

#EstuaryLove

# North **INLET & BAY** Bulletin

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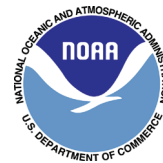
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North Inlet-Winyah Bay National Estuarine Research Reserve





# FREE PUBLIC PROGRAMS

For more info about these and additional programs and to register visit  
[northinlet.sc.edu/upcoming-events/](http://northinlet.sc.edu/upcoming-events/)

We continue to monitor the status of CDC safety recommendations for Covid-19. Currently all programs are virtual or in an outdoor setting with limited registration. Facial coverings are required in the Discovery Center. Program formats may need to be changed or some programs may be cancelled as the situation evolves.

## Bike Programs

5 mile roundtrip:  
Mar. 3, 17, 31, Apr. 15, 22  
13 mile roundtip:  
Mar. 19, Apr. 9

Ride on gravel roads  
through Hobcaw  
Barony's pristine  
forest.

## Fish Printing

Feb. 12, Mar. 11,  
Apr. 20

Use a method of  
printmaking that  
traditionally utilizes  
fish and sea creatures  
to decorate your own  
bag, shirt, apron, etc.

## Talk Birdie to Me

May 12, May 12,  
May 26

Take a short hike  
for begining birders  
through the maritime  
forest and along the  
edge of the estuary.

## Beach Night Life

June 9, July 7

Learn about shells,  
sand dunes, geology,  
tides, and beach  
inhabitants of a  
barrier island during  
an exciting evening  
program on the  
beach.

## Virtual Programs

### Open Virtual Field Trips

Feb. 10

Choose a date  
and topic for an  
interactive virtual field  
study for your class or  
homeschooler

### Virtual Beach Combing

Feb. 11

Learn about some of  
the native univalves  
and bivalves on South  
Carolina's coast.

### Backyard Bird ID 101

Feb. 17

Explore creatures and  
critters that live in the  
intertidal zone and the  
salt marsh creeks of  
Pawleys Island.

### Sea Turtles 101

May 11

Start the sea turtle  
season off learniong  
all about the common  
sea turtles seen off  
the coast of South  
Carolina.

## Virtual Storytime

*Reserve staff read childen's books centered around  
marine life and ecosystems*

**A Day in the Deep** Feb. 8

**Animal Partners in the Ocean** Feb. 15

**Hey Diddle Diddle A Food Chain Tale** Feb.22

## And Also...

**Valentines Clean-up** Feb.13

**Phenology Monitoring Training** Feb. 17

**Book Reading & Signing w/Anita Turnage** Mar. 12

**Walk on the Wild Side!** April 21

## Library Programs

### @ Georgetown County Library

**Riparian Reptiles** Feb. 23 @ 4pm

**Whales and Sharks** March 8@ 4pm

**Plants of the Salt Marsh** April 6 @ 4pm

**Sea Turtles 101** May 18 @ 4pm

**Crabs and Clams** June 21 @ 10am

**All things science!** Aug. 1 @ 10am

### @ Southern Branch Library

**Beachy Scene and Science** Feb. 28

**Sharks vs Whales** March 15

**Nature Journaling** May 25

# RESEARCH & MONITORING

***The Research & Monitoring team at North Inlet-Winyah Bay NERR continues to investigate the environmental conditions, flora, and fauna of North Inlet Estuary and Winyah Bay. We're excited to share just a few of our numerous research results from the past year.***

- We're droning the marsh! Research continued to explore the use of unoccupied aerial systems (AKA drones) as a way to monitor the health of salt marshes. We have conducted drone flights every two weeks for the past 12 months to investigate temporal changes in marsh vegetation based on the aerial imagery collected using this technology.
- Research & Monitoring staff continued a collaboration with researchers from the Woods Hole Oceanographic Institution and Waquoit Bay NERR (Massachusetts) to obtain hyper-local estimates of water level across numerous salt marsh habitat features. Using a simple, low-cost instrument design, we have collected 8 months of data from 14 water level loggers deployed in intertidal and subtidal creeks, marsh pools, and on the marsh surface.
- The Reserve's Margaret A. Davidson Graduate Fellow, Johanna L'Heureux was in-residence at NI-WB NERR during August and September. Johanna collected preliminary data for an experiment using the marsh organs maintained by researchers from the Baruch Marine Field Lab; she will be back in late Spring 2022 to complete her study.
- Research staff are continuing a study to investigate the effects of oyster picking on the animals that utilize oyster reefs as habitat. In addition to shellbaskets, which are used to characterize the oyster reef faunal community, we have partnered with scientists and students from USC-Beaufort to analyze environmental DNA (eDNA) collected on and around oyster reefs. If you see any odd looking plastic trays on our reefs during your winter-time oyster picking trips, please ignore them!
- The Reserve continued its long-standing research on stormwater impacts on coastal water quality. Efforts this past year focused on: 1) how land-use and stormwater infrastructure effect the amount and form of organic matter input to the waters of the Winyah Bay watershed; and 2) how warming water temperatures and the temperature-sensitivity of different sources of organic matter inputs may explain the continuing decline in dissolved oxygen in the Waccamaw River.
- The Baruch Marine Field Lab and NI-WB NERR hosted more than 15 summer student researchers in 2021. Check out what just a few of the students worked on during their ['Summer Along the Sea'](#)!



