bringing on year-round assistant positions with salary levels that incentivize longer term tenure would minimize turnover and lost investment of getting people up to speed. For example, if the more day-to-day administrative duties were managed by a coastal training program assistant, the coordinator could focus on supporting their main duty of stakeholder engagement. Other ideas to support the work of the reserve as demand grows include increasing the reserve administrative assistant role from part-time to full-time, the addition of a year-round position to assist with research and stewardship needs, shifting the SWMP technician from seasonal to year-round so that SWMP is staffed by two full-time people as is the case at many other reserves, and formally expanding the department's communication team portfolio to include the reserve. Additionally, the reserve could proactively position itself for smooth succession planning by creating a structure for knowledge sharing and documentation as the Rhode Island Coastal Resources Management Council has done for its transitions. Another consideration for managing anticipated staff transition, like retirement, is to intentionally overlap new staff with outgoing staff to facilitate knowledge transfer and relationship building.

The department continues to demonstrate its commitment to the mission of the reserve. To help ensure that support is durable, the department is encouraged to document the strong support of the reserve as an ongoing practice and operating principle so that as leadership changes occur in the future, the culture and practice of support for the reserve continues beyond the tenure of current department leadership.

Accomplishment: The Narragansett Bay Reserve staff demonstrated extraordinary resilience, flexibility, support for each other, and dedication in maintaining operations and continuing to meet the needs of their partners and stakeholders, while navigating challenges posed by both the loss of a beloved manager and the pandemic.

Accomplishment: The Narragansett Bay Reserve worked closely with the Rhode Island Department of Environmental Management to successfully hire a new manager and to obtain

approval for a new senior maintenance technician position responsible for maintaining reserve infrastructure, equipment, and facilities.

Recommendations: As the reserve's leadership roles in coastal resilience continue to grow, and as more funding becomes available, the

- The Rhode Island Department of Environmental Management and the Narragansett Bay Reserve leadership are encouraged to seek out and implement creative approaches that support staff retention, ease transition, and enhance staff morale, such as knowledge sharing and knowledge transfer plans, building in time for overlap of outgoing staff and new hires, continuing to provide professional development opportunities that enhance job satisfaction and augment staff member skill sets, and ensuring adequate year-round staffing.
- The Rhode Island Department of Environmental Management is strongly encouraged to support the Narragansett Bay Reserve in pursuing a balanced and manageable portfolio so that they can continue to succeed as a reserve contributing to a national system, and as a state leader in coastal resilience in alignment with the reserve mission and management plan.

Prudence Island Access

Access to Prudence Island is limited to the ferry schedule and the Bristol location of the ferry landing. This impacts multiple aspects of reserve operations. It creates additional challenges and expenses for transport of equipment and supplies for research and monitoring, maintenance and repair, stewardship activities, and programming. The reserve's own research and monitoring activities that are driven by the timing of the tides are hampered by misalignment with the ferry schedule. Opportunities for the reserve to seek assistance through fellowships may also be fewer. Although the reserve management plan notes interest in finding ways to attract more researchers to the reserve, visiting researchers have been deterred from conducting research at the reserve because of the limitation of the ferry schedule and the inability to transport their equipment, increasing the potential for missed opportunities for collaboration. Access to flexible and adequate boat transportation could open up a number of other opportunities as well. State, local, and federal officials and other decision makers could easily be transported to visit Prudence Island sites as a way for them to learn about reserve activities, research project results, and investments that can then inform their decision-making.

The sensitivity and economic importance of the Prudence Island nearshore area further complicates this access challenge. The area of Narragansett Bay within the reserve boundary includes important subtidal habitats for eelgrass beds and soft bottom areas that support shellfish, fish, birds, and harbor seals and are used extensively for recreational and commercial purposes. The management plan identifies the opportunity to develop research and stewardship in these areas to provide better data and evidence to inform education, training, and management.¹ While the reserve does have a small skiff, it is not large enough to safely transport multiple people or larger equipment. There is also no reliable dock infrastructure available that offers protection from the elements where the skiff can be stored when not in use. Currently, the stewardship coordinator only leaves the skiff in the water overnight if the weather forecast is favorable, he's staying on-island, and a privately owned mooring can be borrowed for the

¹ Narragansett Bay Estuarine Research Reserve Management Plan 2023-2028

night. If a department vessel and a reliable docking solution were available, it would provide a more flexible alternative to the ferry and address many of the operational challenges related to the constraints of the ferry's fixed schedule and landing location.

With the exception of the coastal training program coordinator, those who work primarily at the reserve headquarters on Prudence Island are core sector staff, the manager, and seasonal employees. Working remotely from home continues to offer some flexibility for staff; however, much of the work of the reserve must be done onsite on Prudence Island. The necessity of using the limited Bristol ferry as the only access to work poses a significant inefficiency for staff who need to be on island, or who may need to split their time with mainland work. If the reserve had access to a suitable vessel accessible from Wickford available for use by reserve staff members, it would reduce time lost. This would complement staff retention measures discussed in the previous section by contributing to an increase in staff productivity and morale.

The reserve staff members have been resourceful in their efforts to minimize the impacts of the limitations imposed by the necessary dependence on the private ferry; however, if they had a reliable, suitable alternative, the energy spent managing their schedules around the ferry could instead be directed toward the reserve's mission, further amplifying their ability to serve the state and region. The reserve and the department are encouraged to dedicate thoughtful consideration to identifying the breadth of operational needs that would be addressed and efficiencies created by having alternative boat access and the type of vessel to best meet these needs. To aid in that effort, they could connect with other reserves in New England and elsewhere to gather information about how and what types of boats are used to conduct operations and implement programming.

