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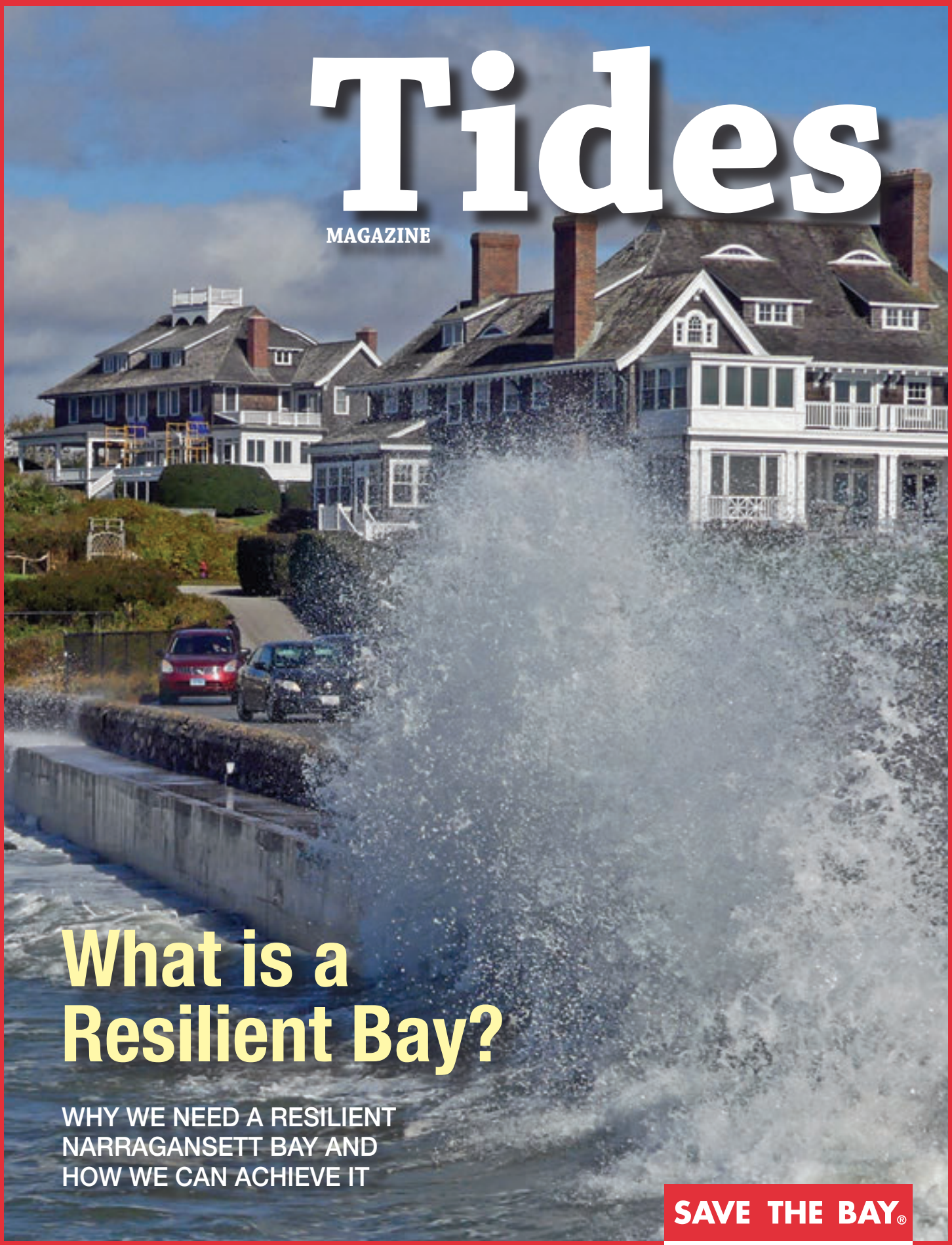
Tides

MAGAZINE



What is a Resilient Bay?

WHY WE NEED A RESILIENT NARRAGANSETT BAY AND HOW WE CAN ACHIEVE IT

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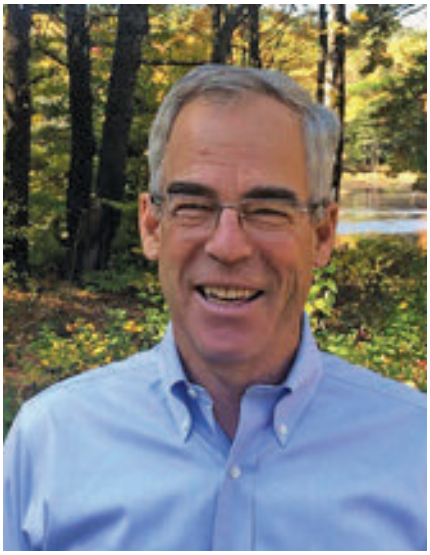
FROM THE DIRECTOR

Achieving Resilience is Possible



What does the term "resilience" mean to you? The definition that speaks to me is based on the one provided by none other than Merriam-Webster: "the capability of a strained body to recover after stress."

Narragansett Bay is strained and stressed. Despite improvements in water quality, human impacts can be seen at every turn. Throw-away plastic packaging washes up on otherwise pristine beaches. The cumulative impacts of development damage coastal habitats and degrade water quality. Nutrient pollution from wastewater, fertilizer, and urban runoff contributes to algae blooms that rob seawater of life-giving oxygen.

Then there are the less visible signs of climate change. Rising seas, while not obvious most days, are revealed in dramatic fashion during storms and moon tides. Warming waters have caused populations of once-familiar species such as winter flounder and lobster to all but disappear from the Bay and help explain the increasing frequency of harmful algae blooms. Intensifying storms flood streets and flush contaminants into coastal waters.

The good news: there is much we can do to improve the resilience of Narragansett Bay, and a resilient Bay ecosystem is one that can adapt to the strains of climate change. In this issue of *Tides*, we highlight the many actions we can take to improve the health and resilience of Narragansett Bay and its watershed.

Preserving open space and forests supports biodiversity and the capacity of the land to absorb and filter rainfall. Restoring rivers and streams to free-flowing condition improves water quality, restores fisheries habitat, and reduces flooding. Protecting undeveloped coastal property adjacent to coastal marshes allows space for marshes to migrate upland as seas rise. And doubling down on nutrient reductions promotes oxygen-rich water and marine life.

Taking these steps to alleviate the stresses on Narragansett Bay requires all of us. From volunteers who lend a helping hand at a planting, to those who lend their voices to our advocacy efforts, and, of course, our members who make all of our work possible. Together, as a community, we can ensure a healthy Bay for decades to come.

With appreciation,

Jonathan Stone
Executive Director

What's Inside...