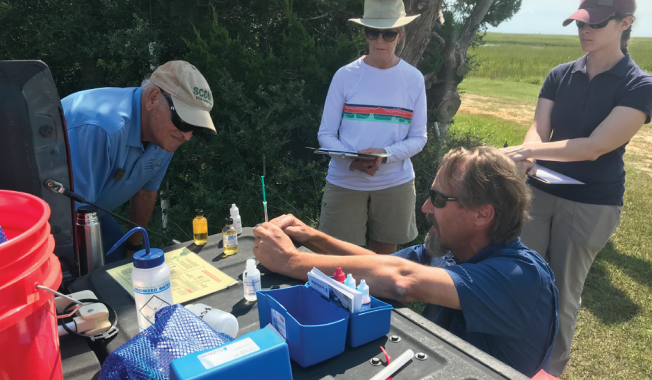
*Technical staff member, Baker Stevens, is up to his neck maintaining all of our environmental monitoring equipment. Here, he is replacing a water depth sensor at Clambank Landing as part of a project investigating water levels across multiple estuarine habitat types. Photo credit: V. Sheremet*

We look forward to an even busier 2022. If you are interested in being a regular, long-term contributor to a community science project monitoring crabs in the salt marshes of North Inlet, please reach out to the Research Coordinator, Robert Dunn (robert@baruch.sc.edu or 843-904-9026).



# STEWARDSHIP

Volunteers are adopting our tidal creeks! The Reserve is working with the SC Adopt-a-Stream program, led in partnership by SC Department of Health and Environmental Control and the Clemson University Center for Watershed Excellence, to develop and expand volunteer water quality monitoring in tidal creeks. Five monitoring



*Volunteers learn how to use kits to measure the amount of dissolved oxygen in the water during a training workshop.*

sites have so far been established, one at Winyah Bay, two in Pawley's Island, and two in Murrells Inlet. Volunteers measure the dissolved oxygen, pH, transparency, and salinity of the creek water and make marsh condition observations on a monthly basis. This watershed-wide effort will provide baseline information about the condition of our tidal creek systems and alert us to issues that may need to be addressed. The Reserve will serve as a hub that will provide sampling supplies and training opportunities to volunteers.



*A pair of American avocets, *Recurvirostra americana*, was an unusual sight in North Inlet.*

The Reserve is also continuing to work toward developing a phytoplankton monitoring program in the local watershed. The National Phytoplankton Monitoring Network (PMN) is a community-based network of volunteers that monitor marine phytoplankton and harmful algal blooms. Two volunteers have been assessing phytoplankton from Oyster Landing at the reserve twice a month since October, and in December a team of two volunteers began collecting and assessing samples from Murrells Inlet. Data will contribute to the national program, and increase understanding of phytoplankton populations in the reserve watershed.

***Volunteers are monitoring our water quality, watching out for harmful algal blooms, and counting shorebirds. We hope to engage even more community members in joining our citizen science marsh monitoring network.***

Shorebird surveys continued to be conducted during the fall migration period. Interesting sightings included 2 American avocets and a reddish Egret. Roseate spoonbills and white pelicans were once rare visitors to North Inlet, but both are now frequently seen. Shorebird survey results are submitted to the International Shorebird Survey portal on the eBird website managed by the Cornell Laboratory of Ornithology.

This past year, the Reserve received funding to support development of an on-line tool to help researchers and managers better understand how the changing climate may affect coastal habitats. The ClimateVulnerability app is a web application of the Climate Change Vulnerability Assessment Tool for Coastal Habitats (CCVATCH), a method of integrating climate change projections, current research on ecological responses to climate change, and local knowledge to assess the most likely causes of vulnerability to habitats and to stimulate discussion among researchers, managers, and educators about adaptation actions. The NI-WB NERR will work with the web app developer and four participating NERRS (GTM, South Slough, Mission-Aransas, and Grand Bay) to test and iteratively develop the app. The intent of this project is to make it easier for Reserves and other land managers to complete vulnerability assessments and use the results to support climate adaptation planning.



# EDUCATION



*An evening beach seine program was offered with the Waccamaw Library.*

Education staff offered a variety of in-person education outreach and conservation action activities designed to enhance public understanding of estuaries, watersheds, and water quality. Outdoor nature activities and programs for multi-generational groups of all ages were especially popular and several art and nature programs, nature walks, and beach and creek seining events in partnership with Waccamaw Branch Library were well attended. Due to pandemic-related personnel and supply chain issues with equipment, the Reserve's kayak outfitter was forced to greatly reduce the number of trips offered this season, but we were able to squeeze in a few great trips to North Inlet and Hobcaw Beach. Participants in Family Fishing Clinics learned fishing techniques such as rigging, baiting and casting in our outdoor pond classroom and then went fishing from Clambank Landing and dock. SCDNR certified fishing instructors (many Inlet & Bay Stewards (IBIS) friends of the Reserve members) led these events with great enthusiasm.

Local school districts are not permitting in-person field trips, and unfortunately the annual school boat trips aboard the ACE/SCDNR education vessel Discovery and land programs with NIWB were canceled for fall. The NIWB NERR developed multiple virtual programs for different audiences and grade levels.

***An expanded partnership with the Georgetown County Library System provided new venues for outdoor events such as pond life, fish printing, and nature journaling, as well as a variety of virtual events and field studies on estuary, watershed, and marine topics.***

The Reserve's Margaret A. Davidson Fellow, Johanna L'Heureux, assisted education staff on a field program on coastal wildflowers and wetland plants during National Estuaries Week in September. Public participants visited the Reserve's marsh boardwalk and L'Heureux's research site at Oyster Landing, and learned about species of salt marsh and wetland plants and her current research on marsh grasses in South Carolina and Massachusetts in an effort to better understand and predict the resilience of salt marshes in the face of climate change. Reserve education staff are also coordinating future public and K12 events with L'Heureux for spring 2022.



*Teachers play a game of 'microplastics pinata' to explore the issue of microplastics in the environment.*

The 2021 Teachers on the Estuary (TOTE) Professional Teacher Development, in collaboration with ACE Basin NERR/SC Department of Natural Resources (SCDNR) and SC Sea Grant Consortium, was held over 3 consecutive days in 3 different locations along the coast. Eighteen teachers attended the workshop, and participants included in-service teachers of all grade levels and informal educators from across the state. Participants visited the NI-WB NERR, Ft. Johnson and the Marine Research Resource Institute in Charleston, and the Edisto Environmental Learning Center.