Recommendation: The Rhode Island Department of Environmental Management and the Narragansett Bay Reserve are strongly encouraged to identify the breadth of the reserve's operational and programming needs that would be addressed and efficiencies created by having alternative boat access and the type of vessel to best meet these needs.

Protecting Habitat and Increasing Coastal and Community Resilience

Rhode Island is a small state with many organizations that have complementary, and in some cases, overlapping missions. Although reserve stakeholders and partners have multiple options for obtaining information and skills, discovery through educational programs, and enjoying the outdoors, they recognize the reserve as their "go-to" source. They view the reserve as consistently bringing significant added value through leadership, a culture of collaboration and coordination, and scientific integrity. The reserve staff members have trusted relationships with those they work with and serve that have developed because of successful, high-caliber work over many years.

Salt Marsh Restoration

The reserve has a long history of leading collaborative work to monitor, assess, better understand, measure, and address salt marsh degradation. During the evaluation meetings, partners shared that the reserve's efforts over the past 20 years in collecting, analyzing, and sharing the long-term monitoring and salt marsh restoration data and results has been critical in informing planning and restoration work in the state. They noted that without the dedicated time and expertise of the reserve research and monitoring program to synthesize and publish the data, it would not be available to Rhode Island

restoration practitioners for use in designing future projects or sharing with other regions. Key partners participating in salt marsh habitat work with the reserve during this evaluation period included: **Rhode Island Coastal Resources Management Council, Save the Bay, Narragansett Bay Estuary Program, Rhode Island Natural History Survey, Rhode Island Department of Environmental Management, and Rhode Island Sea Grant.** Examples of that work include:

- The development and implementation of “[A Strategy for Developing a Salt Marsh Monitoring and Assessment Program for the State of Rhode Island](#)” in 2016.
- Reserve staff and partners worked together to complete and implement the “[Rhode Island Coastal Wetland Restoration Strategy](#)” in 2018. The strategy is designed to provide guidance to restoration practitioners in the state for the management of coastal wetlands that, due to a number of anthropogenic stressors, have become degraded. Importantly, because the state of Rhode Island does not have a department dedicated to ecological restoration, this collective partnership is serving to fill that gap. The strategy acknowledges interest and need for a centralized hub within the Rhode Island Department of Environmental Management for work in habitat restoration and assessment. To that end, the reserve and partners went on to develop “[A Framework for Prioritizing Salt Marsh Restoration and Conservation Activities in Rhode Island](#)” as an addendum to the strategy. The reserve serves as a key partner in the continued development of a permanent statewide coastal restoration program that facilitates the implementation of the strategy through the [Salt Marsh Restoration, Assessment, and Monitoring Program](#).
- The reserve and partners are advancing efforts to identify, prioritize, and conserve lands that provide migration pathways of tidal wetlands as sea level rises. The project is a collaboration among six national estuarine research reserves, the National Estuarine Research Reserve Association, and NOAA Office for Coastal Management, stemming from needs assessment recommendations that the Narragansett Bay Reserve’s project coordinator completed as a NOAA Digital Coast Fellow. The reserve was awarded America the Beautiful Challenge funding from the National Fish and Wildlife Foundation to support this project.
- The reserve partnered with the Elkhorn Slough Research Reserve on a 2016 Research Reserve System Science Collaborative Transfer Project to develop indices of marsh resilience to sea level rise in 16 reserves across the U.S. to assess regional and national patterns in resilience. This [first national assessment](#) of its kind was published in *Biological Conservation*, and solidified tidal marsh resilience to sea level rise (MARS) indices that will be used across the reserve system to evaluate change.
- The reserve led a collaboration of eight reserves across the country to conduct a first of its kind large, multi-reserve experiment to test the effects of sediment thickness, type, and elevation on thin-layer sediment placement on the East and West coasts. Previous to this work, thin-layer sediment placement was typically used in the Gulf of Mexico, and the effectiveness of it as a restoration or adaptation tool in other regions had not been explored. The work was funded by the Science Collaborative beginning in 2017 and was published in *Estuaries and Coasts* in 2022. This groundbreaking work resulted in [guidance for thin-layer sediment placement](#). This work not only involved the reserve’s research team, but the coastal training program coordinator served as the collaborative lead, coordinating the process to incorporate end-user need into the project design and execution.

- At the state level, the reserve continues to participate as a key partner with others including **Save the Bay** and the **Rhode Island Natural History Survey** in initiating, conducting, and monitoring effectiveness of thin-layer sediment placement projects in Rhode Island.

Accomplishment: The Narragansett Bay Reserve is commended for its ongoing leadership in and contributions to salt marsh restoration work. Through collaborative partnerships, the reserve and key partners continue to advance comprehensive assessment, restoration, and monitoring of salt marshes in Rhode Island, the region, and the nation. For example, a reserve-led collaborative conducted a first of its kind large, multi-reserve experiment to test the effects of sediment thickness, type, and elevation on thin-layer sediment placement as an adaptation or restoration tool for applications on the East and West coasts of the U.S. Until this work, the effectiveness of thin-layer placement had not been tested beyond the Gulf of Mexico coast.

Partnerships for Resilience

The reserve fosters and participates in many partnerships to advance work across the region. Multiple discussions during the evaluation meetings with stakeholders, partners, and staff members centered on the strong partnerships that contribute to the success of the reserve.

