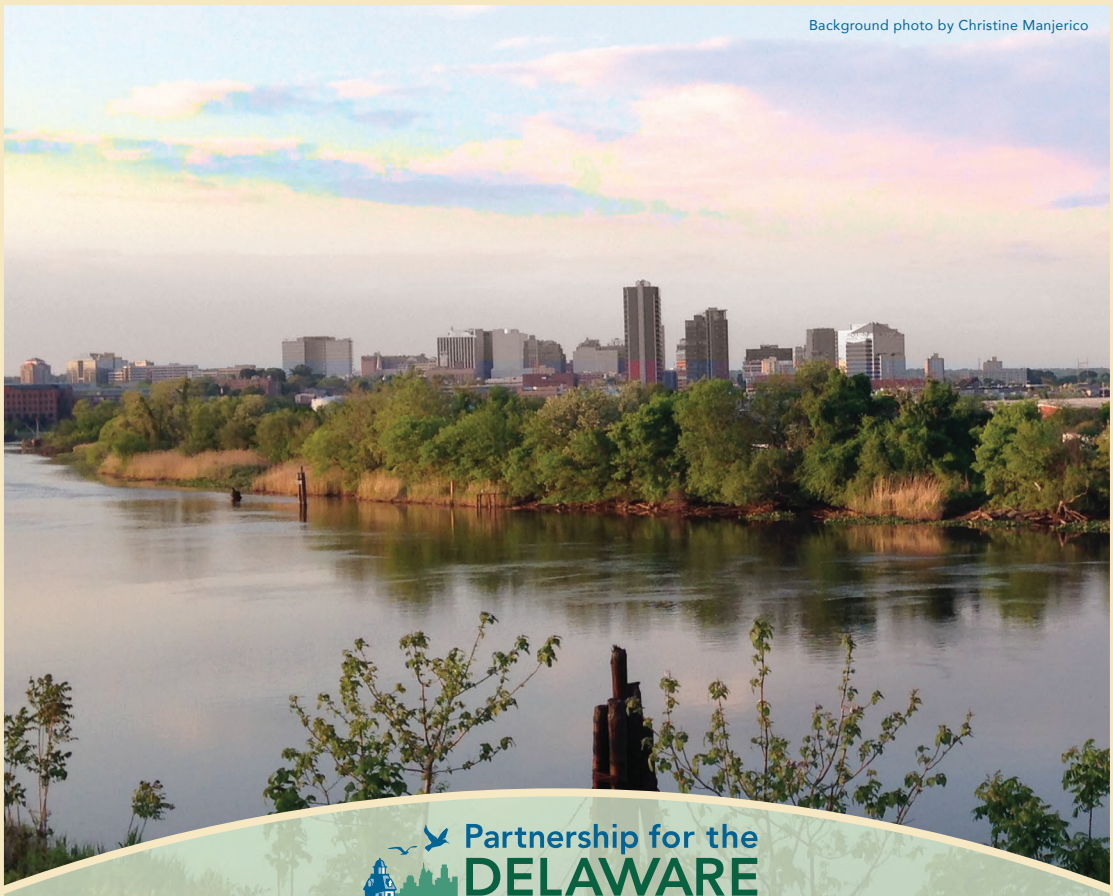
Program



Background photo by Christine Manjerico

Partnership for the DELAWARE ESTUARY

Delaware Estuary Science & Environmental Summit 2025

20 Years of Bridging the Gap Between Science, Policy, and Action

February 11-12, 2025
Chase Center on the Riverfront in Wilmington, Delaware

For more information visit ***www.DelawareEstuary.org***

Welcome to the Delaware Estuary Science and Environmental Summit!

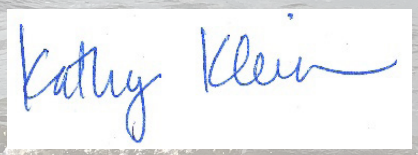
Dear Summit Attendees,

On behalf of the Partnership for the Delaware Estuary (PDE) and the Delaware Estuary Program, we are proud to present the 2025 Delaware Estuary Science & Environmental Summit in Wilmington, DE!

With more than 300 in-person attendees and 70 presentations at this year's meeting, we will cover a variety of topics over our two days together. Linkages made here among people from different watersheds, sectors, and disciplines will promote a better understanding of the resource and foster ecosystem-based management and strategic investment.

We send a big **THANK YOU** to everyone who helped make this meeting possible and are grateful for the sponsorship we have received for the 11th biennial Summit. We extend our thanks to all of our presenters, moderators, and this year's keynote speakers Dr. Tony MacDonald, Director of the Urban Coast Institute, Monmouth University; and Rachael Hogan Carr, Executive Director of the Nurture Nature Center.

Best wishes,



Kathy Klein

Executive Director

LeeAnn Haaf, PhD

Estuary Science Director

Honoring Lenape Land

We begin by acknowledging with respect that we gather today in Lenapehokink, traditional homeland of the Lenape people for tens of thousands of years. Sometimes translated as "Original People," the Lenape were known as mediators and called "The Grandfathers" by the entire Algonquian Family Tree of languages. Encompassing the Delaware River Basin, Lenapehokink includes present-day New Jersey, most of Delaware, the Eastern parts of New York and Pennsylvania, and was home to 20,000 Lenape in three clans: the Wolf Clan in the mountains speaking Munsee dialect, Turtle Clan along the Rivers speaking Unami, and Turkey Clan by the Big Waters speaking Unilatchigo.

Within the first hundred years of foreign contact, 80% of the Lenape had already died from violent conflict and disease. In spite of the famous peace treaty between William Penn and Lenape Chief Tamanend at Shackamaxon, Europeans forced the Lenape westward and northward to Oklahoma, Wisconsin, and Ontario, where many Lenape descendants live today, under the name of a British General, Thomas West, Lord De La Warr, now pronounced Delaware.

But some Lenape never left. Hiding in plain sight as "Keepers of the Land" the Lenape Indian Tribe of Delaware based in Cheswold, Delaware; Nanticoke-Lenni Lenape Tribal Nation in Bridgeton, NJ; Ramapough Lenape Nation in Mahwah, NJ are three of the thriving Lenape communities today.

Let us honor the historical and ongoing presence of the Lenape and the Nanticoke on this land where we now live, work and celebrate "All Our Relations."