# TRAINING



*Homeowners Association reps., property managers and pond owners learned how to conduct pond inspections at a recent workshop at the Horry County South Strand Recreational Facility.*

inspections. The Horry County Stormwater Department partnered to share their knowledge of pond maintenance at the Horry County South Strand Recreation Facility. It was great to get out in the field and to make connections while learning about stormwater management!

A four-part webinar series called “Flooding 411” brought flooding information to residents throughout coastal SC. Hosted in partnership with Clemson Extension, S.C. Sea Grant, and the ACE Basin NERR, these webinars addressed an education need that has become increasingly important in the past several years. Viewers learned about different types of flooding that occur in coastal SC and the influence of human activity on water resources. These webinars explained “Who’s Who” in flood management and recovery and where to go for assistance and resources. Coastal residents also learned actions they can take personally to reduce flooding impacts and to be prepared for flooding. This series proved so popular that plans are in progress to make it a regular series and to adapt content into in-person workshops.

Quarterly workshops known as the “Grand Strand Healthy Pond Series” continue to provide stormwater pond management education to Homeowners Association reps, property managers, and pond owners. Protecting downstream water quality is one of the most important functions of these structures. NI-WB NERR manager, Erik Smith, presented research on nutrient management in ponds as part of a virtual workshop in the fall. More recently, participants were able to gather in-person for a hands-on workshop on conducting pond

***The Coastal Training Program continues to connect decision-makers to the science, tools, and training they need to protect coastal resources. Over the past few months, NERR training programs have had a strong focus on issues of water quality and quantity.***

This summer, the 2022 Grand Strand Stormwater Pond Management Conference will provide a forum to give the latest information, resources, and tools on stormwater pond management for Grand Strand communities. The conference, originally scheduled for March, has had to be rescheduled, and the new date will soon be determined. Please stay tuned and check the registration page for updates on rescheduling.  
<http://northinlet.sc.edu/events/grand-strand-stormwater-pond-management-conference-2/>



# PONDERING PONDS

Landscape features have more going on than meets the eye

**W**hen you gaze out over a pond, there is more going on beneath the surface than meets the eye. You might be enjoying the relaxing views, the ducks and turtles, or the space to walk along the shorelines. However, below the water, biogeochemical processes are hard at work. For the most part, ponds are not naturally occurring features along the South Carolina coast. In fact, stormwater ponds are engineered structures designed to perform specific jobs. Stormwater ponds are built to control stormwater runoff, protect downstream water quality, and prevent flooding. However, ponds require proper management to provide these important functions. The Grand Strand Healthy Pond series is an educational program helping local communities take a deeper dive into pond management.

The Grand Strand Healthy Pond Series is an opportunity for HOA/POA representatives, pond owners, and pond managers to increase their knowledge of pond management best practices. This community-based discussion series will provide a way for pond owners to learn, connect, and share. The series is organized by the North Inlet – Winyah Bay NERR, Clemson Extension, and S.C. Sea Grant Consortium.

The series was launched with virtual programs in 2020. Participants have learned about topics including shoreline erosion, wildlife issues, and the importance of nutrient management. These workshops have included science and data to inform decision-making, strategies for implementing best practices, and resources on who to contact for more information or for professional pond management services.

Most recently, the Healthy Pond Series hosted a Pond Inspection 101 workshop. Conducting pond inspections – by walking around the pond in question and making observations of potential issues - is an important aspect of regular pond maintenance. The Horry County Stormwater Department partnered to share their knowledge of pond maintenance at the Horry County South Strand Recreation Facility. Learning this skill requires some hands-on experience, so we were excited to get out into the field and visit a pond in person! Participants were guided through the process with a pond inspection form. They looked for possible damage to inlet and outlet structures, checked for signs of excess algae growth, and assessed whether shorelines were eroding. Noting pond issues before they become worse can prevent expensive repairs. It was great to get out in the field and to share skills that participants could take back to ponds in their communities.



*Participants learned about pond inspection first hand during a field training at a recent Healthy Pond Series workshop.*