Prudence Island's location makes it vulnerable to storms from every direction, and because access to the island is dependent upon the schedule and capacity of the privately owned ferry, post-storm recovery is more challenging than on the mainland. Utility repair equipment, material, and personnel must be transported via the ferry and can mean that power outages on the island can last much longer than mainland residents may experience. With their considerable exposure to storm activity and associated erosion, when utility poles fail or sustain damage, the threat to public safety and reserve operations is heightened due to the potential for power outages, risk of fire, injury, property damage, and impacts to the marsh during repair or recovery efforts. To address this, the reserve and the **Prudence Island Conservancy** successfully acquired National Estuarine Research Reserve Procurement, Acquisition, and Construction (PAC) funding to coordinate with National Grid, the electric utility company that serves Prudence Island, on a project to remove utility poles and wires from sensitive salt marsh habitat and bury them underneath an existing roadway. This will increase the island community's resilience to storms, reduce their risk of fire hazards, and protect sensitive habitat from impacts caused by damaged or downed poles. Prudence Island residents emphasized their deep appreciation of the reserve's role in completing this project.

The reserve staff continue to maintain a positive relationship and collaboration with the **Prudence Island Planning Commission** and continue to provide assistance and expertise in addressing areas that matter to the Prudence Island community like fire management, disaster preparedness, and invasive species control. In the previous evaluation period, multiple partners collaborated and received a grant award to develop the "[Prudence Island Community Wildfire Protection Plan](#)"; during this evaluation period in 2018, that plan was completed and implemented. The reserve has worked with the preparedness group that started in 2021 to engage the community in disaster preparedness. As a part of this, the reserve helped the group implement and coordinate the Map Your Neighborhood effort to better understand the resources and needs in the community for timely disaster response before outside help can arrive. The reserve has made several on-island facilities available to the community for

use in preparation for and response to disasters. The classroom, lodge, and cottage are available as comfort stations. They serve as temporary housing and are equipped with generators and satellite radio.

Good partnerships depend on strong collaboration and effective communication, and the reserve staff is recognized and trusted by partners for having the expertise to do that well. For example, the coastal training program coordinator serves on the EPA-funded **Southeast New England Program Network's** advisory committee and helps the network build community support and capacity in Rhode Island for stormwater planning. She has worked with them to provide guidance for moving from their development of an idea for the [Stormwater Training/Facilitated Planning Series](#) through planning and implementation, while engaging stakeholders throughout the process. The coastal training program coordinator has now been asked by the mayor of Providence to help the city reach clean waterway goals by helping to build and facilitate a stormwater task force.

Part of improving the resilience of communities is providing accessible education that connects diverse audiences of teachers and students to their watersheds and estuaries. Partners, including the **Rhode Island Environmental Education Association**, which supports the work of environmental organizations and efforts in the state, noted that the reserve has education programming unique within the state and, as a result, has increased the collective understanding of what environmental education can look like. Partners appreciate the education program coordinator's strong interest in tailoring the content and design to the needs of the group. For instance, to manage within the constraints posed by the ferry schedule and its impact on the amount of time a group can spend on the island, the education staff members work with the students at their school site to do pre-work to ensure that they get the most out of their experience during the educational program on the island. The **Girl Scouts of Southeastern New England** has been working with the reserve's education program to create experiences that align with participants' level of comprehension, literacy, and interests. For instance, the scouts can participate in reserve educational programs designed to contribute to requirements to earn the Science, Technology, Engineering, and Mathematics Career Exploration Badge by learning about what a day in the life of the work of conservation and restoration practitioners encompasses. **Big Brothers Big Sisters of Rhode Island** hosts monthly activities for mentor/child matches to do together and has partnered with the reserve to serve over 256 matches within the last two years. These activities allow participants to engage in experiences that are often new or that are not a part of their regular day to day. One mentor shared that her "little sister" had such an amazing time on the island that she wants to explore marine biology or conservation in the future. The education and stewardship coordinators collaborate to provide hands-on learning and skill-building experience with habitat management for student groups that visit the island on a recurring basis. The student groups have created a habitat management plan, removed invasive species like European larch and vines, conducted monthly surveys of birds, pollinators, and flowering plants, and will be creating outreach products like signage to interpret their work for other reserve visitors.

Accomplishment: The Narragansett Bay Reserve has been successful in collaborating and partnering with Rhode Island organizations and municipalities to provide creative, flexible, and potentially life-changing learning and skill building experiences that reach a variety of audiences, including previously underserved populations and the youth. For instance, to manage within the constraints posed by the ferry schedule and its impact on the amount of time a group can spend on the island, the education staff members work with the students at their school site to do pre-work to ensure that they get the most out of their experience

during the educational program on the island. These reserve-led experiences connect people to their watersheds and estuaries and equip participants with awareness and capacity to enhance the resilience of their communities.

Accomplishment: The Narragansett Bay Reserve continues to serve as an example and a resource for the Rhode Island Department of Environmental Management in employing community involvement to improve resilience. Examples include engaging stakeholders throughout the process of developing and implementing the Stormwater Training/Facilitated Planning Series on the mainland of Rhode Island, and the disaster planning and the community wildfire protection plan on Prudence Island.

Evaluation Metrics, 2012-2017

Beginning in 2012, national estuarine research reserves began tracking their success in addressing three evaluation metrics specific to their programs. The evaluation metrics include a five-year target and provide a quantitative reference for each program about how well it is meeting the goals and objectives it has identified as important to the program.