Chief Dennis Coker
Cheswold, Delaware

Table of Contents

Agenda at a Glance

Tuesday Feb 11th, 2025 - Day 1

9:00	Opening & Welcome - Riverfront Ballroom		
9:30	Keynote - Riverfront Ballroom		
10:15	Break		
	Track 1 - Harlan	Track 2 - Dravo Auditorium	Track 3 - Christina Ballroom
10:45 - 12:00	I Clean Waters #1 - Water Quality	II Monitoring and Assessment #1	III Healthy Habitats #1 - Living Shorelines
12:00	Lunch - Riverfront Ballroom		
1:30 - 2:45	IV Clean Waters #2 - Water Quality	V Monitoring and Assessment #2	VI Healthy Habitats #2 - Sediment Material Management
2:45	Break		
3:15 - 4:30	VII Clean Waters #3 - Toxics & Emerging Contaminants	VIII Special Session Monitoring & Assessment #3 - NJ Tidal Wetland Monitoring Network	IX Fisheries Management & Living Resources
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5:00	Poster Session / Happy Hour - Lobby		
6:00	Dinner (ticket required) - Riverfront Ballroom		

Wednesday Feb 12th, 2025 - Day 2

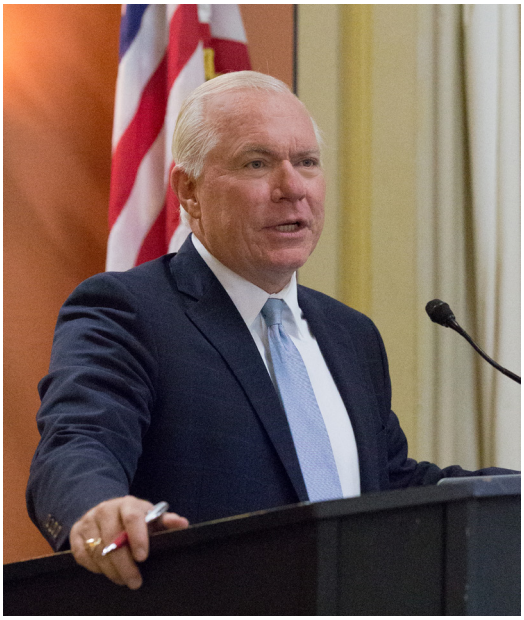
9:00	Keynote - Riverfront Ballroom		
10:15	Break		
	Track 4 - Christina Ballroom	Track 5 - Darvo Auditorium	Track 6 - Harlan
10:45 - 12:00	X Climate Change #1	XI Healthy Habitats - Wetlands & Other Habitats #1	XII Strong Communities #1
12:00	Lunch - Riverfront Ballroom		
1:30 - 2:45	XIII Climate Change #2	XIV Healthy Habitats - Wetlands & Other Habitats #2	XV Strong Communities #2
2:45	Break		
3:15 - 4:30	XVI The Mixing Zone	XVII Special Session Ecosystem Rehabilitation through a Mosaic Approach	XVIII Urban Waters
4:30	Closing		

Featured Speakers

Tony MacDonald, J.D.

Director, Urban Coast Institute, Monmouth University

Our Summit Day 1 keynote speaker is Tony MacDonald, director of the Monmouth University Urban Coast Institute (UCI) in West Long Branch, New Jersey.



He was previously the Executive Director of the Coastal States Organization (CSO) from 1998-2005. CSO, based in Washington, D.C., represents the interests of the governors of the nation's 35 coastal states and territories on coastal and ocean policy matters.

Prior to joining CSO, Tony was the special counsel and director of environmental affairs at the American Association of Port Authorities, where he represented the International Association of Ports and Harbors (IAPH) at the International Maritime Organization on negotiations on the London Convention.

Tony has also practiced law with a private firm in Washington, D.C., working on environmental and legislative issues, and served as the Washington, D.C., environmental legislative representative for the Mayor of the City of New York.

Rachel Hogan Carr

Executive Director, The Nurture Nature Center

Our Summit Day 2 keynote speaker is Rachel Hogan Carr. Rachel has served on Nurture Nature Center's (NNC) board of directors and been Executive Director of the organization since its inception. She has served as principal investigator on several flood-related research and education projects in partnership with National Weather Service and the National Oceanic and Atmospheric Administration.

In 2011, Rachel was named Distinguished Informal Science Educator of the Year by the American Meteorological Society. She has been active in Easton, Pennsylvania, civic initiatives, including as a co-founder of the Downtown Neighborhood Association. Rachel is a Certified Floodplain Manager.

Rachel has spoken widely about how to engage the community in understanding and addressing the risks they face, including engagements for: American Meteorological Society; the Pennsylvania Floodplain Managers Association; the New Jersey Emergency Preparedness Association; NOAA Science Days; FEMA Region III; FEMA TMAC; and others.

Before helping to found the NNC, Rachel worked as a community organizer and in urban real estate development. She holds a master's degree in environmental policy design from Lehigh University, where she focused her research on improving flood risk communication through social science.

Venue Map

Thank you to our moderators!

Scott Ensign**
Kelly Somers**
Jessie Buckner**
Francesca Blom*
Alison Rogerson**
John Harrod*
Josh Moody**
Ron Heun**
David Smith**
Greg Lech**
Martha Narvaez
Lance Butler**
Leah Morgan*
Martha Maxwell-Doyle*
Eve Quinones*

**Science and Technical Advisory Committee member
*Partnership for the Delaware Estuary staff

Delaware Estuary Program's

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**Summit Subcommittee **Summit Subcomitee Chair*