**Maeve Snyder, [msnyder@baruch.sc.edu](mailto:msnyder@baruch.sc.edu)**

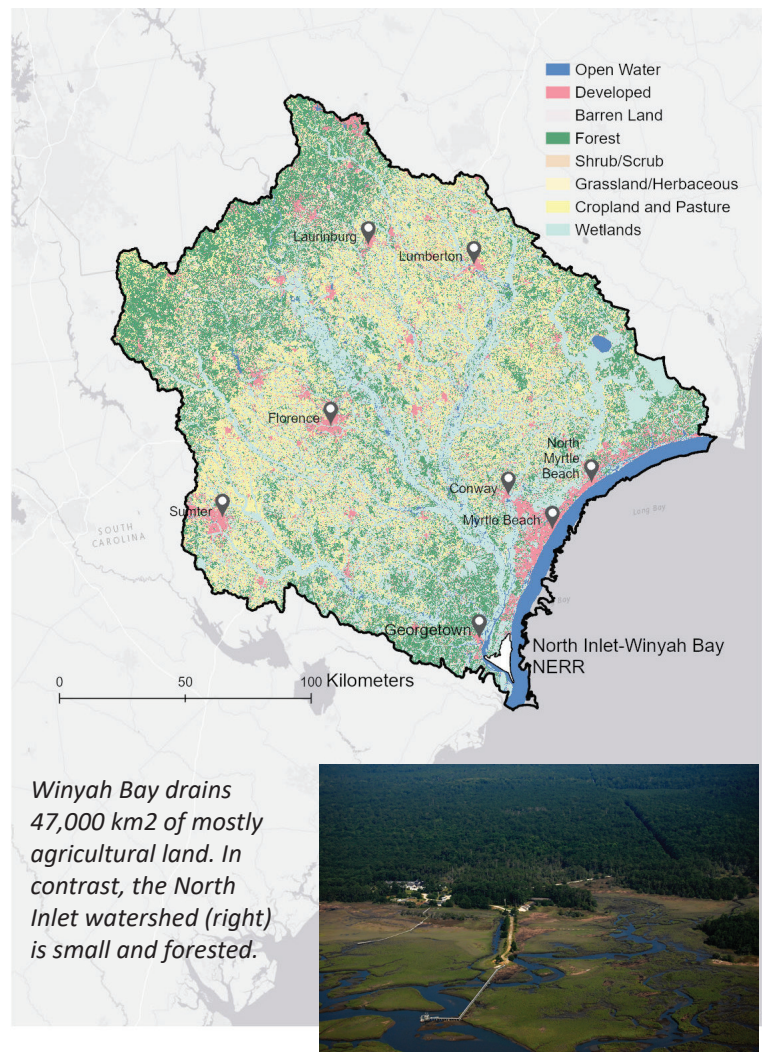


# THE TALE OF TWO ESTUARIES

## Decadal trends in water quality in North Inlet Estuary and Winyah Bay

Despite rapid suburban development and a dramatic increase in human population growth along much of the coast of the southeast United States, pockets of coastal habitat remain that appear minimally impacted. The North Inlet estuary is an ocean-dominated system with a small, forested watershed with relatively little development. This feature suggests that any recent trends in environmental conditions within North Inlet are unrelated to direct anthropogenic impacts within the surrounding region, and instead are due to larger scale processes. On the other hand, Winyah Bay is a large (65 km<sup>2</sup>) body of water at the confluence of five rivers, which drains a 47,000 km<sup>2</sup> watershed made up mainly of agricultural land.

Changes to estuarine water quality during the 20<sup>th</sup> century were generally associated with point and non-point source pollution of nutrients, leading to high nutrient concentrations (eutrophication) and phytoplankton blooms. Recently, improved management of nutrient loading upstream has led to reductions in nitrogen (N) and phosphorus (P) introduction into estuaries. But, in addition to nutrient loading from pollution, climate also plays a role in the conditions within estuaries.

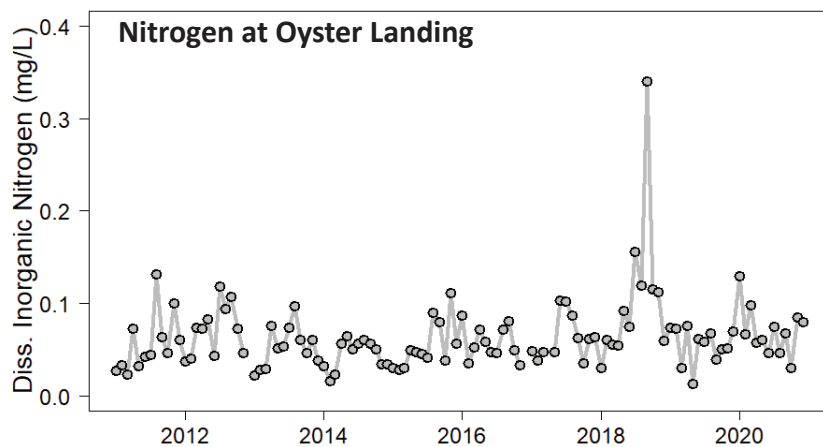


Research Specialists Baker Stevens and Julie Krask gear up for a SWMP Run! The NI-WB NERR's contribution to SWMP (the System-Wide Monitoring Program) includes monthly sampling for nutrients and chlorophyll using automated water samplers (grey barrels) and continuous monitoring of multiple other water quality parameters using data sondes (instruments with neon tape).

Researchers at the North Inlet-Winyah Bay National Estuarine Research Reserve are using long-term monitoring data to compare trends in water quality between the North Inlet and Winyah Bay ecosystems. Between 2002 and 2019, research staff collected water samples every 20 days as part of the Reserve's System-Wide Monitoring Program (SWMP), which continues today. Our analysis focuses on some of the key parameters used to characterize water quality status within estuaries (including ammonium, total nitrogen, and chlorophyll-a concentrations, among others).

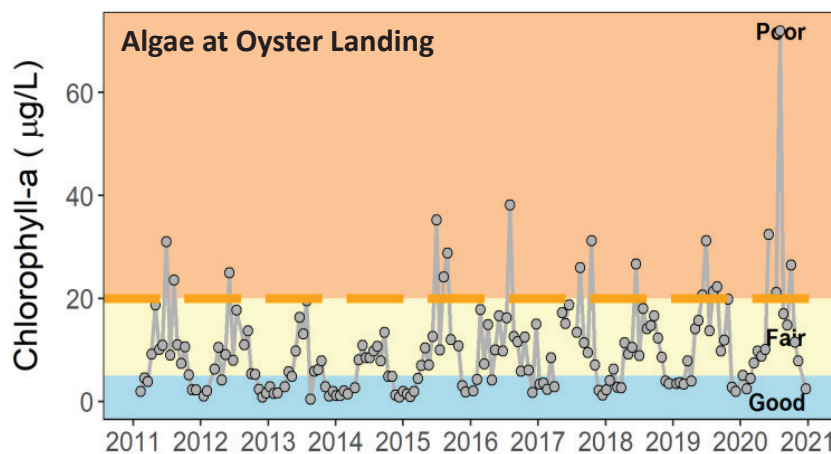


Ammonium is the dominant form of dissolved inorganic nitrogen in our focal estuaries, and thus an important nutrient pool contributing to primary production. Algal biomass (represented as [chl-a]) provides a measure of ecosystem productivity. Our analyses demonstrate that within two adjacent and connected estuaries (the North Inlet-Winyah Bay estuarine system), decadal-scale trends in nutrient concentrations and phytoplankton biomass are driven by different factors within water bodies subject to different degrees of anthropogenic alteration and sea level rise. In the North Inlet estuary, we are seeing an increase in dissolved inorganic nitrogen and chlorophyll-a, while in the adjacent, river-dominated Winyah Bay, inorganic nutrients and chlorophyll-a concentrations are more variable but do not appear to have increased over the same time period. Surprisingly, total nitrogen exhibits the opposite pattern- temporal stability in North Inlet but increasing in Winyah Bay.