ON THE COVER:

As climate change impacts intensify and annual storms slam the Rhode Island coast, we ask the question: how resilient is Narragansett Bay? (Photo credit: Harold Hanka)

TIDES MAGAZINE
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401-272-3540 | savebay.org | tides@savebay.org

Mission and Vision: Save The Bay works to protect and improve Narragansett Bay and its watershed through advocacy, education and restoration efforts. We envision a fully swimmable, fishable, healthy Narragansett Bay, accessible to everyone and globally recognized as an environmental treasure.

ADVOCACY

Hundred Acre Cove: Pollution, Partnerships and a Path Forward

BY KATE MCPHERSON,
SAVE THE BAY RIVERKEEPER

Hundred Acre Cove, an estuary in the northern reaches of Narragansett Bay, was once a thriving ecosystem that supported a recreational shellfishery and healthy salt marsh system. However, a century of development in its watershed has resulted in significant pollution. Despite decades of monitoring and efforts to address the problem, long-standing bacterial pollution in the cove continues to make shellfish harvested there unsafe to eat.

RIGHT: The Hundred Acre Cove shoreline is dotted with houses, docks and other infrastructure, while salt marshes line the water's edge. BELOW: A satellite image shows the land surrounding the cove, which contains both roads and neighborhoods (in white) to the south and west, and agricultural fields (light green) to the north.

In 2018, the Environmental Protection Agency's Southeast New England Program awarded a grant to Save The Bay to investigate the problem. We partnered with the Narragansett Bay Estuary Program, and three municipalities located in the Hundred Acre Cove watershed: Seekonk, Massachusetts, and Barrington and East Providence, Rhode Island. During the grant period, Save The Bay reviewed over 73 reports, water quality tests, and documents pertaining to Hundred Acre Cove and the Runnins River, a 7.5-mile river that forms the Massachusetts-Rhode Island border and is the cove's main tributary.

We compiled our findings into a watershed plan that outlines customized steps each partner community can take to support a healthier Hundred Acre Cove. To complement the plan, we created a series of interactive maps that show the status of septic systems, stormwater systems, water quality data, and water quality improvement projects throughout the watershed. The proposed projects and recommendations fall into four broad categories:

- **Policies and programs that reduce pollution from wastewater.** We know that water pollution in Hundred Acre Cove comes from multiple sources. Sources might include failing septic systems, cesspools, and leaking sewer pipes. Our recommendations in this project category include regular property owner inspection and maintenance of septic systems, targeting those that are older than 30 years and close to tributary streams; replacing cesspools; and regular municipal inspection of sewers.

- **Policies and programs that reduce pollution from stormwater runoff.** Stormwater runoff washes pet and animal waste, petroleum, litter, and other pollution into rivers. This pollution is measurable in Hundred Acre Cove following a storm. To address this, we recommend more detailed stormwater system mapping in each municipality, regular inspection and cleaning, and water quality testing at outfalls. We also suggest infrastructure projects like infiltration basins, swales, and pavement removal to catch the pollutants in stormwater before it reaches waterways.

- **Projects that mitigate intensifying impacts of climate change.** These projects include protecting low-lying areas to give salt marshes a place to move inland as sea levels rise, restoring buffers along the Runnins River (which will filter stormwater, improve flooding, and help wildlife), and removing structures that have restricted the natural flow of the river, including the Mobil Dam and the old stone bridge abutments north of School Street.

- **Funding to support priority actions.** Communities need help building capacity to plan and implement the recommendations and projects we put forth in the plan. We have identified new ways of financing maintenance and upgrades to stormwater systems and list 14 sources of state and federal grants.

Restoring Hundred Acre Cove's waters is an immense challenge, in part because it is a resource shared by two states and three municipalities with different regulatory agencies and policies. Common among all, however, is a commitment to restoring this estuary and its watershed. We look forward to continuing to support these communities as we work together to finance and implement the projects and policies in the plan and to, hopefully one day, celebrate the return of shellfishing to Hundred Acre Cove.

We are grateful to the Southeast New England Program for funding the work that went into this report, and to all of the project partners who made it possible.

Top to Bottom: Volunteers take bacteria samples to see if bacterial pollution in the Runnins River is still an issue in 2019, and a photo of the Mobil Dam taken at high tide. At low tide, water becomes trapped behind the dam, and may contribute to the proliferation of bacterial laden water.

RESTORATION

Restoring the "Kickie"

AFTER YEARS OF PLANNING AND ADVOCACY, THE KICKEMUIT RIVER IS ON ITS WAY TO BEING RESTORED

BY WENLEY FERGUSON,
DIRECTOR OF HABITAT RESTORATION

Over a century ago, the Kickemuit River flowed freely through Warren, Rhode Island and sediment samples suggest that the tidal river once supported a healthy salt marsh habitat. But the ecosystem along the river changed dramatically in 1883 when the first of two dams was constructed to create a public water supply for the Bristol County Water Authority, a water supplier for Barrington, Warren and Bristol. Today, the dams do more harm to the river and the surrounding community than they do to benefit them.

The first dam, the Lower Kickemuit Dam, was constructed to create a drinking water reservoir. Then, the BCWA constructed the second dam, the Upper Kickemuit Dam, in 1961, in an attempt to keep salt water out of the water supply during coastal storms. Unfortunately, the infrastructure never worked particularly well. The supply was polluted and frequently tainted by brackish water, and the reservoir's water treatment plant struggled to meet federal water quality regulations. In 1998, the BCWA secured a new primary water source from Providence Water's Scituate Reservoir via the East Bay Pipeline and, 13 years later, the Kickemuit Reservoir was designated for "emergency backup use only."

In 2013, the Rhode Island Department of Health's SafeWater RI report found the Kickemuit Reservoir to be critically vulnerable to three hazards related to climate change: sea level rise, coastal flooding and hurricanes. Following the publication of the report and an inspection of the upper dam, the BCWA began exploring the idea of removing the dams—rather than maintaining them—since they no longer served their original purpose and negatively impacted the habitat and water quality of the river.

Today, the two dams create stagnant bodies of water that have limited flow. As a result, the upper and lower reservoirs suffer from low oxygen and algal blooms in the summer, creating conditions that stress fish and aquatic life. The lower dam experiences regular tidal inundation during higher tides and storm events, and the lower reservoir is already converting to brackish water, as evidenced by the dead freshwater wetland shrubs that line its banks. Even the 2007 installation of a fish ladder at the lower dam failed to shepherd in a return of migratory

Above: An algal bloom in the lower impoundment, just downstream from Schoolhouse Road. Left: Tidal flooding enters the lower impoundment during a king tide in October 2019.

herring, due likely in part to the reservoir's brackish and poor-quality waters.