Detailed Agenda

February 11, 2025 - Day 1

9:00am – 9:30am	Opening Remarks - Riverfront Ballroom		
9:30am – 10:15am	**Keynote Speaker: Tony MacDonald -** Riverfront Ballroom Tony is director of the Monmouth University Urban Coast Institute (UCI). He was previously the Executive Director of the Coastal States Organization (CSO) from 1998-2005. CSO, based in Washington, DC, represents the interests of the governors of the nation's 35 coastal states and territories on coastal and ocean policy matters. Prior to joining CSO, Tony was the special counsel and director of environmental affairs at the American Association of Port Authorities, where he represented the International Association of Ports and Harbors (IAPH) at the International Maritime Organization on negotiations on the London Convention. Tony has also practiced law with a private firm in Washington, DC, working on environmental and legislative issues, and served as the Washington, DC, environmental legislative representative for the Mayor of the City of New York.		
10:15am – 10:45am	**Break**		
10:45am – 12:00pm Concurrent Sessions	**I. Clean Waters - Water Quality #1** Harlan & Hollingsworth 10:45 - Improving Dissolved Oxygen in the Delaware River Estuary: Moving from a Pathway to Implementation **Thomas Amidon;** Namsoo Suk, Ph.D. 11:00 - Understanding Sediment Oxygen Demand in the Delaware River Estuary: Impacts, Insights and Uncertainties **Matthew Amato;**Li Zheng 11:15 - Use of Change Factor Methodology to Estimate Dissolved Oxygen Under Various Loading Conditions **Jake Bransky;** Thomas Amidon; Sarah Beganskas 11:30 - Philadelphia's Tidal Delaware River Receiving Water Models **Eileen Althouse**; Kinman Leung; Ramona McCullough; Paula Kulis; Phil Duzinski; Kimberly Artita 11:45 - The Role of Nitrification in the Tidal Fresh Delaware Estuary **Paula Kulis;** Li Zheng; Namsoo Suk, Ph.D.; John Yagecic	**II. Monitoring & Assessment #1** Dravo Auditorium 10:45 - Breakwater Enhancement, Sediment Placement, and Monitoring at Supawna Meadows National Wildlife Refuge **Heidi Hanlon** 11:00 - Runnel Creation and Monitoring in Low Marsh at Cape May National Wildlife Refuge **Heidi Hanlon**; Yianni Laskaris 11:15 - Progress on a Programmatic Approach to Assessing Salt Marsh in Delaware and New Jersey for Utilizing Low-cost Low-disturbance Restoration Methods **Kaity Ripple;** Brian Marsh; Jim Feaga; LeeAnn Haaf 11:45 - Q&A	**III. Healthy Habitats - Living Shorelines** Christina Ballroom 10:45 - Investigating The Use of Diatoms as Inundation Indicators on Living Shorelines **Erin O'Brien**; Mihaela Enache; Joshua Moody 11:00 - Bringing a Cemetery to Life: Living Shoreline Design for Riverside Memorial Cemetery **Alan Davis**; Justin Shafer, CFM; John Brennan 11:15 - Delaware's Living Shoreline Cost Share Program **Kayla Clauson** 11:30 - Thompson Island Living Shoreline Planning and Phase 1 Implementation **Bob Collins**; Doug Janiec; Larry Trout, Jr. PE 11:45 - Living Shoreline Feasibility in Delaware County, Pennsylvania **Zach Nemec**
12:00pm – 1:30pm	**Lunch -** Riverfront Ballroom		
1:30pm – 2:45pm Concurrent Sessions	**IV. Clean Waters - Water Quality #2** Harlan & Hollingsworth 1:30 - Delaware Valley Early Warning System: Real-time Decision Support During Major Spill Response Paula Kulis; Kinman Leung; Katie Lavallee; Michael Owens; Jeff Cornwell; Eileen Althouse; Grace Inman 1:45 - Enhancing Spill Response through Modeling and Automation **Joseph Fogarty**; Li Zheng; Namsoo Suk; John Yagecic 2:00 - Sensitivity of Delaware River Salinity Intrusion to Changes in Freshwater Flow **Molly Hesson**; Phil Duzinski; Ramona McCullough; Kimi Artita; Joe Anarumo 2:15 - A Sensitivity Analysis for a 3-Dimensional Model of Salinity Intrusion in the Delaware River Estuary **Kimi Artita**; Phil Duzinski; Kinman Leung; Eileen Althouse; Ramona McCullough; Molly Hesson 2:30 - Stream Restoration and Pollutant Removal in McIntire Park: Integrating Environmental and Community Goals **Ryan O'Banion**; Ty Smith; Dan Frisbee	**V. Monitoring & Assessment #2** Dravo Auditorium 1:30 - Final Piece of the Delaware Wetland Health Assessment Puzzle: Condition of Wetlands in the Pocomoke Watershed **Alison Stouffer** 1:50 - Water Monitoring and Research in the Delaware River Basin: The Next Generation of USGS Water Science **Matthew Pajerowski** 2:10 - Delaware Bay Habitat Restoration Project Monitoring **Toni Rose Tablante** 2:30 - Q&A	**VI. Healthy Habitats - Sediment Materials Management** Christina Ballroom 1:30 - More Mud, More Marshes: Quantifying the Restoration Potential of Using Dredged Material from State- managed Navigation Channels to Benefit Salt Marshes Within New Jersey Back Bays **Adrianna Zito-Livingston**; Kimberly McKenna; Alex Ferencz 1:45 - Maurice River Channel Dredging and Beneficial Use Placement within the State of New Jersey's Heislerville Wildlife Management Area **Brian Harris**; Monica Chasten; Tyler Kinney; Aleksandra Ostojic; Justin Shawler; Keith VanDerSys; Daniel Gallegos 2:00 - A Comparative Analysis of the Delaware River Bottom Sediments Pre- and Post-Army Corps Main Channel Deepening Project (2013-2020) **Catherine Hughes**; John Madsen; Dewayne Fox 2:15 - Scotch Bonnet Island Marsh Elevation Enhancement Project: Beneficially Using Dredged Sediments to Stabilize Drowning Marshes in NJ **Lenore Tedesco**; Monica Chasten; Jason Hearon; Julie Blum; Keith VanDerSys; Lisa Ferguson; Brian Harris 2:30 - Advancing Beneficial Use of Fine-Grained Dredged Sediment: Marsh Edge Berms Constructed in Seven Mile Island Innovation Laboratory (SMIIL), New Jersey **David Perkey**; Lenore Tedesco; Kelsey Fall; Thomas Huff; Monica Chasten