*Dissolved inorganic nitrogen (DIN) is the type of nitrogen in the water that phytoplankton need to grow. At NI-WB NERR, data show that DIN concentrations are increasing over the long term at half of our SWMP stations (graph at left).*

*Phytoplankton growth is measured by chlorophyll-a concentrations. At NI-WB NERR, data show that chlorophyll-a levels are increasing over the long term in North Inlet (graph below) but not changing at the station adjacent to Winyah Bay. A large phytoplankton bloom occurred during the summer of 2020.*



Multiple large estuaries demonstrate climate-driven trends in water quality, which are mainly related to riverine input (e.g., Chesapeake Bay, San Francisco Bay). We have found that long-term increases in concentrations of some nutrient parameters and chlorophyll-a can be observed within smaller estuarine systems dominated by the ocean, likely due to changing hydrologic and climatic processes. Sea level rise is steadily increasing water levels in estuaries of the southeast, including in North Inlet, and we will continue monitoring a suite of environmental parameters to better understand short-term variability and long-term changes to conditions in the North Inlet – Winyah Bay estuarine system.

#### Small Changes You Can Make To Help

- Limit use of fertilizers/pesticides and apply responsibly
- Use compost as fertilizer in gardens
- Collect pet droppings
- Plant trees and rain gardens
- Redirect downspouts away from impervious surfaces like driveways and sidewalks
- Wash cars and boats on lawn and not the driveway

**Robert Dunn, [robert@baruch.sc.edu](mailto:robert@baruch.sc.edu)**

# WE ARE ALL SCIENTISTS

## Community participation in research and monitoring

*In the winter of 1881–82, a teacher in Iowa named Wells Cooke asked for ornithologists to send him lists of winter bird residents and the dates of the first arrivals of spring migrants. This long-term study is considered to be one of the earliest formal citizen-science programs in the country, and expanded into one of the first government programs for birds, the North American Bird Phenology Program, which private citizens could join. Participants in this program generated a data set of 6 million historical observations of over 800 bird species, documenting occurrences and migration times from the 1880s through 1970, the longest and most comprehensive legacy data set on bird migration in existence. When the program closed in 1970, it left millions of hand written bird migration records. Volunteers again stepped up to transcribe and enter the records into a database, resulting in over 400,000 validated records released to the public and scientific community, information that we can use to help us understand how climate change is affecting migratory birds across North America.*

The term ‘citizen science’ was not added to the Oxford English Dictionary until 2014, defined as, “Scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions.” But the practice is not new. Members of the public have for most of recorded history investigated scientific questions; their efforts have created important datasets and specimen collections and led to scientific insights. In fact, prior to the professionalization of science in the late 19<sup>th</sup> century, nearly all scientific research was conducted by amateurs, people who were not paid as scientists but had a driving interest in particular topics or questions. Charles Darwin was not a professional scientist, but an unpaid companion on the Beagle, though he had medical training. The term “scientist” wasn’t even coined until around 1834 when Cambridge University historian William Whewell decided one word was needed to refer to all those working in fields of science, and came up with the ‘tist’ as an analogy to ‘artist’.

We still struggle with terminology. The scientific community, like the rest of society, faces long-standing challenges around accessibility, justice, equity, diversity, and inclusion. The word ‘citizen’ has been problematic as it is commonly defined as, “A legally recognized subject or national of a state” and the term ‘citizen science’ can be perceived to exclude those without citizenship status within a given nation. However, the original intent of the modifier ‘citizen’ was to signify an inclusive kind of science that enables those without a formal scientific background to participate in knowledge production, similar to the way the words amateur or nonprofessional might be used, although those terms also have their own negative interpretations. Labels such as community science, volunteer monitoring, public participation in scientific research (PPSR), participatory action research, community-based research, neighborhood science, civic science, and even street science have been suggested. While terminology does matter, making the field of science more inclusive, what has been termed the ‘democratization of knowledge production’, is the crucial goal. No matter what terminology we decide to use, the focus should be on ways to actually broaden participation in and increase beneficiaries of this knowledge production.



Volunteers with the Phytoplankton Monitoring Network are essential monitors for harmful algal blooms.



Advances in technology and the availability of on-line databases, digital cameras and smartphones have given a boost to the number and variety of citizen science projects available for participation. Volunteers can find projects covering interests from environmental monitoring to recovering historical documents to finding new stars, and they can participate from their living rooms, back yards, schools and parks. Through this type of 'crowdsourced' citizen science, researchers have been able to reach greater scales in geography and sample size than ever before, and also have been able to expand research topics beyond what has been traditionally funded by governments and institutions.

But citizen science is about more than just collecting data. At a time when the population is increasingly distrustful of science and policy making, through citizen science projects members of the general population can directly experience all stages of the scientific process of asking questions and generating hypothesis, creating an experimental design, gathering and analyzing data, and drawing and communicating conclusions. In addition to restoring public trust in science, public participation has the potential to re-orient science toward addressing the complexity of environmental problems at local scales. Traditional academic research priorities and study design are often determined by institutional funding. Community generated science can empower communities to advocate for their local environments and gather the evidence needed to articulate issues and influence decision makers to act on environmental problems.

This past fall, the NI-WB NERR offered training to our first cohort of citizen science water quality monitoring volunteers. By 'adopting' sites in Pawley's Island and Murrells Inlet tidal creeks, community members are expanding our ability to monitor and understand our estuarine systems. We will be recruiting and training volunteers for additional monitoring projects, including phytoplankton monitoring, marsh biosurveys, and phenology monitoring, working toward building a Winyah Coastal Watershed Marsh Monitoring Network. Through this effort, we hope to provide community members with the tools and training they need to evaluate and protect their local waterways, and to collect quality baseline data that will help us to determine the health of our coastal wetlands.