With a goal of restoring the health of the Kickemuit River, Save The Bay began advocating for the removal of both dams in 2015. Now, in a broad collaborative effort, the BCWA, the Rhode Island Department of Transportation, the Town of Warren, the National Oceanic and Atmospheric Administration's (NOAA) Restoration Center, the Rhode Island Department of Environmental Management, the State of Rhode Island's Chief Resilience Officer, and Save The Bay have joined forces to make the restoration of the "Kickie" a reality.

The project gained traction in 2019, when RIDOT agreed to support the effort by increasing the size of the culverts and elevating sections of Schoolhouse Road, an area downstream of the upper dam that floods during heavy rainfall. Meanwhile, Save The Bay helped the BCWA secure funds for engineering the dam removal projects and submit permit applications to state and federal agencies. Following the road elevation project, and final permit approval, the BCWA will begin removing first the lower dam, then the upper, in late 2022 and into 2023.

When the connectivity of the river is restored, tidal waters in the estuary will once again flow in at high tide and drain at low tide, creating a tidal creek with improved water quality and salt marshes along its banks. The restored estuarine habitat will support a greater diversity of fish and, with it, opportunities for recreational fishing. Egrets and other wading birds will return to the estuary, and the river will become accessible to kayakers, bird watchers and the fishing community. And, as so many habitat restoration projects do, the effort will leave the Warren community more resilient to climate change, with an estuary that provides increased flood storage capacity. ■

Top to bottom: An aerial view of Schoolhouse Road, with the upper impoundment on the right and the lower impoundment to the left (Photo credit: RIDOT) and Jim Vieira and George Coffey of the BCWA monitor water quality in the lower impoundment (Photo credit: BCWA).

WHO SAVES THE BAY? STAFF PROFILE

Meet Leanne Danielsen

BY MACKENSIE DUPONT CROWLEY, COMMUNICATIONS SPECIALIST

Since 2012, our events manager, Leanne Danielsen, has been at the helm of events like the Swim, the Taste of The Bay, the Artists for The Bay Show and Sale, and Earth Day Birthday. She shares her experience—and how she's adapted to everything from weather to a global pandemic—below.

How have Save The Bay events transformed over the years?

We're always looking to make small changes so that we can include more people in our events and in supporting the Bay. Today, even if you're not a swimmer, you can exercise your right to a healthy Bay in the Virtual Swim and Open by taking on a challenge like walking or biking. Artists for The Bay was once focused on painting and sculpture but now welcomes a broader range of artists and, this year, will be moving forward as a virtual event. We're also always looking to improve logistics and participant experience.

The COVID-19 pandemic forced you to get creative, didn't it?

With virtual options, specifically! We turned Taste of The Bay into a fundraiser benefiting our long-time food and beverage vendors, since their industry has been hit so hard during the pandemic. We made sure that young artists could still participate in our art contest remotely, and we worked with other partners to find ways to promote our joint work digitally. We scaled down our in-person Swim in 2021, then fog led to an unfortunate morning-of cancellation. Thankfully, our swimmers adapted well to the news, and completed their swim later that day and on other days throughout the summer. The Swim is so much more than our largest fundraising event. It's a community of passionate athletes who work hard to raise money and awareness for our mission. We're truly grateful for their efforts.

Leanne and her husband, Tom, enjoy Taste of The Bay at Save The Bay's Providence headquarters in 2019.

You've mentioned to me how much you love hosting Taste of The Bay, specifically.

Starting Taste of The Bay is one of the highlights of my tenure here, and with the help of our vendors and supporters, it's grown to be a huge success. When you look around the event, all you see are happy people enjoying the best food and drink Rhode Island and the Bay have to offer, and it's an amazing experience.

How do events fit into the mission and work of Save The Bay?

Our events reflect the fact that saving the Bay is a community effort—they're all about relationships! With the support of our sponsors, we are able to engage our partners and supporters in a fun way that brings awareness to Save The Bay's work. Plus, every event honors a different part of Save The Bay's mission. For example, the Swim is a celebration of Narragansett Bay as a clean, healthy and beautiful resource that can be used for recreation. At Taste of The Bay, we recognize that the Bay provides us with sustenance. And, the Artists for The Bay Show and Sale highlights that the Bay is a source of inspiration for us all. ■

Thank You...

Save The Bay's sponsors help make all of our celebrations possible—whether they take place in person or virtually!

Thank you to all of the sponsors listed below who are supporting our 2021 events season:

Citizens Bank
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Save The Bay Action Updates

Community

- In September, Save The Bay entered into agreements with the City of Newport and the Rhode Island Department of Transportation to **relocate our Exploration Center and Aquarium** on Easton's Beach to the downtown Gateway Center. We look forward to connecting more guests and students to the wonders of Narragansett Bay at the new site!
- Save The Bay volunteers have **marked all known storm drains** in both East Providence and Barrington, R.I. in support of our efforts to improve water quality in Hundred Acre Cove. Volunteers marked 873 drains in Barrington, 2,130 in East Providence, and similar efforts continue in Seekonk, Mass., and Middletown and Jamestown, R.I.
- While Save The Bay's in-person **Swim** from Newport to Jamestown, R.I. was canceled on July 17 due to heavy fog, our swimmers still exercised their right to a clean and healthy Narragansett Bay! In the weeks that followed, swimmers and virtual challenge participants raised over $225,000.

Education

- We resumed summer BayCamps at our Providence Bay Center in 2021. Over two months, **300 campers joined us** for our hands-on land- and boat-based camps, engaging in activities that helped them connect with Narragansett Bay while learning about its habitats and species.
- **The Exploration Center and Aquarium reopened its doors this summer,** finally able to unveil the new shark and skate exhibit we installed in January 2020. During the summer, we introduced 7,500 aquarium guests to Narragansett Bay's animals, plants and habitats. *Read more on page 18.*

Restoration

- The **restoration of the Kickemuit River** is underway! Save The Bay Director of Habitat Restoration Wenley Ferguson championed the idea of removing two dams to restore the river and collaborated with the Rhode Island Department of Transportation, and the Bristol County Water Authority, and others on the project. *Read more on page 6.*
- Save The Bay is pleased to have supported the **Silver Creek wetlands restoration** project at the Bristol Golf Course. With guidance from Save The Bay Director of Habitat Restoration, Wenley Ferguson, the town reconnected the course's stream-like swales, removed fill, and, with volunteer support, planted more than 2,000 native shrubs and trees in the new wetlands. The measures will result in increased flood storage capacity within the creek's watershed, enhanced wildlife habitat, and improved water quality in this stream that flows into Narragansett Bay.