2:45pm – 3:15pm	**Break**		
3:15pm – 4:30pm Concurrent Sessions	**VII. Clean Waters - Toxics & Emerging Contaminants** Harlan & Hollingsworth 3:15 - PFAS 101 and the Impacts to the Delaware Estuary **Elizabeth Colletti**; Radhika de Silva, PhD, PE 3:30 - Monitoring PFAS in the Delaware River and Tributaries to Reduce Loading and Protect Water Quality for End Users **Jeremy Conkle**; Ron MacGillivray; Matt T. Amato; Elaine Panuccio; Jake Bransky 3:45 - PFAS in Delaware Surface Waters **John Cargill, IV** 4:00 - Microplastics Upstream of the Delaware River: Assessing the Antibiotic-Resistant Bacterial Hitchhikers of Microplastic Pollution in Blue Marsh Lake **Jill Felker**; Tami Mysliwiec; Vinh Lu; Hailey Zavecz 4:15 - Q&A	**VIII. Special Session: Monitoring & Assessment - New Jersey Tidal Wetland Monitoring Network** Dravo Auditorium 3:15 - The New Jersey Tidal Wetland Monitoring Network: Background, Trends, Management Implications, & Data Availability **Kirk Raper**; Kelly Faller; Joseph Grzyb; Ceili Pestalozzi; LeeAnn Haaf; Metthea Yepsen 4:15 - Q&A	**IX. Fisheries Management & Living Resources** Christina Ballroom 3:15 - Celebrating 75 years of Sport Fish Restoration in the Delaware estuary **Josh Newhard**; Gabe Gries 3:30 - Life History, Population Status, and Restoration of American Shad and River Herring in the Delaware River Basin **Ella Rothermel**; Sheila Eyler; Lance Butler; Greg Lech; Ron Huen; Kelly Faller 3:45 - An Adaptive Resource Management Framework for the Harvest of Horseshoe Crabs in the Delaware Bay Region **Margaret Conroy**; John Sweka; Dave Smith; Kristen Anstead; Jim Lyons; Linda Barry; Connor McGowan; Bryan Nurse 4:00 - Developing Management and Restoration Strategies for American Oystercatcher Breeding along the Delaware Bay (New Jersey) **Emmy Casper**; Meghan Kolk; Samantha Collins; Danielle McCulloch; Lisa Ferguson; Todd Pover 4:15 - Q&A
4:30pm – 6:00pm	**Poster Session / Happy Hour** - Lobby 1. Determination of 6PPD-Quinone in Aqueous Matrices Using Solid Phase Extraction With Various Polymeric Sorbents and Liquid Chromatography with Tandem Mass Spectrometry (LC/MS/MS)- **Arielle Cocozza** 2. The Potential of Non-Plastic Oyster Shell Bag Materials in Delaware Bay Living Shorelines - **Jecy Klinkam**; Leah Morgan; Jenny P. Shinn; Toni Rose Tablante 3. Marine stewardship/permaculture - **Katrina Midgette** 4. Developing Habitat Requirements for Submerged Aquatic Vegetation (SAV) Preservation and Restoration in the Delaware River Watershed - **Kelly Somers**; Michael Mansolino; Todd Lutte; Joel Hoffman; Cayla Sullivan 5. Vegetation Management of an Elevated Nesting Habitat Using a Concentrated Salt Solution Spray - **Lisa Ferguson**; Samantha Collins; Julie Blum; Brittany Morey 6. Adaptive Management on the Fly - **Nicole Zuck**; Jeff Richter 7. Assessing School Campus Pollinator Habitat - An Inventory of Pollinators to Establish Baseline Data for Ongoing Community Science Studies, Campus Habitat Improvements and Conservation Education Initiatives - **Ron Smith** 8. Freshwater Mussel Species Occurrence Surveys in the Delaware River Watershed, Pennsylvania - **Gregory Lech**; Jordan Allison; Dakota Raab; Kyle Clark 9. Exploring Alternative Fish Hosts for Freshwater Mussels in the Tidal Delaware River: Enhancing Propagation Efficiencies at Fairmount Waterworks Interpretive Center, Philadelphia, Pennsylvania - **Lance Butler**; Shannon Boyle; Kathryn McFarland; Roger Thomas; Leah Morgan 10. Analysis of Mussel Biodiversity Utilizing Metabarcoding and qPCR Techniques - **Amelie Loguidice**; Ashley Holland; Aimee Hunter; Brielle Spencer; Jacqueline Swann; Jennifer Rienzi 11. Monitoring Nekton Biodiversity at the Delaware National Estuarine Research Reserve - **Michael Mensinger**; Drew Faulhaber 12. Vouchering Specimens at the Delaware Museum of Nature and Science - **Ashley Kempken**; B. Alex Kittle; Matthew R . Halley; Elizabeth K. Shea 13. Improving Delaware Estuary Watershed Health Through Community Engagement and Collaborative Partnerships - **Francesca Blom**, Jasmine Chandler, Marguerite DiGiorgio, John Harrod, Eve Quinoness, Jana Savini		
6:00pm – 8:00pm	**Dinner (Separate Registration Required)** - Riverfront Ballroom		