Approved June 18, 2012. The goals and objectives are from the Narragansett Bay National Estuarine Research Reserve 2010-2015 Management Plan.

Metric 1

Goal: Enhance peoples' ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: Increase the use of high quality NBNERR and NERRS estuary, water quality data, and climate change education products by formal (and informal educators) in the Narragansett Bay watershed.

Strategy: Provide formal educators with professional development opportunities that include both technical training and background in technology-driven educational tools that enhance NBNERR and NERRS education programs such as Google Earth and the new SWMP interface as well as hands-on field opportunities. These trainings will follow the Teachers on the Estuary (TOTE) model that has been used with great success at NBNERR over the last few years. These multi-day workshops utilize the Reserve's habitats and current research as a base for introducing teachers to coastal issues and real-world science that they can then incorporate into their classroom studies. While the Reserve has worked hard to reduce costs, these trainings still depend on adequate funding. Reduced operations funding over the next few years could limit the number of trainings possible as well as the total number of contact hours for each educator. More information can be found in the Narragansett Bay Management Plan 2010-2015, pp 42-43.

Performance Measure: Number of professional development contact hours for formal educators.

Target: By 2017, 700 professional development contact hours for formal educators.

Results:

- Year 1 (2013) = no data submitted
- Year 2 (2014) = 112 contact hours
- Year 3 (2015) = 188 contact hours
- Year 4 (2016) = 243 contact hours
- Year 5 (2017) = 176 contact hours
- Total = 719**
- Average per year = 143.8**

Discussion: The target is 700 professional development hours over the five-year period. The reserve exceeded the target. The reserve's education partners who bring students to the reserve and who host programs at the site offer consistent praise of the quality and flexibility of the program content and design. They also express appreciation for the expertise and knowledge of the reserve staff members providing the programs.

Metric 2

Goal: Increase the use of Reserve science and sites to address priority coastal management issues within Narragansett Bay and its watershed.

Objective: Contribute to status and trends assessments and forecasting of environmental quality by tracking short-term variability and long-term changes in abiotic and biological parameters at the Reserve and within Narragansett Bay.

Strategy: The reserve will work with partners to continue developing and expanding the number of key parameters and sites that are monitored annually in SAV and salt marsh habitats to better understand complex ecosystem changes over time to better quantify short and long-term changes in biological and physical conditions in Narragansett Bay. The metric is defined not only by the number of ecological parameters measured, but also by the number of locations those measurements are taken at. For example, one ecological parameter will be salt marsh vegetation composition; another will be soil bearing capacity; while another could be nekton composition. The metric will be the sum of those ecological parameters, multiplied by the number of discrete measurement locations in salt marsh or SAV beds. This is important because it includes a spatial component to variation in data. Additional ecological parameters will be included if they can provide significant data to help understand the variation in these complex ecosystems. Thus the addition of a new ecological parameter measured at 10 locations would increase the metric by 10.

This expansion will be accomplished in part with new funding that NBNERR secured with Save The Bay from the RI Habitat Trust Fund. In addition, existing staff time will be refocused to accomplish this task.

More information can be found in the Narragansett Bay Management Plan 2010-2015, pp 30-34.

Performance Measure: Sum of each ecological parameter multiplied by the number of new sites the ecological parameter is measured at.

Target: By 2017, 52 is the sum of each ecological parameter multiplied by the number of new sites the ecological parameter is measured at.

Results:

- Year 1 (2013) = no data submitted
- Year 2 (2014) = 33
- Year 3 (2015) = 33
- Year 4 (2016) = 44
- Year 5 (2017) = 63
- Total = 173**
- Average per year = 35.6**

Discussion: The target is 52 over the five year period. The total for the evaluation period of the sum of each ecological parameter multiplied by the number of news sites at which the ecological parameter is measured exceeds the goal by 121. This is indicative of the leadership the reserve provides in collection, synthesis, and evaluation of status and trends data so that coastal stakeholders can make science-grounded decisions.

Metric 3

Goal: Increase the use of Reserve science and sites to address priority coastal management issues within Narragansett Bay and its watershed.

Objective: Continue to provide coastal resource managers, the scientific community, and general education practitioners with appropriate scientific and technical information to foster informed decision making.

Strategy: The Reserve will continue to create and distribute new technical communication products to a wide range of stakeholders. Technical communication products are technical reports, fact sheets, and peer review manuscripts that include significant Reserve staff contributions. The technical communication products may be generated by any sector. The Reserve makes technical communication products available through online downloads from the Reserve's website, direct email distribution and limited print publication. More information can be found in the Narragansett Bay Management Plan 2010-2015, pp 30-34. The Reserve currently has 28 technical communication products that are available to stakeholders and will make an additional 22 available by 2017.

Performance Measure: Number of new technical communication products made available to stakeholders.

Target: By 2017, 22 new technical communication products made available to stakeholders.

Results:

- Year 1 (2013) = no data reported
- Year 2 (2014) = 8 new products
- Year 3 (2015) = 6 new products
- Year 4 (2016) = 7 new products
- Year 5 (2017) = 12 new products
- Total = 33**
- Average per year = 6.6**

Discussion: The target is 22 over the five year period and the total of new data products exceeds the goal by 11.

Evaluation Metrics, 2017-2022

Approved February 20, 2019. The goals and objectives are from the 2010-2015 Narragansett Bay Reserve Management Plan.

