January-December 2022



Annual Citizen Science Monitoring Report

North and South Rivers Watershed Association MassBays South Shore Region





Table of Contents

3 Who We Are 4 Where We Monitor **5** Our Monitoring Programs 6 The Monitoring Year 7 Our Projects and People 8 River Herring 9 Horseshoe Crabs 10 RiverWatch Water Quality **11** Temperature **12** Marine Invasives **13** Eelgrass 14 Salt Marsh Sentinels **15** Purple Loosestrife **16** Looking Forward **17** How to Volunteer 18 2022 Citizen Science Volunteers of the Year **19** Thank You! 20 Image Credits



Who We Are



The North and South Rivers Watershed Association (NSRWA) is a non-profit grassroots environmental organization located on the South Shore of Massachusetts.

- Founded in 1970
- 1,600+ household members
- 12 towns within the watershed: Abington, Duxbury, Hanover, Hanson, Hingham, Marshfield, Norwell, Pembroke, Rockland, Scituate, Weymouth, and Whitman

The NSRWA's purpose is to improve the health of our watershed through education and citizen engagement programs and restoration projects.

The Massachusetts Bays National Estuary Partnership

(MassBays) is an EPA National Estuary Program dedicated to protecting, restoring, and enhancing the estuarine resources of Ipswich Bay, Massachusetts Bay, and Cape Cod Bay.



MassBays has five regions – NSRWA serves as the South Shore

Regional host and works in 9 coastal communities. The South Shore Region includes the communities of Cohasset, Scituate, Norwell, Hanover, Marshfield, Pembroke, Duxbury, Kingston, and Plymouth and the estuaries within them.

Both organizations work in tandem and provide support to our partnering communities and nonprofits to protect, restore, and monitor the waters of the South Shore from their headwaters to the coast.





Where We Monitor

The NSRWA monitoring focuses on the North and South Rivers and its tributaries. As host of the MassBays South Shore program, the NSRWA provides technical support and volunteers to the MassBays South Shore communities and nonprofit partners.



Key:

- Darker yellow MassBays South Shore Region Towns
- Green Line North and South Rivers Watershed
- Blue Line MassBays South Shore Estuaries and Interestuarine Areas

Our Monitoring Programs

Our monitoring programs take two forms – programs that are primarily conducted by volunteers with the guidance of our Watershed Ecologist and South Shore Regional Coordinator for MassBays, Dr. Sara P. Grady, and those that MassBays/NSRWA staff conduct. **Programs in bold are included in this report.** Programs that are not in bold may be included in future reports.



Our Monitoring Year

JanFebMarAprMayJunJulAugSepOctNovDecRiver Herring
Horseshoe Crabs
RiverWatch Water Quality
Marine Invasives
EelgrassII<

Volunteer Training* Monitoring

* Some training occurs at the same time as monitoring





Our monitoring follows the seasons, as different organisms are at their peak numbers throughout our rivers, estuaries, and coasts. We start with monitoring spawning herring and horseshoe crabs, continue through the summer trying to capture water quality issues at their potential worst, and monitor salt marshes and vegetation at their growing peak. Some projects continue all year long, like streamflow monitoring and tidal restoration.

Our Projects and People

We have over a dozen monitoring projects, some of which we've been working on for almost three decades, and others that are brand new. We wouldn't be able to accomplish all these years of consistent monitoring without our volunteers and partners.







Two-thirds of our volunteers in 2022 were herring counters, and the remaining third helped with our other projects. However, some volunteers participate in more than one project and are represented more than once here – we had 122 citizen science volunteers in 2022!



NSRWA/MassBays South Shore 2022 Monitoring Report | Page 7

River Herring

What We Do

Herring populations have been declining in coastal streams for multiple reasons including an inability to get to their spawning grounds due to dams or non-operational fish ladders. Herring are a crucial link in the coastal food chain, as a source of food for striped bass, bluefish, osprey, herons and other coastal species. Our volunteers count river herring at six locations to track herring populations, and we also assist with coordinating counts at MassAudubon's Tidmarsh Wildlife Sanctuary.