February 12, 2025 - Day 2

9:00am – 10:15am	**Keynote Speaker: Rachel Hogan Carr -** Riverfront Ballroom Rachel Hogan Carr is the Executive Director of the Nature Nurture Center and also serves on its board of directors. She led the seminal Flood Safety Education and Awareness Campaign in the Delaware River Basin ("Focus on Floods"), a cooperative project with National Oceanic and Atmospheric Administration (NOAA) and National Weather Service, which secured five local and national awards. Carr was named 2011 Informal Science Educator of the Year by the American Meteorological Society for her role in developing the Focus on Floods education campaign with National Weather Service. Carr has spoken widely about how to engage the community in understanding and addressing the risks they face, including engagements for: American Meteorological Society; the Pennsylvania Floodplain Managers Association; the New Jersey Emergency Preparedness Association; NOAA Science Days; FEMA Region III; FEMA TMAC; and others		
10:15am – 10:45am	**Break**		
10:45am – 12:00pm Concurrent Sessions	**X. Climate Change #1** Christina Ballroom 10:45 - Development of a Multidimensional Coastal Wetland Migration and Maintenance Data Layer for NJ ResTOrS **Kimberly McKenna**; Thomas Herrington; Richard Lathrop; Joshua Moody 11:00 - Integrated Modeling to Assess Delaware River Basin Water Resource Vulnerability to Drought **Aubrey Dugger**; Hedeff Essaid 11:15 - Risk & Resilience : Sea Level Rise Scenario Visualization for Adaptation and Mitigation Practices **Chris Feinman**; Matthew Konfirst 11:30 - City of Wilmington GHG Reduction Program: Working to Achieve 50% Reduction By 2030 **Alison Quimby** 11:45 - Q&A	**XI. Healthy Habitats - Wetlands & Other Habitats #1** Dravo Auditorium 10:45 - Coastal Marsh Restoration: An Ecosystem Approach for the Mid-Atlantic - Joint Agency Guidance **Bartholomew Wilson**; Jonathan Watson 11:00 - CHARRM: Finding Efficiencies Among Mid-Atlantic Resource Managers, Restoration Practitioners and Research Scientists in the Mid-Atlantic Region **Danielle McCulloch**; Jessie Murray 11:15 - Organizing a Collaborative Statewide Submerged Aquatic Vegetation (SAV) Network and Initiatives in Delaware **Kayla Clauson**; Brittany Haywood 11:30 - Submerged Aquatic Vegetation Monitoring and Restoration Efforts in Delaware's Inland Bays **Taylor Hoffman**; Jazz Petersen; Andrew McGowan 11:45 - Creating Resilient Marsh and Beach Habitat in Delaware Bay: The Evolution of a Regional Restoration Strategy in the Face of Climate Change **Alek Modjeski**	**XII. Strong Communities #1** Harlan & Hollingsworth 10:45 - Community Engagement and Nature Based Solutions in the Face of Historic Flooding in Eastwick **Erin Lacour**; Lamar Gore 11:00 - Community-Driven Modeling for Flood Risk Resilience in the Darby-Cobbs Watershed **Jazmin Ricks**; Ahmad Haseeb Payab 11:15 - Hurricane Ida: An Interstate Flood Resilience Plan for the Brandywine in Delaware and Pennsylvania **Grant DeCosta**; Gerald J. Kauffman, Jr.; Seung Ah Byun 11:30 - Monitoring and Modeling of Urban Creeks in Philadelphia **Anish Mahat**; Eileen Althouse; Kinman Leung; Zachary Eichenwald 11:45 - Community Science Data Informs Restoration in an Urban Ecosystem **Matthew Sarver**; Katie Bird
12:00pm – 1:30pm	**Lunch -** Riverfront Ballroom		
1:30pm – 2:45pm Concurrent Sessions	**XIII. Climate Change #2** Christina Ballroom 1:30 - Foundational Support for Evaluating Flood Risk Management and NYC Water Supply Reliability in the Catskill and Delaware Watersheds **Jennifer Garigliano** 1:45 - Climate Change Projections for NYC Watershed and Upper Delaware Headwaters Region **Jerry Mead** 2:00 - Future climate to intensify extreme floods and shift flood generating mechanisms in the Delaware River Basin **Ning Sun**; David Judi; Hongxiang Yan; Mithun Deb; Zhaoqing Yang 2:15 - Using a Hydro-Terrestrial Modeling Framework to Investigate the Impacts of Climate, Land Use, and Sea Level Change on Hydrology and Salinity during Drought in the Delaware River Basin **Aubrey Dugger;** Salme Cook; Liv Herdman; Jared Smith; Hedeff Essaid; Andreis Prein 2:30 - Enhancement of Methodology for Calculating Net Carbon Emissions for Natural and Working Lands **Brett Wiley**; Kirk Raper; Metthea Yepsen; Chris Barry; Daniel Clark; Olga Lyandres; Alissa Benchimol	**XIV. Healthy Habitats - Wetlands & Other Habitats #2** Dravo Auditorium 1:30 - Oh, the places you'll go...Delaware Marsh Migration Model **Kenny Smith** 1:45 - Making a Splash in Southern New Castle County: Restoring a Historical Seasonal Pond Complex **Brigham Whitman**; Matthew Sarver 2:00 - Salt Marsh Vegetation Composition and Habitat Change at Black-Crowned Night Heron Nesting Sites on Historic Dredge Mounds **Julie Blum**; Samantha Collins; Lisa Ferguson 2:15 - The Importance of Patch Shape at Threshold Occupancy: Functional Patch Size Within Total Habitat Amount **Jeff Keller**; Patrick Sullivan 2:30 - Q&A	**XV. Strong Communities #2** Harlan & Hollingsworth 1:30 - Creation of an Outdoor Exploration Space **Alison Quimby**; PDE Staff 1:45 - ASAP: The Apprenticeship In Shellfish Aquaculture Program **Jenny Shinn**; Diana Burich; Michael Acquafredda; Lisa Calvo 2:00 - Overview of The New Jersey Nature-Based Solutions (NBS) Reference Document: A Tool to Help Municipalities, Non-Profits, and Decision Makers in the Development, Implementation, and Monitoring of Effective NBS to Address Climate Hazards **Janine Barr**; Ashlyn Spector; Elizabeth Semple; Katie-Rose Imbriano; Paolo Mora Villacres 2:15 - Ecological uplift potential of green bulkheads **Taylor Beck** 2:30 - Q&A

2:45pm – 3:15pm	**Break**		
3:15pm – 4:30pm Concurrent Sessions	**XVI. The Mixing Zone** Christina Ballroom 3:15 - Seaports on the East Coast are Victims of Their Success **James Dennis** 3:30 - A New Conceptual Sediment Budget for Delaware's Sandy Estuarine Beaches **Justin Shawler**; Aleksandra Ostojic; Sean McGill; Alexander Renaud; Ashley Elkins 4:15 - Q&A	**XVII. Special Session: Ecosystem Rehabilitation through a Mosaic Approach** Dravo Auditorium 3:15 - Improving Ecosystem Rehabilitation through a Mosaic Approach – Advancing a Regional Philosophy in New Jersey **Terry Doss**; Josh Moody; Meredith Comi; Martha Maxwell-Doyle 4:15 - Q&A	**XVIII. Urban Waters** Harlan & Hollingsworth 3:15 - Upstream Opportunities - A listening approach to early public engagement in DRBC climate resilience planning **Kristen Bowman Kavanagh**; Elizabeth Koniers Brown; Avery Lentini; Chris McCann; Kevin Pregent 3:30 - Northeast Rising: Implementing Climate Resilience through Community Building on the Brandywine River in Downtown Wilmington, Delaware **Karen Igou**; Gerald Joseph McAdams Kauffman 3:45 - City of Wilmington Urban Pollinator Corridor and Food Resilience Project: A Community Approach to Conservation and Sustainability at the Neighborhood Level **Kerry Wilson**; Michele Wales; Tannicka Johnson 4:00 - Breaking Down Barriers: Making the Outdoors More Accessible in the Delaware River Watershed **Michelle Barakat** 4:15 - Q&A
4:30pm	**Closing - Riverfront Ballroom**		

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The **Partnership for the Delaware Estuary**, host of the Delaware Estuary Program, leads collaborative, science–based efforts to improve the Delaware River and Bay, which covers portions of Delaware, New Jersey, and Pennsylvania.