Metric 1 – Education Sector

Goal: Enhance peoples’ ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: Increase public awareness, understanding and appreciation of the Narragansett Bay estuary by designing, implementing and supporting high-quality, science-based education programs for P-12 and community education audiences.

Strategy: Enhance, conduct and evaluate a variety of P-12 education programming to provide in-depth hands-on experiential learning for a variety of age groups utilizing the reserve’s habitats and resources while building on STEM principles. Narragansett Bay is a valuable environmental and economic asset for the State of Rhode Island. The health and resilience of the Bay and its watershed is vital to both the natural and human communities that depend on the estuary. Issues such as the improper management of wastewater and non-point source pollution often result in unsafe water for swimming, shellfish harvesting closures, algal blooms, loss of eelgrass habitat and fish kills. By increasing public awareness of these issues and the importance of healthy estuaries, the Reserve hopes to foster behavior changes that positively affect water quality, estuary health and lessen the severity of climate change impacts. The Reserve was able to increase its contact hours with students between FY2014 to FY2015 because of an increase in ferry transportation options under new ownership, and is looking to maintain or exceed that higher level of contact with students.

Performance Measure: From 2017 to 2022, the number of contact hours for P-12 education programming.

Target: From 2017 to 2022, the reserve will provide 12,500 contact hours through P-12 education programming.

Results:

- Year 1 (2018) = 2,736 contact hours
- Year 2 (2019) = 3,007 contact hours
- Year 3 (2020) = 1,332 contact hours
- Year 4 (2021) = 1,350 contact hours
- Year 5 (2022) = 2,613 contact hours
- Total** = 9,706 contact hours
- Average per year** = 1,941 contact hours

Discussion: The target is 12,500 contact hours over the five year period. The shortfall in meeting the target total is likely explained by the decrease in onsite programming offerings and participation during the pandemic. The education staff members were able to provide safe educational program experiences for smaller groups throughout the pandemic. The results above are taken from the Office for Coastal Management education database. The difference between the above results and those noted on page

21 under “the breakdown of P-12 education contact hours as tracked by the reserve by year is:” may be attributed to tracking by calendar year versus by fiscal year.

Metric 2 – Training Sector

Goal: Enhance peoples’ ability and willingness to make informed decisions and take responsible actions that affect coastal communities and ecosystems.

Objective: Increase the knowledge and skill levels of coastal decision-makers so their decisions may better preserve and protect the natural resources of Narragansett Bay and its watershed.

Strategy: Offer a variety of training opportunities to coastal decision makers on topics based upon local needs assessments and program evaluations. Decisions made by coastal decision-makers within the Narragansett Bay watershed can have significant and enduring consequences to the health and integrity of the Bay and the environment in general. Many of the key decision-makers often do not have adequate access to relevant science-based information, training and tools to aid them in making important decisions that affect Narragansett Bay and its watershed. As development pressure increases along with the effects of climate change, there will only be more demands imposed upon coastal natural resources, rendering it imperative that decision-makers have the capacity to make sound decisions about issues that affect the Bay and its watershed. Training topics and content will be based on informal and formal needs assessments to better meet the needs of coastal decision makers.

Performance Measure: From 2017-2022, the total percent of training participants reporting increase in knowledge and skills through post training surveys

Target: From 2017-2022, 95 percent of participants report an increase in knowledge and skills through post training surveys.

Results:

- Year 1 (2018) = 99.8% of participants reporting an increase
- Year 2 (2019) = 99.3% of participants reporting an increase
- Year 3 (2020) = 98.9% of participants reporting an increase
- Year 4 (2021) = 100% of participants reporting an increase
- Year 5 (2022) = 100% of participants reporting an increase
- Five year average = 99.6%

Discussion: The results reflect the ability of the reserve to deliver content that is relevant to stakeholders in a way that promotes effective learning.

Metric 3 – Research Sector

Goal: Increase the use of Reserve science and sites to address priority coastal management issues within Narragansett Bay and its watershed.

Objective: Continue to provide coastal resource managers, the scientific community and general education practitioners with appropriate scientific and technical information to foster informed decision making.

Strategy: Provide the necessary resources for visiting scientists and graduate students to conduct

research at the Reserve through logistical support such as temp housing, access to vehicles, field supplies, storage, or lab space. Provide detailed information on what resources the Reserve can provide to external researchers on the Reserve’s website. Encourage Reserve staff to seek external funding to support additional research within the Reserve and provide financial resources from operations funding when possible. Publications (both peer review and gray) continue to be the most successful and widespread method of distributing and dissemination of quality science and data to help inform future research and coastal management.

The research database collects information by calendar year (not cooperative agreement cycle). It is noted that the reserve’s research sector is in the process of further defining what should be included in the research database. As of now, “All Types of Publications” are to be counted towards the performance measure and this includes publications from both staff and external researchers.

Performance Measure: From 2018 to 2022, the total number of new publications released (peer reviewed and gray) based upon research conducted within the Narragansett Bay NERR

Target: From 2018 to 2022, 25 new publications (peer reviewed and gray) based upon research conducted within the Narragansett Bay NERR.

Results:

- Year 1 (2018) = 7 new publications
- Year 2 (2019) = 6 new publications
- Year 3 (2020) = 4 new publications
- Year 4 (2021) = 1 new publication
- Year 5 (2022) = 4 new publications
- Total** = 22

Discussion: The target for the five year period is 25 new publications. The research database shows zero publications for each year. This may be due to difficulty with entering data posed by issues with maintenance of the research database. The database is being updated and it is hoped the result will be greater ease and accuracy in future tracking of research publications. The count of the publications in this case is by calendar year and is based on the publication date. To obtain these numbers, the evaluator reviewed progress reports submitted by the reserve and conducted a Google Scholar search (see “Appendix”). Additionally, the pandemic occurred within this time frame and certainly had an impact on collaboration and publication.