2022 Raw Counts (& Peak Count in Last 10 Years)

Bound Brook – 0 (4 - 2020)First Herring Brook – 10 (40 - 2021)Third Herring Brook Tack Factory – 0 (345 - 2020)South River – 49 (80 - 2012)Herring Brook – 231 (10,984 - 2019)Tidmarsh #1 - 22 (22 - 2022)Tidmarsh #2 – 57 (181 - 2019)





Hudanich family counting herring by Trillium Studios.

In 2022, volunteer counts continued to be low after a peak in 2019 at the most successful run, Herring Brook in Pembroke. Similar declines have been seen around the region and the reason is still unknown. This site is monitored by volunteers as well as an electronic counter.



Our volunteers spent over 236 hours counting herring – in 10 minute increments!



Horseshoe Crabs

What We Do

Every spring, in May and June, horseshoe crabs move shoreward to reproduce on our local beaches. To monitor their populations, volunteers on the South Shore gather data every year to determine if current regulations are helping to maintain or increase the number of crabs in the bay. We have been monitoring horseshoe crabs since 2008 in Duxbury Bay.

We monitor around the new and full moons and in 2022 the first monitoring occurred in mid-May. That is when we saw peak density, or crabs per m², as well as peak spawning index (SI), or females per m2.











RiverWatch Water Quality

What We Do

Since 1994, we have monitored bacteria and other water quality indicators like temperature, dissolved oxygen, salinity, and conductivity at ten sites in the North and South Rivers every other week from June through August.

Since we have started sampling, the percent of bacterial samples that have exceeded the swimming standard each summer has decreased, from 22-24% in the 90s and 2000s to 15% in the 2010s and 2020s. This is due to a reduction in stormwater pollution as well as increased sewering along the South River that reduced wastewater pollution.







Our volunteers start sampling 3 hours after Damons Point high tide – sometimes as early as 6:15am!



In 2017 we started testing enterococcus bacteria at all ten RiverWatch sites. In 2022, the geometric mean of all the samples met the swimming standard (35 cfu/100mL) at all sites except the Washington Street Bridge and Willow Street/Keville Footbridge. The geometric mean of fecal coliform did not exceed the shellfish standard at any marine sites except Julian Street, which is outside the conditionally approved shellfishing area.



Temperature

Measuring temperature is a part of almost every monitoring effort we do. We were curious whether we could detect any increases in temperature due to climate change in our RiverWatch temperature record, which is the most reliable and consistent. There were no trends looking at all the data pooled together over time, nor looking at each site's data for an entire summer over time. However, we did find a significant trend in the August water temperature at the Washington St Bridge site on the North River in Pembroke. and Hanover. We conduct these surveys to track new and existing invasive species that impact intertidal and subtidal ecology by occupying niches belonging to native species





August water temperatures at Washington Street Bridge have increased an average of 0.16°C annually or 2.8°C since 2004.



Marine Invasives

What We Do

Our marine invasives volunteers monitor both intertidal sites (Third Cliff, Fourth Cliff, and Brant Rock) and docks (Scituate Harbor, Green Harbor, and Duxbury Harbor) for presence and relative abundance of non-native creatures like crabs, tunicates, and algae. We are part of a larger group coordinated through Mass. Coastal Zone Management (CZM), the Marine Invader Monitoring and Information Collaborative, that collects similar data along the New England coastline.



Species found in 2022

Styela clava – club tunicate Botrylloides violaceus – sheath tunicate Botryllus schlosseri – golden star tunicate Didemnum vexillum – mystery tunicate Diplosoma listerianum – diplosoma tunicate Carcinus maenas – European green crab Hemigrapsus sanguineus – Asian shore crab Caprella mutica – Japanese skeleton shrimp Palaemon elegans – European rock shrimp





Story Map of Previous Data from NSRWA and our

MIMIC partners (via CZM)



On docks the most common species is the club tunicate, *Styela clava*. In the intertidal it's the Asian shore crab, *Hemgrapsus sanguineus*. (Pictured left).