Advocacy

- Summer 2021 delivered major water quality victories for Narragansett Bay and Little Narragansett Bay. After over a decade of Save The Bay advocacy, the RIDEM issued a new permit for the **Westerly Wastewater Treatment Facility** that reduces the amount of nitrogen the facility can discharge into local waters. And the **Warwick Sewer Authority** announced plans to proceed with sewer infrastructure installation. Save The Bay has been working with the department and local officials to move the project forward.
- The CRMC has designated **Providence's Public Street** as a public right-of-way. A year of collaborative advocacy between Save The Bay, the Washington Park Improvement Association and the South Providence Neighborhood Association led to this milestone that will increase public access Bay-wide and along urban waterways.

Christening of the M/V *Rosemary Quinn*

Save The Bay concluded the events portion of our 50th Anniversary in September 2021 with the christening of the M/V *Rosemary Quinn*. The new landing craft was funded by the John and Daria Barry Foundation with additional support from our 50th Anniversary Campaign. The vessel will support Save The Bay's education programs while facilitating cleanups and habitat restoration projects at new sites throughout the Bay. A great way to start our next half-century!

COVER STORY

Defining and Achieving "Resilience"

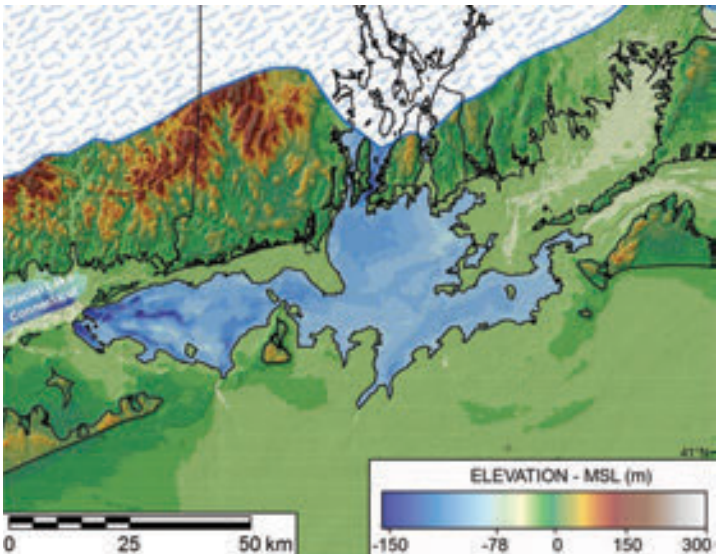
WHY WE NEED A RESILIENT NARRAGANSETT BAY AND HOW WE CAN ACHIEVE IT

BY MIKE JARBEAU,
NARRAGANSETT BAYKEEPER

There is perhaps no better time to consider "resilience" than fresh off the heels of an active hurricane season that left the Narragansett Bay region with major flooding along its rivers and coastline. While the season offered near-misses, it gave us a profound opportunity to consider how Narragansett Bay's ecology, infrastructure, and public access points will fare when the next hurricane does hit. We find ourselves asking: how resilient is Narragansett Bay in the 21st century? How do we help the Bay be more resilient in the face of rising sea levels, intensifying storms, and continued development pressures? It's something that should be considered by lawmakers, planners, and residents on a continuing basis.

RESILIENCE AND NARRAGANSETT BAY

In an age of accelerated climate change, "resilience" is a commonly used term. At Save The Bay, we use it to describe Narragansett Bay's ability to adapt to and recover from changing conditions, while still maintaining a healthy ecosystem. In other words, the more resilient the Bay is, the better chance its coastline, habitats and watershed have to adapt. The changes, in this context, could be natural ones or could be caused by human ac-



ABOVE: Geologically speaking, Narragansett Bay is a relatively new natural feature. 18,000 years ago, the area was a freshwater lake formed by retreating glaciers. (Photo credit: Jon Boothroyd.) BELOW: Low-lying marshes, like the one shown here in Westerly, are vulnerable to climate change-related flooding. (Photo credit: Harold Hanka)

tivity, over either a short or long period of time. The good news is that, for the Bay, a certain degree of change is the norm.

The Bay that we know today is a product of the last glaciation period, which carved out the Bay's passages around 18,000 years ago. The retreating glaciers left behind a freshwater "Lake Narragansett" until rising sea levels eventually allowed for seawater intrusion. In this case, the Bay adapted from a freshwater environment to the estuary we know today over thousands of years.

Today, we continue to see evidence of the Bay's ability to change all around us. During the past several decades, warming waters have promoted an abundance of black sea bass and scup in the Bay, while the lobster and winter flounder that depend on cooler waters are increasingly scarce. And salt tolerant plants along the shoreline are migrating to higher ground in response to sea level rise.

Coastal ecosystems are extremely dynamic, and shorelines have a level of natural resilience because of their ability to move, adapt and recover from environmental challenges. Sometimes this means that, rather than return to a previous state, a resilient ecosystem might move to a new state more favorable for its survival.

Salt marshes are an excellent example of this. Salt marshes provide habitat to many important species, while minimizing erosion, storm surge and flooding impacts. Salt marshes rely on the process of flooding and draining caused by tides. In a healthy ecosystem, the marsh is able to adapt to minor changes in water levels, and can even "move" inland if space permits.

Left: As the marshes and habitats around the Bay adapt to rising sea levels, man-made structures, like low-lying roads, pose greater and greater challenges to resilience. (Photo credit: M.J. Quincy via MyCoast)

A resilient Bay is one from which resources abound; a Bay we can all continue to work with and enjoy in the years to come. While a natural shoreline may move, it will still afford us the ability to use and enjoy it. But, under today's pressures and changes, resilience is harder to maintain than it ever has been in the past.

OBSTACLES TO RESILIENCE

Unfortunately, the Bay can only adapt to and recover from so many changes. When the changes come too quickly, or too severely, the ecology can't keep up. In Narragansett Bay, even salt marshes cannot keep pace with accelerated sea level rise. Rather than occasionally being submerged in water, in keeping with the rhythm of the tides, they are constantly underwater and drowning in place. To make matters worse for our salt marshes, man-made structures like sea walls and roads sometimes block the path the salt marshes are trying to follow, posing yet another obstacle to the marshes' ability to adapt.