Partnership for the DELAWARE ESTUARY

Connecting people, science, and nature for a healthy Delaware River and Bay

Additional Funding Support Provided by:

EPA

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Abstracts *Listed alphabetically by first author's last name*

Philadelphia's Tidal Delaware River Receiving Water Models

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1. CDM Smith, 2. Sci-Tek Consultants, 3. Philadelphia Water Department
Oral

Philadelphia Water Department (PWD) developed three-dimensional hydrodynamic and water quality models of the tidal Delaware River to aid in understanding and management of Philadelphia's water resources. These grid-based receiving water models were initially developed for PWD's Wet-Weather Long-Term Control Plan using USEPA Environmental Fluid Dynamics Code (EFDC) model platform to meet regulatory requirements. They are continuously updated and expanded to increase understanding of hydrodynamic and water quality characteristics and complex processes in Philadelphia's receiving waters. Extensive monitoring surveys inform model validation. While bacteria and dissolved oxygen models were initially developed to evaluate water quality impacts of Combined Sewer Overflows (CSOs), PWD later developed a salinity model to understand how watershed conditions impact river salinity for water supply planning. These models have become critical tools for PWD to evaluate regulatory compliance and management strategies impacting water resources of the region. This presentation will provide an overview of the tidal Delaware River models and describe how they are utilized to address PWD's current and future needs, emphasizing the advantages of using models as tools for understanding, planning, and reacting to emerging water quality issues for a utility managing wastewater, stormwater, and drinking water resources. Planning for the future of Philadelphia's water resources includes anticipating variable conditions from climate change and sea level rise, and changes to the water quality regulatory landscape regarding CSO controls and wastewater effluent limits. Due to early and continuous investment in monitoring and modeling, PWD has stayed ahead of these concerns with improved understanding of receiving water impacts.

Understanding Sediment Oxygen Demand in the Delaware River Estuary: Impacts, Insights and Uncertainties

Amato, Matthew[1], Li Zheng[1]
1. Delaware River Basin Commission
Oral

Sediment oxygen demand (SOD) reflects the rate of oxygen consumption by biological and chemical processes in sediment, and often significantly impacts the amount of dissolved oxygen (DO) in the water column of aquatic ecosystems. Water quality modeling studies performed by the Delaware River Basin Commission (DRBC) confirm that SOD is an important driver of DO in the freshwater portion of the tidal Delaware River. To evaluate the degree to which DO can be expected to improve in the future as a result of additional pollution controls, it is important to understand what is causing SOD and what management measures, if any, might cause it to change. While extensive measurements of SOD have been collected in the Delaware River Estuary (DRE), uncertainties remain regarding its sources and the drivers of its spatiotemporal variability. The goal of this presentation is to provide an overview of the current knowledge of SOD dynamics in the DRE, highlighting results from recent and ongoing investigations involving comprehensive sediment sampling and advanced modeling studies. Equally important, this presentation will discuss what is missing from our understanding about SOD in the DRE and what the DRBC is doing to bridge that knowledge gap. These efforts are essential for enhancing our understanding of SOD dynamics in the DRE and for informing effective management strategies that improve water quality for aquatic life.

Improving Dissolved Oxygen in the Delaware River Estuary: Moving from a Pathway to Implementation

Amidon, Thomas[1], Namsoo Suk, Ph.D.[1]
1. Delaware River Basin Commission
Oral

When the Delaware River Basin Commission (DRBC) was created in 1961, little or no dissolved oxygen was present in portions of the Delaware River Estuary for months each year. Since then, dissolved oxygen levels and fish populations in the Estuary have improved significantly due to implementation of DRBC's regulation in 1968 of carbonaceous biochemical oxygen demand discharged by wastewater treatment plants. Nonetheless, in the most urbanized reach of the Estuary —from Wilmington, Delaware, to the Tacony section of Philadelphia, Pennsylvania — dissolved oxygen levels remain lower than in the regions both upstream and downstream, especially during periods of low flow in the summer months from July through September. In September 2024, the DRBC published A Pathway for Continued Restoration: Improving Dissolved Oxygen in the Estuary, a landmark study that determined the addition of technically feasible advanced treatment to reduce summer ammonia loads from a relatively small number of wastewater treatment plants would significantly improve dissolved oxygen levels. The analysis was conducted using a linked three-dimensional hydrodynamic and water quality model developed and calibrated by a DRBC team under the guidance of a panel of highly qualified experts. The DRBC is now working to improve the model by reducing its uncertainty, while also working with States to perform a wasteload allocation study that will provide a technical basis for implementing EPA's revised dissolved oxygen criteria. This presentation will discuss how and why model improvements are underway and why the wasteload allocation study is both necessary and beneficial.

A Sensitivity Analysis for a 3-Dimensional Model of Salinity Intrusion in the Delaware River Estuary

Artita, Kimi[1], Phil Duzinski[2], Kinman Leung[2], Eileen Althouse[1], Ramona McCullough[3], Molly Hesson[4]
1. CDM Smith, 2. Philadelphia Water Department, 3. Sci-Tek Consultants, 4. Sage Services
Oral

Tidally influenced areas such as the Delaware Estuary are facing a threat to their potable water sources due to changing climate and sea level rise conditions. During drought conditions between 1964-65, the Delaware River salt line, defined as the location of the 7-day average 250 mg/L chloride isochlor, moved upstream to within ten miles of the water intake at Philadelphia's Baxter Drinking Water Treatment Plant. To support water supply planning, the Philadelphia Water Department (PWD) has developed a 3-dimensional model of the Delaware Estuary. In this presentation, we describe an analysis of observed data (streamflow, sea levels and rise, salinity, wind speed and direction) that was used to develop a sensitivity analysis of the salt front migration due to commonly observed wind-induced setup events. Setup events are defined here as a 1-day to multi-day rise in sea level and salinity at the mouth of the estuary that signal the onset of saltier ocean water migrating upstream. The results show that the salt front is sensitive to magnitude, duration, and timing of the setup event, and that the simulated response is likely exacerbated under extreme low-flow conditions along the Delaware River. This valuable tool can be used to inform decision making and future flow management in the Delaware Estuary.