Eelgrass

What We Do

Duxbury, Kingston, and Plymouth Bays have experienced severe declines in eelgrass coverage over the last several decades. Monitoring these changes allows us to assess the health and current status of eelgrass

within the embayment and find out what might be driving the losses. We collect this data using a drop camera to measure eelgrass percent cover at 119 sites throughout the bays, on boats captained by volunteers. We also selectively collect and measure eelgrass shoots and assess them for wasting disease and growth of organisms on the eelgrass blade. The data is entered into the iSeaGrass app, which was created in partnership with Mass. Division of Marine Fisheries (DMF).





Four survey days were conducted in 2022 – August 8th, 10th, 15th, and 23rd with only one boat available for each day, resulting in 34 out of 119 stations sampled. This is fewer boat days and stations completed than in previous years. Of these, 14 were valid for making comparisons to previous years (data in map above).

- 11/14 sites had eelgrass
- Of the 11 sites:
 - 10 had 1-10% cover of eelgrass
 - 1 had 10-30% cover of eelgrass
 - 5 sites had new eelgrass
- Of the 3 without eelgrass, eelgrass had been absent in all previous years



iSeaGrass storymap

Duxbury/Kingston/Plymouth Bay

Increase

Variable Never

Salt Marsh Sentinels

What We Do

Every fall, dock owners along the North and South Rivers work with our ecologist to document shifts in vegetation from the river to upland that can be an indicator of sea level rise due to climate change. Docks are located from near the mouth all the way past Route 53, so we are also able to set a baseline to document marsh migration up the river corridor as sea level rise causes brackish marsh to convert into salt marsh.



In 2022, 11 docks were surveyed, 5 of which were new sentinels we welcomed to the program. That brings the total number of active salt marsh sentinels (surveyed within the past 3 years) to 24. Of the 6 that were re-surveyed, 3 had data from 2018. Over the 5-6 years of this project, we have seen small shifts in zonation. In the sites above, we have seen an increase of 1.5 feet of upland border vegetation (like Phragmites), a slight gain of 0.5 feet of high marsh vegetation (extending into previously non-wet areas), and a loss of -2.1 feet of low marsh (mostly a loss of bank edge dominated by a few sites).



Purple Loosestrife

What We Do

Purple loosestrife is an invasive plant that can dominate wetlands. We collected *Galerucella sp.* beetles from the Mill Pond dam removal site, on the Third Herring Brook, where they had been used to control purple loosestrife previously, raised them, and transplanted them to Jacobs Pond where purple loosestrife has become a concern for the Town of Norwell. In September 2022, a group of students from Norwell High School helped us document their presence and initial success.







The tiny *Galerucella* beetle only eats purple loosestrife, nothing else!

Looking Forward

Headwaters Bacterial Source Tracking

We are assisting the Town of Hanover with bacterial source tracking in the headwaters of the North River (Indian Head River, Drinkwater River, French's Stream) to determine where the chronic higher bacterial counts at Washington Street Bridge might be coming from, and to find potential stormwater and wastewater improvement projects. (April-September 2023)

Blue Mussel Restoration and Monitoring

We are working with Hanscom AFB at the Fourth Cliff Recreation Area and MassAudubon to enhance and restore blue mussels in shorebird migration areas. Blue mussels provide important food for migratory shorebirds but have declined over the past few decades. (Ongoing)

Indian Head Watershed Culvert Assessment

We are planning to survey (and in some cases, resurvey) culverts within the Indian Head River watershed to assess connectivity and prioritize restoration in concert with the two dam removals on the river. (Pending)

Salt Marsh Restoration Assessment

We have initiated a multi-year effort to conduct desktop and field assessments of South Shore salt marshes and prioritize them for restoration using current techniques to improve hydrology, sediment retention and accumulation, and vegetation survival. (Starting Summer 2023)









How to Volunteer

The best way to know about our citizen science opportunities is to sign up for our e-news, where we post our project signups throughout the year. In addition, you can sign up through our general Citizen Science Volunteer form, which will add you to the lists for the projects that interest you.