*Volunteers with the SC Adopt-a-Stream monitor water quality monthly in our local tidal creeks.*

## Get Involved

**TRAINING:** Phenology Monitoring Program Introduction, on-line training February 17th, 4-5:30 PM register at <http://northinlet.sc.edu/events/phenology/>

**LEARN MORE:** Phytoplankton Monitoring Network at NIWB <http://northinlet.sc.edu/niwb-pmn/>  
South Carolina Adopt-a-Stream  
<https://www.clemson.edu/public/water/watershed/scaas/index.html>

**JOIN A PROJECT:** Winyah Wildlife on iNaturalist <https://www.inaturalist.org/projects/winyah-wildlife>

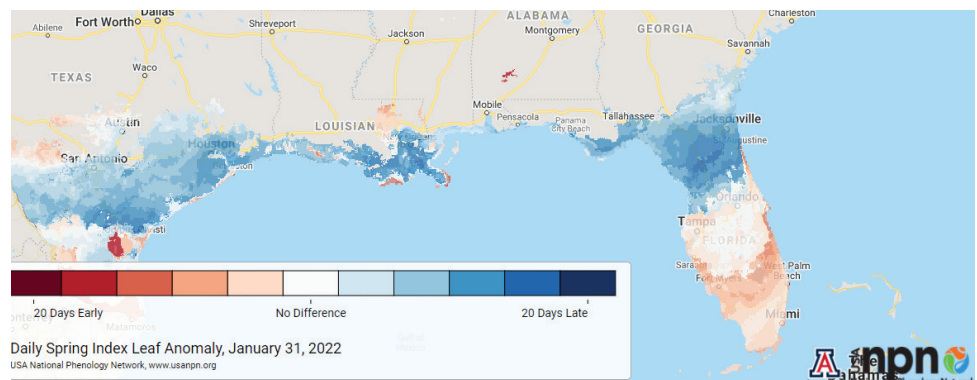
*Jennifer Plunket, [jen@baruch.sc.edu](mailto:jen@baruch.sc.edu)*

# LOOK OUT FOR SPRING

## Phenology Monitoring Documents Long-Term Change

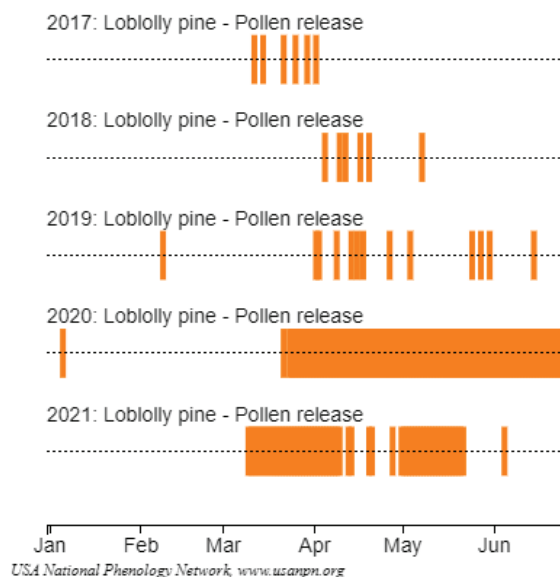
**P**henology is the study of periodic plant and animal life cycle events, such as flowering and seed production and animal reproductive behavior and migration. These events are sensitive to seasonal and inter-annual variations in environmental conditions including temperature and precipitation. With global warming, many spring events are occurring earlier and fall events are happening later than they did in the past, but not all species phenological responses are changing at the same rate or in the same direction. Ecosystem mismatches can occur for example when a plant blooms before its pollinators emerge. Knowledge of how plants and animals respond to changes in climate can help to predict whether their populations will be stable. Long term monitoring of these events is the best way to gather the needed information to develop a better understanding of how the changing climate is impacting ecosystems.

The [USA National Phenology Network](https://www.usanpn.org/) (USA-NPN) brings together volunteer observers, government agencies, non-profit groups, educators and students of all ages to monitor the impacts of climate change on plants and animals in the United States. The USA-NPN First Leaf and First Bloom Indices are synthetic measures



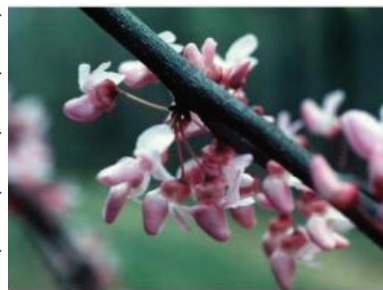
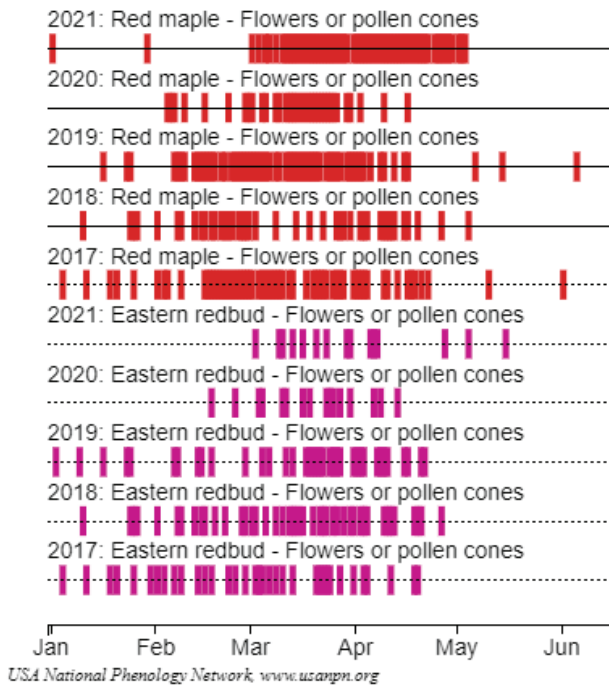
of the onset of spring that are based on the leaf out and flowering of lilacs and honeysuckles, which are among the first plants to show their leaves in the spring. Spring leaf out has started to arrive this year in the southernmost states of the U.S. however in southern Florida and Texas, leaf out has been patchy, arriving several days late to over a week early in some locations.