Human development frequently challenges the Bay's resilience. Buildings, infrastructure, roads, walls, and other structures inhibit shoreline migration and other natural processes. When left in a natural state, beaches, marshes, and other coastal features adapt and adjust to the effects of wave action, wind, and storms. This is resilience at work. But, when we unnecessarily or extensively "harden" the shoreline—by constructing seawalls or revetments, for example—we inhibit the natural flow of water and the shore's migration. These structures reflect and amplify wave energy, which accelerates erosion, and can reduce or eliminate public access altogether. Many popular beaches, boat ramps, and recreation areas are shrinking or under threat due to these factors. While these hardened shorelines may provide short-term protection for certain properties, they reduce overall resilience—and the evidence can be observed all around Narragansett Bay, where properties without walls tend to have wider beaches than properties with them.

continued on next page > > >

BUILDING RESILIENCE

In the last hundred years, sea level has risen approximately one foot and water temperatures have increased 3° F in Narragansett Bay. These rates of change have

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accelerated and are projected to increase even more in the coming decades. So, how do we help Narragansett Bay stay resilient in the face of climate change and development? At Save The Bay, the answer is three-fold: we plan, we adapt and, though it's hard to accept, we prepare to retreat.

Plan for the Future

Federal, state, and local agencies must incorporate climate change into their short- and long-term plans. At Save The Bay, we advocate for Bay-friendly legislation and regulations, including those that provide funding and resources to projects that help the watershed build resiliency. This year, the establishment of the Ocean State Climate Adaptation and Resilience (OSCAR) Fund—following years of Save The Bay advocacy—was a big step in the right direction, as it made ecological resilience a policy priority for Rhode Island and set up a framework for municipalities to finance resilience-related projects.

While the Rhode Island General Assembly made OSCAR state policy, it did not commit state dollars or identify a stable revenue stream for the fund. This means Rhode Island will miss out on an opportunity to leverage the millions of dollars available in federal matching funds for adaptation and resilience projects. Save The Bay's policy team will continue to push for funds in the 2022 legislative session.

Even with new policies and legislation, addressing the Bay's resilience is a task that will extend well into the future. We know that we have a responsibility to future generations to give them the tools, information and inspiration they need to become effective Bay stewards. That's why Save The Bay's education team educates thousands of students each year through first-hand, experiential lessons directly along the Bay's shorelines and on its waters.

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Help Habitats Adapt

Climate change is accelerating the pace at which actions need to be taken to protect Narragansett Bay. Save The Bay is working to help the habitats across the Bay and watershed adapt. We're elevating salt marshes in Quonochontaug and Ninigret ponds to keep pace with sea level rise, and joining forces with community partners—like the Warren Land Trust—to secure lands for marsh migration along places, like the Palmer River. We are supporting dam removal along the Kickemuit, Runnins, Ten Mile, and Pawcatuck rivers, so that the rivers can flow freely, both supporting local habitats and lessening flooding in nearby communities.

Prepare for Retreat

Homes, businesses, and infrastructure will need to be pulled back from the coast. Look at any Bayside community—from Charlestown to Portsmouth to Warwick—and you'll see that flooding has become more frequent and more severe. And it's projected to get worse. In many

locations, the only realistic adaptation option is to pull back from the shore. Save The Bay has helped communities like Barrington, Tiverton, and Warwick complete many projects involving the removal of pavement or installation of buffers that help shorelines migrate and survive. But larger, more expensive retreat decisions lie ahead.

Securing Narragansett Bay's resilience is a complex challenge that demands the attention and cooperation of the entire Bay community. As we plan, adapt, and prepare to retreat, many of our most difficult questions remain unanswered: *How will our major port facilities cope with rising seas? What is to be done where rising seas are pushing saltwater inland and disrupting septic systems and drinking water supplies? Where will we relocate the wastewater treatment plants that become inundated? Who will pay for the movement, demolition, and cleanup of coastal properties before or after they are no longer viable?*

Save The Bay has been, and will continue, challenging policy makers to address these questions and other long-term challenges. The sooner they do, the better the chances that Narragansett Bay and our coastal environment will adapt and remain healthy so generations to come will reap the benefits of a resilient, productive ecosystem that provides sustenance and enjoyment for us all. ■

(1) Evidence of an adapting Bay can be found by observing the changing list of species that inhabit it; winter flounder, for example, are less common than they used to be. (2) Our efforts to elevate salt marshes by adding a very thin layer of sediment and replanting with marsh grasses—like we've done at Quonochontaug, shown here—helps these important habitats adapt to rising sea levels. (3) Hardening the shoreline with structures like seawalls exacerbates erosion and habitat loss, often resulting in a complete loss of sandy beach, as seen in the photo of Matunuck. (4) Meanwhile coastal areas that are left in a natural state, like Napatree, retain their wide sandy beaches as the habitats can adapt as needed to sea level rise. (Photo credit: Google Earth) (5) It's easier to imagine what the Narragansett Bay of the future might look like during king tide events, like the one in Newport shown here. (Photo credit: Norman MacLeod via MyCoast)

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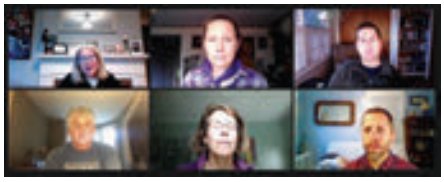
Projects for Resiliency: Five Types to Know



BY SAVE THE BAY'S POLICY TEAM

Save The Bay's habitat and policy staff work with communities to identify projects that will result in more resilient ecosystems and communities. Learn about the project types, and where we've completed them, below.

1 Pavement and Structure Removal

Throughout the Narragansett Bay watershed, paved roads and parking lots lie close to the water's edge. Some roads lead directly to the Bay and cannot be protected from rising seas and regular flooding events. Meanwhile, boardwalks, seawalls, old foundations and buildings harden the shoreline and compromise the Bay's ability to adapt to changing environmental conditions. In both cases, the solution is to remove or relocate the roads and structures. Removing pavement provides space for stormwater management and coastal habitats and reduces flooding of vulnerable infrastructure; removing structures enhances lateral public access along the shoreline and increases resilience. **These projects also provide space for coastal habitats to migrate inland and support improved water quality.**

Regrading Allins Cove in Barrington, 2009.

PROJECT SITES INCLUDE: Mill Cove Road, Warwick; Kickemuit Ave, Bristol; India Point Park, Providence; Barrington Beach, Barrington; Van Zandt Seawall, Warwick; Grinnell's Beach, Tiverton.

2 Bank Regrading and Stabilization

As a result of hardened shorelines and the resulting intense wave action, many banks around the Bay have eroded at a steep angle. When the shoreline becomes too vertical, marshes can't migrate inland, and wildlife—like horseshoe crabs that rely on beaches for spawning habitat—can't make use of the environment. What's more, when plants can't colonize the shore, the loose sand erodes quickly. By regrading the banks with excavators, stabilizing them with natural materials like coconut fibers, and planting with native plants, we increase shoreline health and resilience. **These projects help strengthen valuable shoreline habitats, minimize erosion, and often create more recreational beach.**

PROJECT SITES INCLUDE: Allin's Cove, Barrington; Stillhouse Cove, Cranston; City Park Beach, Warwick.