It should also be noted that this five-year period (2017 to 2022) is referenced in the “Evaluation Metrics, 2022-2027” section below in the “Strategy” section under “Metric 3 – Research Sector.” The total number of publications for the 2017 to 2022 time frame is 40. Part of the discrepancy is due to the difference in tracking by fiscal year versus calendar year.

Evaluation Metrics, 2022-2027

Approved September 19, 2022. Goals and Objectives are from the NOAA-approved draft Narragansett Bay NERR Management Plan 2022-2027.

Metric 1 – Education Sector

Goal: (Management Plan Goal 1) Increase awareness, accessibility, and use of Reserve resources to improve understanding of Narragansett Bay and its watershed.

Objective: (Management Plant Objective E1) Targeted education audiences will be able to identify the functions and ecosystem values of Narragansett Bay and its habitats.

Strategy: Enhance, conduct, and evaluate a variety of P-12 education programming to provide in-depth hands-on experiential learning for a variety of age groups utilizing the reserve’s habitats and resources while building on STEM principles. Narragansett Bay is a valuable environmental and economic asset for the State of Rhode Island. The health and resilience of the Bay and its watershed is vital to both the natural and human communities that depend on the estuary. Issues such as the improper management of wastewater and non-point source pollution often result in unsafe water for swimming, shellfish harvesting closures, algal blooms, loss of eelgrass habitat and fish kills. By increasing public awareness of these issues and the importance of healthy estuaries, the Reserve hopes to foster behavior changes that positively affect water quality, estuary health and lessen the severity of climate change impacts.

Over the previous five-year period (September 2016 through August 2021) P-12 education contact hours totaled 11,655. This total was lower than previous five-year periods due to reductions in contact hours related to COVID-19 restrictions on school field trips, limits on indoor gatherings, etc. (e.g., contact hours for March through August 2019 totaled 2,066 vs. contact hours for March through August 2020, which totaled 342).

The breakdown of P-12 education contact hours as tracked by the reserve by year is:

FY2017: 3,085

FY2018: 2,736

FY2019: 3,108

FY2020: 1332

FY2021: 1392

TOTAL: 11,655

We feel comfortable slightly increasing the 2022-2027 target for this metric above the total for the previous five-year period, anticipating an increase in P-12 education contact hours as COVID-19 related restrictions continue to be lifted. However, totals may continue to be slightly lower than pre-COVID19 periods due to occasional program cancellations related to instances of COVID-19-positive personnel and participants.

Performance Measure: From 2022 to 2027, the number of annual contact hours for P-12 education programming.

Target: From 2022 to 2027, the reserve will provide 12,500 contact hours through P-12 education programming.

Results: Year 1 (2023) = 3,225 contact hours
Year 2 (2024) = TBD
Year 3 (2025) = TBD
Year 4 (2026) = TBD
Year 5 (2027) = TBD
Total = TBD

Discussion: The reserve is on track to meet and likely exceed the total target.

Metric 2 – Training Sector

Goal: (Management Plan Goal 2) Advance scientific literacy and improve decision-making to positively affect Narragansett Bay, its watershed, and communities.

Objective: (Management Plan Objective T1) Decision-makers throughout the Narragansett Bay region increase their knowledge and skills related to priority issues.

Strategy: Offer a variety of training opportunities to coastal decision makers on topics based upon local needs assessments and program evaluations. Decisions made by coastal decision-makers within the Narragansett Bay watershed can have significant and enduring consequences to the health and integrity of the Bay and the environment in general. Many of the key decision-makers often do not have adequate access to relevant science-based information, training, and tools to aid them in making important decisions that affect Narragansett Bay and its watershed. As development pressure increases along with the impacts of climate change, there will only be more demands imposed upon coastal natural resources, rendering it imperative that decision-makers have the capacity to make sound decisions about issues that affect the Bay and its watershed. Training topics and content will be based on informal and formal needs assessments to better meet the needs of coastal decision makers.

Over the previous reported five-year period, the total number of trainings delivered by the Coastal Training Program Coordinator was 63. While the CTPC was able to offer trainings and workshops virtually during the COVID-19 pandemic, the number of trainings held in FY2020 was less than in previous years (9 trainings in FY2020 vs. an average of 14 trainings in each of the previous 4 years).

The breakdown of number of trainings by year is:

FY2017: 16
FY2018: 15
FY2019: 15
FY2020: 9
FY2021: 8

TOTAL: 63

We are decreasing slightly the 2022-2027 target for this metric above the total for the previous period. We anticipate an increase in the number of trainings held as COVID-19 related restrictions continue to be lifted and virtual trainings become more commonplace. However, totals may continue to be slightly lower than pre-COVID19 periods due to program cancellations related to instances of COVID-19-positive personnel and participants. There has also been a recent increase in the amount of direct technical

assistance provided by the CTPC, which may in turn reduce the number of trainings delivered. The target will remain well above the established NERRS minimum target of five trainings per year.

Performance Measure: From 2022 to 2027, the total number of training events delivered by the Coastal Training Program

Target: From 2022 to 2027, the total number of training events delivered by the Coastal Training Program will meet or exceed 50 total trainings, or an average of 10 trainings per year.