Previous studies have shown the First Leaf and First Bloom Indices fairly well predict the spring phenology of other local species. Additionally, volunteers can become observers with the [Nature's Notebook](https://www.naturesnotebook.org/) project to contribute local phenophase information about the plants and animals in their own yards. This growing dataset is being used by researchers, resource managers, decision makers and educators to better understand how the changing climate is affecting the timing of events such as wildfires, and when to harvest or irrigate land and conduct controlled burns.

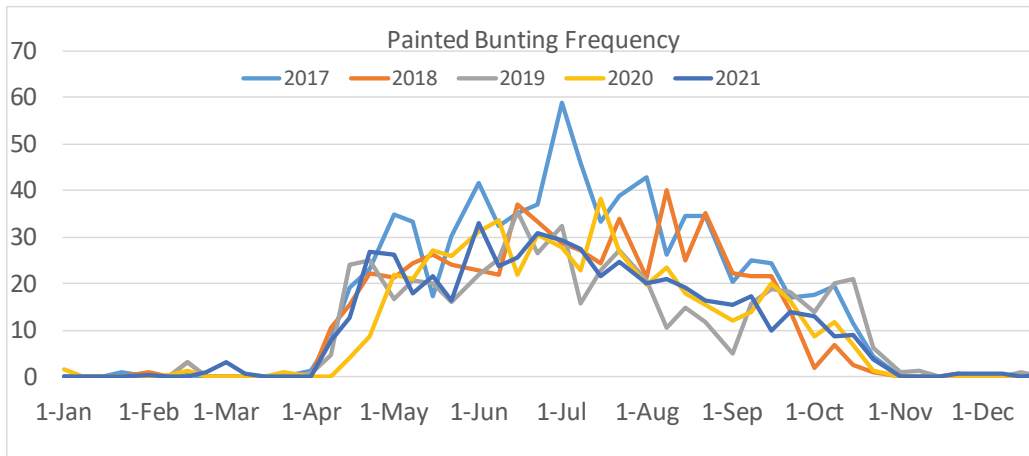


*It's almost that time of year again when our cars and the ground become coated with the 'golden sheen' of pine pollen. Taking note of when pollen begins to be released creates an important phenological record. Data at left is from Nature's Notebook volunteer observers. Pine pollen under a microscope, right photo, resembles Mickey Mouse.*





Two flowering trees to be watching soon are red maple, *Acer rubrum*, and eastern redbud, *Cercis canadensis*. The flowers of the red maple are tiny, usually red, with male and female flowers occurring separately on the same tree. The flowers of the red bud are actually more purple in color, small and clustered at each leaf node. Both trees have shown variable first bloom dates over the years according to data from Nature's Notebook volunteer observers.



Information about bird phenology can be found at another volunteer database- [eBird](https://ebird.org/). The graph at left shows the frequency of painted buntings, *Passerina ciris*, reported on checklists in the southeast. Although the number of reports has varied over the last five years, the first arrival time of early April has been very consistent.

The Reserve is starting a new citizen science project that will document changes in the estuarine ecosystem that are occurring over time with climate change. Project participants will conduct weekly observations of plant phenology and wildlife activity for selected species at designated monitoring sites. Following a written protocol that is based on the Nature's Notebook phenology program, the phenological stages (e.g. leaf break, flower buds) will be recorded for marked plants along a marsh trail. An initial phenology trail has been established at the Reserve, and additional trails will be created at other local sites as the program grows.

If you would like to learn more about this program or phenology in general, please attend our virtual training on February 17 from 4:00 to 5:30PM. You can register at <http://northinlet.sc.edu/upcoming-events/>. Training will include salt marsh plant identification, phenotype identification, field techniques and data entry. This introductory training will occur virtually through Zoom, and field trainings will be scheduled with small groups in February and March.

Jennifer Plunket, [jen@baruch.sc.edu](mailto:jen@baruch.sc.edu)

## EVENTS



### Volunteer Training: Phenology Monitoring

**Thursday, February 17<sup>th</sup>, 4 to 5:30 PM**

Volunteers with the Salt Marsh Season Phenology Community Science Project will record observations of plant phenology and wildlife activity for selected species at designated salt marsh monitoring trails. Training will include salt marsh plant identification, phenotype identification, field techniques and data entry. This introductory training will occur virtually through zoom, and field trainings will be scheduled with small groups in February and March.

**Register at** <http://northinlet.sc.edu/events/phenology/>



### 2022 Grand Strand Stormwater Pond Management Conference

**June 2022, Date TBD**

The 2022 Grand Strand Stormwater Pond Management Conference will provide the latest information, resources, and tools on best practices for pond management. Topics include integrated weed management, erosion, inspections, upland management, and more!

**Who Should Attend:** HOA representatives, pond owners, property managers, pond management professionals

**Visit the** [NERR event calendar](#) **for more updates.**

## CELEBRATIONS

**♥ ESTUARY LOVE February 1 to 28.** Throughout the month of February, we will be sharing all the many reasons we love estuaries and invite you to join the conversation. Lookout for posts on Facebook, Twitter and Instagram for fun facts and stories from the NIWB Reserve and others.

**🎉 50<sup>th</sup> Birthdays!** The Coastal Zone Management Act, Clean Water Act, Marine Mammals Protection Act, and National Marine Sanctuaries Act are all turning 50 this year! Throughout the year we are promoting 50 Ways to Love Your Ocean and Coasts, featuring a different theme each week. Visit the [NOAA website](#) to learn more about how this legislation has shaped the past 50 years of ocean and coastal protection, and for inspiration on how you can show your support for continued protection.