3 Culvert Redesign

A culvert is a small structure that channels water under a road or other structure. With climate change causing more intense rainstorms and rising sea levels, many culverts throughout the watershed are not large enough to allow proper water flow. Undersized culverts also restrict the passage of fish and wildlife, cause the water to become stagnant and polluted, and cause localized flooding. By replacing culverts, we allow rivers and tidal waters to ebb and flow as needed, improving their ability to adapt to and recover from changing water levels. **Replacing culverts improves water quality and habitats in estuaries and rivers, and reduces flooding impacts.**

PROJECT SITES INCLUDE: Harbor Drive, Westerly; Schoolhouse Road, Warren. (Read more about the Kickemuit project on page 6.)

FAR LEFT: The removal of pavement from the end of Mill Cove Road in Warwick, R.I. opened up space that allowed the nearby habitat to adapt to rising sea levels. LEFT: The culvert at Schoolhouse Road in Warren, R.I. is no longer large enough to accommodate higher water levels, and inhibits waterflow and fish passage. It will soon be redesigned to support water quality and local ecology.

Removing the Shady Lea Mill Dam on the Mattatuxet River in North Kingstown, R.I.

4 Dam Removal

Relics of industries of yesteryear, dams stem the flow of rivers throughout the Bay watershed. While the ponds they created once supported water power for mills, the stagnant water is anything but healthy for the rivers or the Bay. The water becomes warm, supports algal blooms, can become choked by invasive plants and is too stagnant to flush out bacteria and other pollution. The dams themselves prevent important fish species from completing their spawning cycle, and many local dams are at risk of failing under the stress of severe storms. **Dam removal projects improve water quality, create healthier habitat, and reduce flooding risk.**

PROJECT SITES INCLUDE: Pawtuxet Falls Dam, Warwick and Cranston; Shady Lea Mill, North Kingstown; Paragon Dam, Providence.

5 Land Conservation

In the face of increasing development demands, we must protect coastal and inland habitats that support a healthy Bay and watershed. Salt marshes need space to migrate inland with sea level rise, and forests control the amount of water that enters tributary streams, offer invaluable permeable surfaces that can soak up large amounts of rainfall, and filter pollutants that have been picked up by stormwater. **Land conservation supports the health of coastal habitats and water quality, and mitigates flooding impacts.**

PROJECT SITES INCLUDE: Sowams Meadow Preserve, Warren.

The preservation of land at the Sowams Meadow Preserve in Warren, R.I. will guarantee that the valuable marsh habitat will have space to move inland as seas rise. (Photo credit: Warren Land Conservation Trust)

COMMUNITY

MyCoast, My Future

RHODE ISLANDERS BECOME ALLIES AND ADVOCATES FOR COASTAL RESILIENCY IN THEIR OWN COMMUNITIES AND BEYOND

BY MACKENSIE DUPONT CROWLEY, COMMUNICATIONS SPECIALIST

It could be the discovery of a flooded parking lot on a sunny day, a surprisingly high wrack line on the sandy shore, or the normally-exposed coastal features in your neighborhood suddenly submerged underwater. If you live near Narragansett Bay, you may have experienced this moment: something along the coast in your community seems out of the ordinary.

This was the case for the community of Barrington, when a field at Walker Farm—near a popular access point to Hundred Acre Cove—began regularly flooding with salt water. Upon taking a closer look, Save The Bay's director of habitat restoration, Wenley Ferguson, saw that the grass being mowed in the field was actually salt marsh grass. Over the last two decades, a nearby salt marsh had migrated landward with rising seas. In response to these observations, Wenley worked with the town to develop a plan and secure funding to support this coastal habitat.

ABOVE: Community documentation of flooding at Barrington's Walker Farm helped environmental advocates develop a proposal to restore the habitat in the area. BELOW: Mackensie investigates a king tide along Watch Hill Harbor in Westerly, R.I.

What got the ball moving on this project? Photos submitted through the MyCoast app revealed that the field, which once flooded irregularly, was now flooding several times each month.

The MyCoast Portal

Launched in 2014 by the Rhode Island Sea Grant, the University of Rhode Island Coastal Resources Center (CRC), the Rhode Island Coastal Resources Management Council (CRMC) and Save The Bay, MyCoast is a portal that allows the public to share photos and data relating to events that indicate coastal change. When a photo is uploaded, MyCoast fetches background data, like weather and tidal information, from that specific time and the user's location, creating context around the submission.

Download the MyCoast App

1. **Search for "MyCoast" in the app store and look for the wave logo**
2. **Download the free app**
3. **Create your free MyCoast account**
4. **Start taking photos and documenting!**

Download on the App Store

GET IT ON Google Play

Based on the type of coastal threat being reported, submissions are sorted into three categories within the portal: "StormReporter," for documenting storm damage; "King Tides," for capturing our highest tides, which fall during the specific circumstance of a new or full moon coinciding with a perigee tide; and "Coastal Resilience," for monitoring shoreline adaptation projects such as bank regrading and pavement removal.

The collected data is used to visualize the impact of coastal hazards and aid decision-making by coastal resource managers and municipal officials, as was the case at Walker Farm in Barrington. Aided with information from MyCoast, Save The Bay worked with the Town of Barrington to develop a proposal funded by a CRMC restoration grant and the Rhode Island Infrastructure Bank to regrade the concrete rubble along the shore, plant a buffer of native plants, move the mow line inland and erect signage related to migrating marshes in the area.

From Residents to Advocates

"Community members know and care about their places and they are the best boots-on-the-ground allies to identify hot-spots," says Pam Rubinoff, coastal management extension specialist for the Rhode Island Sea Grant and the CRC.

The MyCoast initiative also allows residents to become more educated advocates for climate resiliency projects in their neighborhoods and beyond.

"I've used MyCoast photos to show people what flooding will be like on a regular basis with one foot of sea level rise," says Wenley Ferguson. "Under certain scenarios, these seasonal tides will be daily occurrences. The photos are a window into the future, and they show how the flooding events will affect coastal habitats, infrastructure and public access."

Photos captured during moon tides from Warwick's Oakland Beach neighborhood led to community awareness of the increased vulnerability of Sea View Drive and Suburban Parkway along Brushneck Cove. The City of Warwick agreed to pull the pavement back and close off one section of roadway to vehicle access, while improving pedestrian access and providing more parking space. Overall, the moon tide photos submitted through MyCoast not only led to a project that created space for coastal habitats, but also provided some clear and safe public access.