Breaking Down Barriers: Making the Outdoors More Accessible in the Delaware River Watershed

Barakat, Michelle[1]
1. Justice Outside
Oral

Accessibility to the outdoors is an international issue that impacts historically underserved and underrepresented communities of all kinds. In the Delaware River Watershed, there is both a dynamic relationship with disinvestment in communities and an array of exemplary efforts toward change that reflect the magnitude of resiliency that communities have. Making the outdoors more accessible and empowering communities to build resilient plans for restoration will continue to improve both humans and the environment in the Delaware River Watershed. Through a series of case studies and tangible indicators of change, empowerment of disenfranchised communities in the relation to the health of the watershed will be demonstrated.

Overview of The New Jersey Nature-Based Solutions (NBS) Reference Document: A Tool to Help Municipalities, Non-Profits, and Decision Makers in the Development, Implementation, and Monitoring of Effective NBS to Address Climate Hazards

Barr, Janine[1], Ashlyn Spector[2], Elizabeth Semple[2], Katie-Rose Imbriano[2], Paolo Mora Villacres[2]
1. Rutgers University, 2. The Nature Conservancy New Jersey
Oral

There has been growing interest at the local, State, and Federal level in using nature-based solutions (NBS) to address climate hazards, including coastal flooding, inland flooding, stormwater overflow, and extreme heat. For example, the 2019 Revision of the Comprehensive Conservation and Management Plan for the Delaware Estuary identifies NBS as a strategy to (1) stabilize and restore eroding shorelines and (2) build and protect wetlands, infrastructure, and other key resources. While copious NBS guidance documents, peer-reviewed literature, and tools are available, challenges still exist that can limit interested parties (e.g., municipalities, community-based organizations, and decision makers) from implementing NBS. These challenges involve: 1. quantifying the actual impact (i.e., the magnitude and duration of impact) created by NBS under ideal conditions, 2. constructing and managing projects long-term, and 3. documenting the breadth of co-benefits NBS provide in grant applications. Rutgers University, in collaboration with The Nature Conservancy of New Jersey, have developed the New Jersey NBS Reference Document (available winter 2025) to address these challenges, highlight best practices for NBS in New Jersey, and identify gaps in current data or knowledge. This document was developed through a robust literature-review and stakeholder engagement process involving scientists, engineers, planners, and other experts at the local, State, and Federal level. The purpose of this presentation is to highlight key takeaways from the document regarding the following NBS types relevant to the Delaware Estuary's resilience efforts and discuss potential next steps: bioretention systems, coastal habitat resilience, regenerative land management, stream restoration, and urban forestry.

Salt Marsh Vegetation Composition and Habitat Change at Black-Crowned Night Heron Nesting Sites on Historic Dredge Mounds

Blum, Julie[1], Samantha Collins[1], Lisa Ferguson[1]
1. The Wetlands Institute
Oral

Dredge mounds that were placed on southern New Jersey marshes in the mid-20th century have become important present-day nesting habitats for a variety of wading bird species. These habitats include vegetation species such as *Iva frutescens* and *Phragmites australis*, which can provide important protection from predation and the elements. As sea levels rise and severe storms become more frequent, much of the available nesting habitat is disappearing due to erosion, increased inundation, and changes in vegetative cover. In order to monitor current and changing vegetation condition, 22 4 m^2 monitoring plots were established in 2023 across four important wading bird nesting areas on Gull Island and Sturgeon Island near Stone Harbor, New Jersey. In 2023 and 2024, all encountered Black-Crowned Night Heron nests within or bordering these plots were monitored for nest success and also surveyed within 1m^2 plots for vegetation species composition, vegetative cover, total *P. australis* stems, and horizontal vegetation obstruction. Elevation was collected at each nest using high-accuracy GNSS equipment. By assessing what vegetation species are present at nest sites, how densely the vegetation grows, and how high up the nests are located, we can better understand how wading bird nest success may relate to changing conditions such as nest exposure and inundation frequency.

Ecological Uplift Potential of Green Bulkheads

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1. DNREC - Delaware Coastal Programs
Oral

Bulkheads are a gray infrastructure built for erosion control in waterfront environments. The bulkhead's harsh vertical relief does not provide comparable habitat value to a natural marsh for estuarine organisms. One method to bring ecological uplift to the grey space is to install a green bulkhead in front of the bare bulkhead. The green bulkhead's design is an interpretation of a marsh organ in which PVC are installed at different heights to accommodate tidal range. The PVC are filled with sand and planted with native *Spartina alterniflora*. To test the method, Delaware Department of Natural Resources and Environmental Control – Delaware Coastal Programs installed a green bulkhead in Little Assawoman Bay in 2022 that has experienced varied success. Monitoring efforts include a photographic timeline, nekton seines, eDNA metabarcoding, and water quality over the growing season for three years. This presentation will discuss the ecological uplift success, adaptive management, pitfalls, and potential for green bulkheads as a bulkhead addition.

Upstream Opportunities - A Listening Approach to Early Public Engagement in DRBC Climate Resilience Planning

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1. Delaware River Basin Commission
Oral

The Delaware River Basin Commission (DRBC) was formed in 1961 with a mission to manage, protect and improve the water resources of the Delaware River Basin. The DRBC Commissioners passed a resolution in 2024 that directed the Commission to develop a Climate Resilience Plan (CRP). The CRP will culminate in a list of prioritized actions and management approaches to prepare and adapt the Basin's shared water resources to withstand the impacts of climate change and other emerging challenges. The plan is intended to be developed in consultation with the DRBC Commissioners, advisory committees and stakeholders. As development of a detailed framework for the CRP begins, the DRBC has embarked upon an enhanced public engagement effort that is distinct from the Commission's formal comment processes. Through a series of listening sessions and in collaboration with partner organizations, the DRBC is actively seeing public input from around the Basin's many communities on the scope of the CRP. The goal is to gather stakeholder concerns and experiences relating to climate change and water resources, which concerns they find most pressing and how they would like to stay engaged throughout the CRP planning process. Input received during this initial round of engagement and the forthcoming CRP framework and provide opportunities to engage perspectives from around the Basin in this process. Join us to learn about the CRP, hear about the process, and share your input.