How To Build A Rain Garden Thursday, June 25 @ 12:00 Noon Join <u>NSRWA</u>, <u>WaterSmartSouthShore</u>, and <u>Wild Ones</u> for a luncheon Zoom meeting on How to Build a Rain Garden. Want to stop having standing water in your yard? Live near a waterbody and want to reduce polluted runoff? Want to create bird and butterfly habitat? These are just some of the potential benefits of building a rain garden on your property!... <u>Read more and register</u>.

Sign up for our e-news at the bottom of our website home page:



Sign up through our Citizen Science Volunteer form:





2022 Citizen Science Volunteers of the Year

On October 2, 2022 we honored our Citizen Science Volunteers of the Year, Lanci and Page Valentine, Peter and Gwenn MacLearn, and Joyce Pun-Flynn for their work on the Stone Living Lab beach profiling project at Duxbury Beach. A majority of their volunteer effort was in 2021, when the beach was surveyed almost monthly.







Dr. Sara Grady presents a handmade Volunteer of the Year award gift to (L-R) Page Valentine, Lanci Valentine, and Peter MacLearn.

Thank You!

Partners

- **Charles River Watershed Association** Cohasset Center for Student Coastal Research **Duxbury Beach Reservation** Jones River Watershed Association Living Observatory Marine Invader Monitoring & Information Collaborative Marshfield Veterans Mass. Coastal Zone Management Mass. Department of Environmental Protection Mass. Division of Marine Fisheries Mass. Eelgrass Group Mass. Salt Marsh Working Group MassAudubon **Morrell Associates** Mystic River Watershed Association Nashua River Watershed Association
- Neponset River Watershed Association OARS Plymouth Harbormasters Office Scituate Water Division Scituate Chair Company Stone Living Labs Town of Cohasset Town of Cohasset Town of Duxbury Town of Duxbury Town of Hanover Town of Hanover Town of Kingston Town of Marshfield Town of Norwell Town of Pembroke Town of Plymouth Town of Scituate

Funders

Anonymous Donor Mass. Department of Environmental Protection Mass. Division of Marine Fisheries MassBays NOAA Restoration Center Norwell Conservation Commission Norwell CPC Norwell Women's Club NSRWA Members Veolia

2022 Summer Interns

Bryce Lacombe, Taylor Czybora, Grace Berthiaume





Image Credits

Photos and graphs are by NSRWA/MassBays unless otherwise noted/specified below.

Page 5 Brook trout, Jane Hawkey, Integration and Application Network (ian.umces.edu/media-library); conductivity, Alexandra Fries, Integration and Application Network (ian.umces.edu/media-library); streamflow, and tidal restoration, Tracey Saxby, Integration and Application Network (ian.umces.edu/media-library)
Page 8 Kim Kraeer, Lucy Van Essen-Fishman, Integration and Application Network (ian.umces.edu/media-library)
Page 7 Kim Kraeer, Lucy Van Essen-Fishman, Integration and Application Network (ian.umces.edu/media-library)

Page 9 Jane Thomas, Integration and Application Network (ian.umces.edu/media-library), Christine Ledin Page 10 Jane Hawkey, Integration and Application Network (ian.umces.edu/media-library)

Page 11 Tracey Saxby, Integration and Application Network (ian.umces.edu/media-library)

Page 12 Jane Thomas, Integration and Application Network (ian.umces.edu/media-library), Mass CZM, Taylor Czybora

Page 13 Annie Carew, Integration and Application Network (ian.umces.edu/media-library)

Page 14 Tracey Saxby, Integration and Application Network (ian.umces.edu/media-library)

Page 15 Kim Kraeer, Lucy Van Essen-Fishman, Integration and Application Network (ian.umces.edu/ media-library)

Page 16 Culvert, Kim Kraeer, Lucy Van Essen-Fishman, Integration and Application Network (ian.umces. edu/media-library); marsh monitoring, Jane Hawkey, Integration and Application Network (ian.umces.edu/media-library)

Page 18 Graph, Stone Living Labs Beach Profiling Storymap