## EVENTS

### VOLUNTEER CLEAN-UP

Ocean Highway  
Hog Heaven to Hobcaw  
Sunday, February 13th  
7:30 to 10:00 AM

BE  
MINE

Register at  
[northinlet.sc.edu/events/valentines-clean/](http://northinlet.sc.edu/events/valentines-clean/)



#iheartestuaries



IBS

Inlet & Bay Stewards

Serving the North Inlet-Winyah Bay National Estuarine Research Reserve



### 2022 WACCAMAW CONFERENCE

#### 50 YEARS OF THE CLEAN WATER ACT

The Clean Water Act is the federal policy to prevent, reduce, and eliminate pollution in our waterways. After 50 years, we celebrate our accomplishments, review the current state of our waters, and determine the next steps to protect clean water in our watershed.

CWA  
@50

Join us for a week of events, fun activities, and competitions.

Visit us online for more information and a full calendar of events.

[winyahivers.org](http://winyahivers.org)

A PUBLIC  
EDUCATION  
EVENT

MARCH 20 - MARCH 26



# ESTUARY TRENDS

## Weather & Water Quality Highlights from 2020

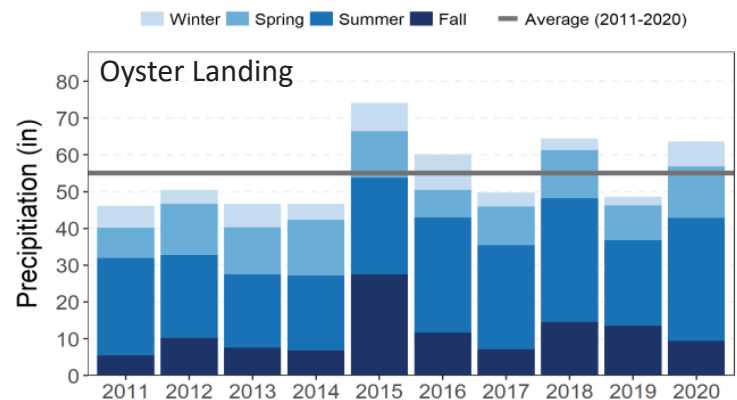
The health of every National Estuarine Research Reserve is continuously monitored by the System Wide Monitoring Program (SWMP). This program is designed to measure changes in estuarine water quality, habitat and land use and provide information on environmental trends. Reserve generated data and information are available to local citizens and decision makers. For more information, go to: <https://coast.noaa.gov/nerrs/>



The NIWRB Reserve has five sampling sites, two in Winyah Bay and three in North Inlet. From left to right: Winyah Bay, Thousand Acre, Debidue Creek, Oyster Landing and Clambank Landing.

### Analysis of 2020 data showed that...

- ◆ Rainfall in 2020 was about 10 inches higher than the ten year historical average.
- ◆ Salinity is decreasing over time at all SWMP stations.
- ◆ Chlorophyll-a concentrations are increasing in North Inlet and hit their highest levels during the summer of 2020.



### Trends in weather and water quality from 2011 to 2020...

Location ID	Location Name	Air Temperature		Precipitation		
OL	Oyster Landing	↑		—		
Location ID	Location Name	Water Temperature	Salinity	Dissolved Oxygen	pH	Turbidity
CB	Clambank	↑	↓	↓	—	↑
DC	Debidue Creek	↑	↓	↓	↓	—
OL	Oyster Landing	↑	↓	—	↓	—
TA	Thousand Acre	↑	↓	—	↓	↓
Location ID	Location Name	Ortho-phosphate	Ammonium	Nitrite	Nitrate	Chlorophyll -a
CB	Clambank	—	↑	↓	—	↑
DC	Debidue Creek	—	↑	—	—	↑
OL	Oyster Landing	—	↑	—	—	↑
TA	Thousand Acre	—	↓	—	↑	—

*\*Based on data collected from 2011-2020*

X Insufficient Data  
 ↑ Increasing  
 — Not Changing  
 ↓ Decreasing

= Precipitation is not changing. Rainfall in 2019 was just below the long-term average.

↑ Air and water temperature are increasing.

= Dissolved Oxygen is decreasing at half of the stations

↓ Salinity and pH are decreasing at most stations.

### Did you Know?

You can see real-time data from any of the NERRS around the country at [www.nerrsdata.org/mobile](http://www.nerrsdata.org/mobile)



# OUR STAFF



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<http://northinlet.sc.edu/contact-us/>



# North Inlet-Winyah Bay

## National Estuarine Research Reserve

The **North Inlet-Winyah Bay National Estuarine Research Reserve** includes North Inlet and lower Winyah Bay and encompasses tidal marshes, oyster reefs, beaches, coastal forest, and open water. This reserve provides habitat for many species, including federally threatened and endangered sea turtles, sturgeon, red knots, and wood storks.



The reserve conducts research and provides education programs needed by communities to conserve and manage coastal resources. Primary focus areas include impacts of urbanization and stormwater management on coastal water quality, effects of climate variability on natural and human coastal communities, and monitoring and actions to protect biodiversity.

The reserve headquarters is located at the Baruch Marine Field Laboratory on Hobcaw Barony. Daily oversight is provided by the Belle W. Baruch Institute for Marine and Coastal Sciences, University of South Carolina. NOAA's Office for Coastal Management provides funding, national guidance, and technical assistance.



The nation's 29 research reserves protect over 1.3 million acres and provide habitat where plants and wildlife thrive. Community benefits include recreation, flood protection, and water filtration.

North Inlet-Winyah Bay National Estuarine Research Reserve

[www.northinlet.sc.edu](http://www.northinlet.sc.edu)