With ever-rising high tides and storm surge leading to flooding and erosion of Rhode Island's beaches, coastal waterways, private property, and public infrastructure, it is no secret that sea level rise is becoming a greater threat to our low-lying communities. But, Narragansett Bay community members can help by monitoring these vulnerable areas and advocating for shoreline adaptation projects! It's just one more way we can all "Save The Bay." ■

Documenting king tide and storm flooding using photos like the one, above, of Warwick's Sea View Drive, and at right, of the Salter Grove causeway, helps residents and advocates alike understand the impacts of sea level rise.

King Tides

You may have heard this term used in reference to an especially high tide. In reality, a very particular set of astronomical circumstances make king tides, the highest high-tide and lowest-low tide of the year, both regular and predictable events.

King tides occur during a perigean spring tide. Let's break down what that means:

- **Each month, we experience two spring tides that increase tidal ranges, during the new moon and the full moon.**
- **The moon's closest point to the earth during its 28-day elliptical orbit is called its perigee.**

In other words, a full or new moon must co-occur when the moon is closest to earth in its elliptical orbit to produce a king tide.

King tides provide a glimpse of future everyday water levels. As sea levels rise, raising tidal levels higher and further inland, today's king tides will be monthly, or even daily, events, in the future.

EDUCATION

Take a Bite Out of Learning

SHARKS AND SKATES TAKE THE SPOTLIGHT AT THE EXPLORATION CENTER AND AQUARIUM

BY ADAM KOVARSKY,
LEAD AQUARIST

Since 2006, Save The Bay's Exploration Center and Aquarium has invited the public to come face to face with the species that inhabit Narragansett Bay. Over the years, seahorses, flounder, sea stars, sea robins and, of course, sharks and skates, have all called the aquarium home.

The Exploration Center and Aquarium functions differently than many other aquariums. Not only do all proceeds directly support Save The Bay's mission, but our collection is entirely sourced from and returned to local waters. Plus, through initiatives like our shark and skate breeding program, the aquarium exhibits actually support local species populations.

Aquarium biologists (or "aquarists") at Save The Bay's Exploration Center and Aquarium have been breeding little skates (*Leucoraja erinacea)* and chain catsharks *(Scyliorhinus retifer*) for educational purposes and wild release since 2010. Each of these species is a member of the chondrichthyes class, which includes sharks, skates, rays and chimeras. Every member of this class has a flexible cartilaginous skeleton. They can hear minute sounds up to a mile away, smell a single drop of blood up to a third of a mile away, and see 10 times better than a house cat at night.

Both chain catsharks and little skates have an adaptation called "electroreception," or an ability to detect electrical current moving through the water, through an organ called "the Ampullae of Lornezini." Even as embryos, they use their ampullae to detect nearby movement and stop moving in their egg cases to try to avoid detection by predators.

Above: A male clearnose skate (Raja eglanteria) swims along the surface of the Exploration Center and Aquarium's Shark and Skate Touch Tank. Below: Illuminated shark and skate egg cases bring Save The Bay's shark and skate breed and release program to life.

Despite all these amazing adaptations, data provided by the International Union for Conservation of Nature and Natural Resources indicates that 66 percent of chondrichthian species are at risk for extinction. While little skate and chain catsharks lay up to 240 eggs a year, only one or two will avoid predation and competition long enough to reach maturity and produce their own offspring. Overfishing, habitat loss and climate change only create more challenges for these species.

Every year, the Exploration Center and Aquarium teaches thousands of students and guests about the importance of chondrichthyan conservation. Our aquarists support local little skate and chain catshark populations through our breed-and-release program. By carefully protecting shark and skate egg cases, also known as mermaid's purses, and nurturing young sharks and skates into adolescence, we give these local species their best chance at early survival. Since we began, we have released nearly 700 sharks and skates into Rhode Island waters.

In late 2019, with support from the Institute for Museum and Library Services and the Alletta Morris McBean Charitable Trust, we installed a new, larger, and handicapped-accessible shark and skate conservation exhibit. A new touch tank and backlit display case allow visitors to observe and interact with these species in new ways. Since the tank has been installed, more than 7,000 guests have had the chance to engage with the hands-on exhibit, and over 1,300 students participated in our Sharks and Skates of Narragansett Bay distance learning curriculum. The new exhibit, coupled with the hard work of staff and interns, has helped us release more than 100 sharks and skates back into our local waters.

While species like chain catsharks and little skates may be facing challenges, we humans can take steps to help them. We can work with policymakers to make sure we have laws to protect these animals, encourage policies that reduce overfishing, and work toward burning fewer fossil fuels.

When you're ready to meet these sharks and skates, or when you find yourself with questions about them that need to be answered, stop by the Exploration Center and Aquarium. We can't wait to tell you more! ■

TOP: Guests engage with a skate at the Exploration Center and Aquarium's new touch tank. ABOVE: A female chain catshark (Scyliorhinus retifer) lays a pair of "mermaid's purses" in the aquarium's tank.

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WHO SAVES THE BAY? VOLUNTEER SPOTLIGHT

Kathryn Langlois: Volunteering as a Learning Opportunity

BY KATY DORCHIES, DIRECTOR OF COMMUNICATIONS AND MARKETING

Over the last two years, Kathryn Langlois of Warren, R.I., has become a valuable volunteer, lending support at our Exploration Center and Aquarium in Newport, with storm drain marking efforts in Barrington, and leading cleanups around the watershed. Her primary motivation? To learn more about Narragansett Bay!

When did you first become acquainted with Narragansett Bay?

I became acquainted with Narragansett Bay when I moved to Rhode Island in late 2019. I immediately looked for a way to help the Bay and further my education at the same time. So, in December 2019, I signed up to volunteer as a docent at Save The Bay's Exploration Center and Aquarium.

Was this the first time you engaged with environmental issues?

I grew up near the Mississippi, and I remember that my family would keep me away from the water because it was unhealthy, so I first became aware of environmental issues as a child. I had a lot of environmentally focused teachers throughout grade school, and in high school I joined a club that tested water at local state parks. One of the things we looked for was wildlife that only lived in specific water quality conditions. I remember finding that the wildlife varied from stream to stream.

And, some of your volunteer work with Save The Bay has been related to raising awareness of water quality, too.

Yes, I got involved with storm drain marking in Barrington! It was amazing to have the chance to explore the entire town and its parks—and the act of searching out storm drains was something else! And so many people around the town approached me to ask questions about what I was doing. It was a great opportunity to talk to residents about Save The Bay and why keeping storm drains clear of debris is important for the Bay.

Your enthusiasm for volunteering is contagious! What would you like people to know about volunteering with Save The Bay?