Results:

- Year 1 (2023) = 0 number of training events
- Year 2 (2024) = TBD
- Year 3 (2025) = TBD
- Year 4 (2026) = TBD
- Year 5 (2027) = TBD
- Total** = TBD

Discussion: Similarly to the metric for the research sector below, the reporting deadline for this metric is not until February 2024. Considering past performance of the coastal training program sector, it is anticipated that the program will meet or exceed the target in the next evaluation period.

Metric 3 – Research Sector

Goal: (Management Plan Goal 3) Practice and promote place-based research, monitoring, education, training, and stewardship that improves the health and resilience of Narragansett Bay ecosystems and communities.

Objective: (Management Plan Objective R4) The scientific community, educators, and coastal decision makers are more aware of Reserve research activities and products by dissemination via conferences, journal publications and reports, and other methods.

Strategy: Provide the necessary resources for staff and visiting scientists to conduct research at the Reserve through external funding and logistical support such as temporary housing, transportation, or lab space. Publications (both peer review and gray) continue to be the most successful and widespread method of distributing and dissemination of quality science and data to help inform future research and coastal management.

Over the previous five-year period, the total number of peer-reviewed and gray publications based on research conducted within and in collaboration with the Narragansett Bay NERR totaled 41.

The breakdown of number of publications based upon NBNERR-related research is:

FY2017: 11
FY2018: 8
FY2019: 11
FY2020: 7
FY2021: 4

TOTAL: 41

We feel that this is a relatively high total related to the conclusion of several multi-year projects within that time frame. While the Reserve remains committed to producing research-based publications, we plan to set the target for this metric slightly lower than the total for the previous five-year period based on the projects currently in progress and their schedules for completion.

Performance Measure: From 2022 to 2027, the total number of publications released (peer reviewed and gray) based upon research conducted within and in collaboration with the Narragansett Bay NERR

Target: From 2022-2027, the Reserve will support the release of 30 new publications (peer reviewed and gray) based upon research conducted within and in collaboration with the Narragansett Bay NERR both from staff and external researchers.

Results:

- Year 1 (2023) = 4 new publications
- Year 2 (2024) = TBD
- Year 3 (2025) = TBD
- Year 4 (2026) = TBD
- Year 5 (2027) = TBD

Discussion: The reserve manager provided the data in advance of the reporting deadline of February 2024. In addition to the four publications noted in the results above, there are two publications that have been submitted to journals and an additional four publications in development at this time.

Conclusion

For the reasons stated herein, I find that the Rhode Island Department of Environmental Management is adhering to the programmatic requirements of the Coastal Zone Management Act and its implementing regulations in the operation of its approved Narragansett Bay National Estuarine Research Reserve.

These evaluation findings contain four recommendations that must be considered before the next regularly scheduled program evaluation. Program recommendations that must be repeated in subsequent evaluations may be elevated to necessary actions.

This is a programmatic evaluation of the Narragansett Bay National Estuarine Research Reserve that may have implications regarding the state's financial assistance awards. However, it does not make any judgment about or replace any financial audits.

Jeffrey L. Payne, Ph.D.
Director
NOAA Office for Coastal Management

Date

Appendix: Research Publications, Calendar Years 2018-2022

2018

Gehman, A.M., Hall, R.J., and Byers, J.E. 2018. Host and parasite thermal ecology jointly determine the effect of climate warming on epidemic dynamics. *Proceedings of the National Academy of Science* pre-print; <https://doi.org/10.1073/pnas.1705067115>

Kutcher, T.E., C. Chaffee, and K.B. Raposa. 2018. [Rhode Island coastal wetland restoration strategy](#). 55 pp.

Raposa KB, McKinney RA, Wigand C, Hollister JW, Lovall C, Szura K, Gurak, Jr. JA, McNamee J, Raithel C, Watson EB. 2018. Top-down and bottom-up controls on southern New England salt marsh crab populations. *PeerJ* 6:e4876

Raposa, K.B. 2018. Build-out of intensive Tier 3 salt marsh monitoring in Rhode Island. Final report to the RI Coastal Resources Management Council. 8 pp.

Raposa, K.B. 2018. Evaluation of strategies to facilitate salt marsh migration. Final report to the RI Coastal Resources Management Council. 13 pp.

Raposa, K.B., Lerberg, S., Cornu, C. *et al.* Evaluating Tidal Wetland Restoration Performance Using National Estuarine Research Reserve System Reference Sites and the Restoration Performance Index (RPI). *Estuaries and Coasts* **41**, 36–51 (2018).

Durant, D. A Baseline Characterization of Macrozoobenthic Communities around Prudence Island, RI submitted for consideration to be published as a Short Communication/Note on the Northeastern Naturalist peer-reviewed journal is in review for resubmission.

2019

Raposa, Kenneth & Weber, Robin & Ferguson, Wenley & Hollister, Jeffrey & Rozsa, Ron & Maher, Nicole & Gettman, Alan. (2019). Drainage enhancement effects on a waterlogged Rhode Island (USA) salt marsh. *Estuarine, Coastal and Shelf Science*. 231. 106435. [10.1016/j.ecss.2019.106435](https://doi.org/10.1016/j.ecss.2019.106435).

Wasson, K., N.K. Ganju, Z. Defne, C. Endris, T. Elsey-Quirk, K.M. Thorne, C.M. Freeman, G. Guntenspergen, D.J. Nowacki, and K.B. Raposa. 2019. Understanding tidal marsh trajectories: evaluation of multiple indicators of marsh persistence. *Environmental Research Letters*, Volume 14, Number 12.