Volunteers are important and volunteering at Save The Bay, especially at the aquarium, is such a great way to reconnect with the wildlife around us. To anyone considering volunteering: if you've ever wanted to learn more about the animals or ecosystems in the Bay, if you've ever been disgusted by trash at a local park you enjoy, or if you've ever just wanted to learn more about the Bay: volunteer! ■

Volunteer Kathryn Langlois shows off a storm drain marker while lending a hand with Save The Bay's drain marking efforts in Barrington, R.I.

If you're interested in volunteering like Kathryn, visit savebay.org/volunteer to register on our Volunteer Portal!

Anne Sage Discusses the True Impact of Bay Stewardship

BY KATY DORCHIES,
DIRECTOR OF COMMUNICATIONS
AND MARKETING

It's no secret that Narragansett Bay offers treasures. For some, the treasure is the beauty of its scenery, or the network of tributary rivers and coves that lend themselves so well to kayaking or sailing; for others, it's the Bay's resources, or the ability to fish or swim in so many of its waters. For a young Anne Sage, however, the greatest Bay treasure was the sea glass she collected from the shore near her childhood home.

Wandering the coast of Nayatt Point in Barrington, R.I., Anne would look across the Bay at Rocky Point, while using her shirt as a repository for the haul of sea glass she'd carry home to add to her collection. But, like so many childhood memories do, Anne's connection to sea glass brought with it an important lesson.

"My mother would take me with her to do the recycling. I'd help her separate the glass and the newspapers. It was through those activities that I made the connection that my treasure, my sea glass collection, was... trash," she laughs. "And, since I had a whole collection of sea glass, I came to realize how much trash was actually in Narragansett Bay."

The lesson was a powerful one to learn at the tender age of six. While the realization didn't dampen Anne's perspective of the Bay—which she likens to Rhode Island's equivalent of Vermont's Green Mountains—it did establish her awareness of the relationship between people and our natural resources. An awareness that grew stronger as time went by.

"Twenty years ago, I volunteered at a Save The Bay environmental education program in Bristol. I saw the educators using a 3D watershed model, and saw how well the children responded to the lesson, and to this idea of being stewards to the land," she recalls. "When I saw the children in that lesson take so well to the idea, I better understood why Save The Bay existed."

"There's always been a need to have a caretaker of the Bay," she says. "But we all need to be those caretakers. It's important to remind yourself that you're part of something bigger than you. The Bay is bigger than you. When you're here, you're a temporary caretaker for the next generation."

Both Anne and Save The Bay turned 51 this year, so she has been better situated than most to see the difference a lifetime's worth of advocacy can make on a natural resource.

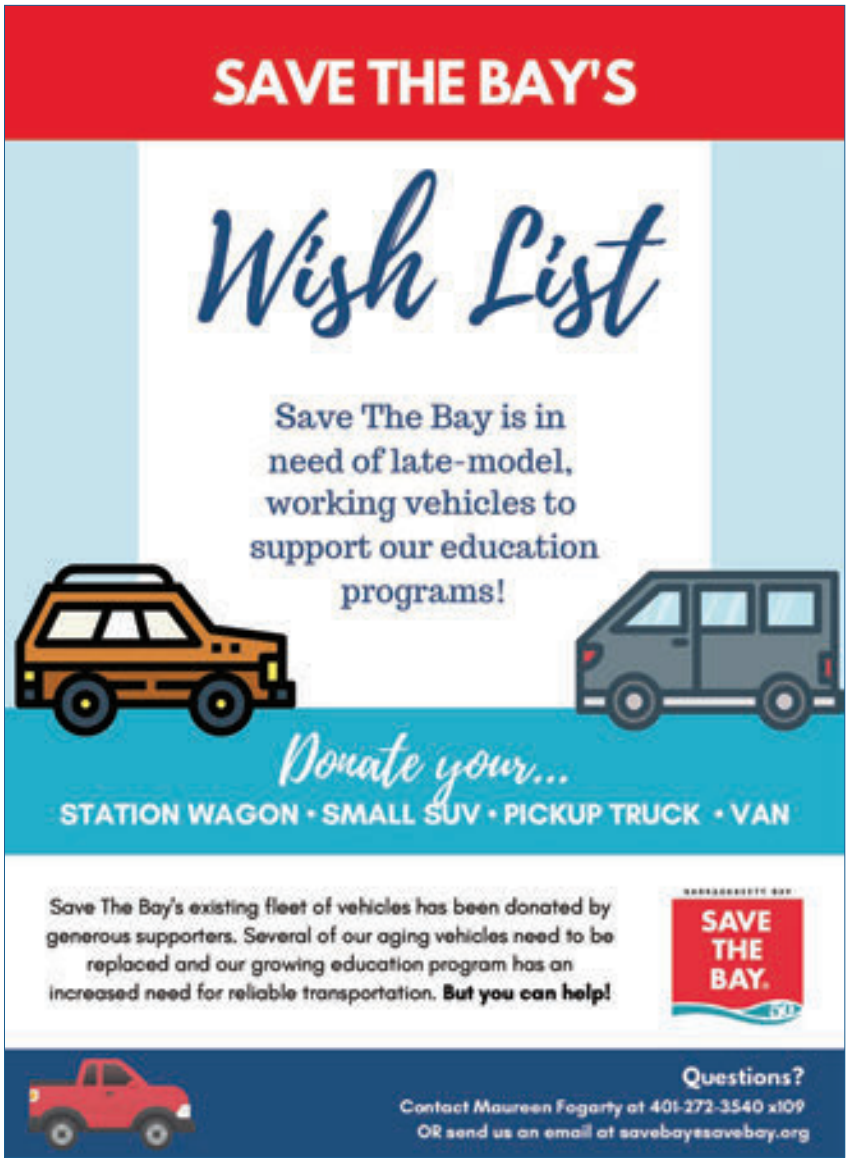
"When I was growing up, I remember hearing about pollution in the watershed—in places like the Pawtuxet River. But, as better policies were put in place, I've seen these waterways get cleaned up over the course of my lifetime," she reflects. "And that's the whole idea: the decisions you make today affect a lifetime. If we make decisions that hurt the Bay, it can take a lifetime to recover. If we make decisions that help the Bay, it can take a lifetime to see the difference—but we will see the difference."

> *"There's always been a need to have a caretaker of the Bay ... But we all need to be those caretakers."*

While Anne hopes that, someday, the idea of stewardship is so well-adopted by the public, by businesses, and by policymakers, that Save The Bay's efforts are no longer needed—she knows that day is still far over the horizon. In the meantime, she says:

"The Bay can't speak for itself. It needs a voice to speak for it. Save The Bay is that voice." ■

Anne Sage, husband Jesse Sgro, and their son Miles, continue their support of Save The Bay from their new place of residence in California. Their home, of course, is decorated with Anne's enduring collection of sea glass from Narragansett Bay.



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