Wasson, K., K. Raposa, M. Almeida, K. Beheshti, J. A. Crooks, A. Deck, N. Dix, C. Garvey, J. Goldstein, D. S. Johnson, S. Lerberg, P. Marcum, C. Peter, B. Puckett, J. Schmitt, E. Smith, K. S. Laurent, K. Swanson, M. Tyrrell, and R. Guy. 2019. Pattern and scale: evaluating generalities in crab distributions and marsh dynamics from small plots to a national scale. *Ecology* 100(10):e02813.

Raposa, K.B, R.L.J. Weber, D. Durant, S. Rasmussen, R. McKinney and C. Wigand. In prep. Upland buffer vegetation removal as a potential tool for facilitating salt marsh migration. Target journal: *Restoration Ecology*

Cahoon, D.R., Olker, J.H., Yeates, A.G., Guntenspergen, G.R., Grace, J.B., Adamowicz, S.C., Anisfeld, S., Baldwin, A.H., Barrett, N., Beckett, L., Benzecry, A., Blum, L.K., Burdick, D.M., Crouch, W., Ekberg, M.C.,

Fernald, S., Grimes, K.W., Grzyb, J., Hartig, E.K., Kreeger, D.A., Larson, M., Lerberg, S., Lynch, J.C., Maher, N., Maxwell-Doyle, M., Mitchell, L.R., Mora, J., O'Neill, V., Padeletti, A., Prosser, D., Quirk, T., Raposa, K.B., Reay, W.G., Siok, D., Snow, C., Starke, A., Staver, L., Stevenson, J.C., and Turner, V., 2019, Hurricane Sandy impacts on coastal wetland resilience: U.S. Geological Survey Open-File Report 2018–1142, 117 p.

NBNERR also submitted content to be included in two additional publications:

- Joe Tyburczy (California Sea Grant); writing a book chapter on managing estuaries for climate resilience (we contributed a figure from our NERR TLP guidance document)
- Neil Saintilan (Macquarie University; Sydney Australia); “Global patterns and drivers of tidal marsh response to accelerating sea-level rise”. Article submitted to *Nature* (we sent in our NBNERR SET data for inclusion).

2020

Raposa, K.B., Jason S Goldstein, Kristin Wilson Grimes, Jordan Mora, Paul E Stacey, Richard A McKinney, A comparative assessment of salt marsh crabs (Decapoda: Brachyura) across the National Estuarine Research Reserves in New England, USA, *Journal of Crustacean Biology*, Volume 40, Issue 1, January 2020, Pages 67–75.

Raposa, K., K. Wasson, J. Nelson, M. Fountain, J. West, C. Endris, and A. Woolfolk. 2020. “[Guidance for thin-layer sediment placement as a strategy to enhance tidal marsh resilience to sea-level rise.](#)” Published in collaboration with the National Estuarine Research Reserve System Science Collaborative.

Raposa, K.B., et al. Evaluation of plot-scale methods for assessing and monitoring salt marsh vegetation. *Northeastern Naturalist*, 2020 Mar 6; 27(1): 151–167.

Burdick, D., C. Peter, B. Fischella, M. Tyrrell, J. Allen, J. Mora, K. Raposa, J. Goldstein, C. Feurt, L. Crane. 2020. Synthesizing NERR Sentinel Site Data to Improve Coastal Wetland Management Across New England Data Report. NEERS Science Collaborative. 37pp.

2021

Kutcher, T.E. and K.B. Raposa. In prep. Long-term outcomes of salt marsh restorations overshadowed by climate change. Draft report to the RI Department of Environmental Management

2022

Raposa, K.B., C. Chaffee, and nine additional co-authors. Laying it on thick: Ecosystem effects of sediment placement on a microtidal Rhode Island salt marsh. *Frontiers in Environmental Science*, 2022 Sept 6; Volume 10.

Saintilan, N., Raposa, K.B. and 30 additional co-authors. Constraints on the adjustment of tidal marshes to accelerating sea-level rise. *Science*, 2022 28 July; Volume 377, Issue 6605, Pages 523-527.

Kutcher, T. E., Raposa, K. B., & Roman, C. T. (2022). A rapid method to assess salt marsh condition and guide management decisions. *Ecological Indicators*, 138, 108841.

Vivianne Mazzocco, Tahsin Hasan, Simona Trandafir & Emi Uchida (2022) Economic Value of Salt Marshes under Uncertainty of Sea Level Rise: A Case Study of the Narragansett Bay, Coastal Management, 50:4, 306-324

2023

Raposa, K.B., Woolfolk, A., Endris, C.A. *et al.* 2023. Evaluating Thin-Layer Sediment Placement as a Tool for Enhancing Tidal Marsh Resilience: a Coordinated Experiment Across Eight US National Estuarine Research Reserves. *Estuaries and Coasts* **46**: 595–615.

Kutcher, T. E., Raposa, K.B. Assessing long-term outcomes of tidal restoration in New England salt marshes. *Journal of Environmental Management*, 2023 Jul 15:338:117832.

Krause, P.J. and 12 co-authors. 2023. Increasing health burden of human babesiosis in endemic sites. *American Journal of Tropical Medicine and Hygiene* 68:431-436.

Raposa, K.B. *et.al.* 2023 TLP: Techniques, limitations, and potential. *Coastal & Estuarine Science News*, Issue#2.

Submitted:

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