Use of Change Factor Methodology to Estimate Dissolved Oxygen Under Various Loading Conditions

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1. Delaware River Basin Commission
Oral

In order to simulate dissolved oxygen conditions in the Delaware River Estuary, the Delaware River Basin Commission (DRBC) developed a linked three-dimensional hydrodynamic and water quality model under the guidance of a highly qualified expert panel. This model allowed DRBC to simulate existing and restored dissolved oxygen conditions in three modelled years and demonstrated that reduced ammonia loads from specific wastewater discharges to the Estuary could result in improved habitat for the aquatic community. Leveraging the DRBC model's predictive capabilities as well as the USGS network of long-term continuous dissolved oxygen gages, DRBC developed a change factor methodology to extend estimates of dissolved oxygen improvement to unmodeled years and ungaged locations. Change factor methodologies, commonly applied to climate predictions, involve characterizing relative differences between modelling scenarios or between gaged and unmonitored locations, and applying these differences to observed data . This methodology improves DRBC's understanding of potential dissolved oxygen restoration by allowing for estimation of dissolved oxygen across different loading scenarios, in unmodeled years, and at unmonitored locations. These enhanced estimates of dissolved oxygen are superior to either the model output or the continuous data alone and will help inform efforts to improve dissolved oxygen in the Delaware Estuary.

Exploring Alternative Fish Hosts for Freshwater Mussels in the Tidal Delaware River: Enhancing Propagation Efficiencies at Fairmount Waterworks Interpretive Center, Philadelphia, Pennsylvania

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1. Philadelphia Water Works, 2. Sage Services, LLC., 3. Drexel University, 4. Academy of Natural Sciences at Drexel University, 5. Partnership for the Delaware Estuary
Poster

Host specificity refers to the relationship between freshwater mussels and their fish hosts, which is essential for the reproductive success of this increasingly relevant taxa. Apart from a few species, juvenile morphogenesis is contingent upon an obligate parasitic relationship between freshwater mussel larvae and an appropriate host fish. Host specificity varies considerably with some mussels reliant on one or a few closely related host fish (i.e., specialists), while other species can parasitize a wide range of fish (i.e., generalists). The successful propagation of freshwater mussels in laboratory settings depends on the use of suitable fish hosts. However, in many cases, scientists must rely on alternative hosts when primary hosts are unavailable, unresponsive to captivity, or face environmental challenges that hinder their use (e.g., endangered species). The Alewife Floater (*Utterbackiana implicata*) has been recognized as a functionally dominant species in the freshwater tidal region of the Delaware River and depends on the spring migration of river herring (such as Alewife and Blueback herring) for successful recruitment. However, in laboratory settings, these fish have shown to be challenging to maintain, leading to high mortality rates during inoculation or prior to excystment. In 2024, scientists at the Fairmount Waterworks' freshwater mussel hatchery achieved the first documented and successful propagation of *U. implicata* using hybrid striped bass (*Morone saxatilis* X *Morone chrysops*). Metrics of relative infestation, post-inoculation mortality, and yield per fish, far surpassed that of know primary hosts, making hybrid striped bass a potentially effective host for propagation of Alewife Floaters.

PFAS in Delaware Surface Waters

Cargill, IV, John G.[1]
1. DNREC – Watershed Assessment & Management Section

In late 2022, DNREC conducted a statewide surface water sampling study to assess PFAS in Delaware Surface Waters. A final summary report was published in the Fall of 2024, which identified several watersheds that will require additional investigation based upon the magnitude of PFAS concentrations or a unique PFAS "fingerprint." During this presentation, results of the study will be highlighted and discussed. The report and supporting documents can be found here: https://dnrec.delaware.gov/waste-hazardous/remediation/pfas/and-surface-water/.

Developing Management and Restoration Strategies for American Oystercatcher Breeding along the Delaware Bay (New Jersey)

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1. Conserve Wildlife Foundation of New Jersey, 2. The Wetlands Institute, 3. U.S. Fish and Wildlife Service
Oral

American oystercatcher breeding productivity has been monitored on New Jersey's Atlantic Coast beaches since 2003, but the subpopulation of oystercatchers nesting along the New Jersey side of the Delaware Bay remained unmonitored until recently. In 2022, Conserve Wildlife Foundation of New Jersey partnered with The Wetlands Institute and U.S. Fish and Wildlife's Delaware Bay Coastal Program to coordinate the first comprehensive monitoring program for American oystercatchers breeding along the Bayshore. We monitored the breeding productivity of approximately 20 nesting pairs for two seasons using both field-based observation and trail camera surveillance, resulting in new documentation of threats affecting nest and brood success. Census surveys also established baseline estimates for the population size and distribution of breeding pairs at 35 sites spanning approximately 29 miles of Bayshore beaches. To study site fidelity, migration, and fine-scale movements, we deployed field-readable bands on oystercatcher adults and chicks. Finally, we collected habitat characteristic data (e.g., nest site elevations) at nesting locations and implemented targeted *Phragmites* removal at two high-priority nesting sites to maintain and create suitable oystercatcher nesting habitat. We intend to compile productivity trends, habitat use analyses, and nest site preferences into a comprehensive document that will inform resource managers on best management practices for American oystercatchers and will help restoration practitioners incorporate features benefiting oystercatchers into their projects. As a result, this project will facilitate the implementation of a multi-species approach to restoration on the Delaware Bayshore.

Delaware's Living Shoreline Cost Share Program

Clauson, Kayla[1]
1. Delaware DNREC
Oral

Delaware as a low-lying, coastal plain state tends to feel the ramifications of climate change, sea level rise, and shoreline erosion like other states across the east coast. A proven effective way to help mitigate some of these effects is the installment of living shorelines. Living shorelines are a shoreline stabilization technique that utilize natural materials and native plants to protect wetlands, filter pollutants, improve water quality, and help the land-water continuum for animals to access important breeding/nursery habitat. Many organizations with capacity and expertise (i.e., Non-profit organizations) have the means to acquire various funding to implement large-scale living shoreline restoration projects. However, there is a disconnect between funding opportunities between formalized organizations and the public, who reside along our beloved waterways. To fill this gap, Delaware's Department of Natural Resources and Environmental Control hosts a Living Shoreline Cost Share Program. The program offers financial assistance to singular landowners and/or Homeowner Associations who are looking to install living shorelines on their properties that are facing erosion. The goal is to increase coastal resilience by incentivizing waterfront landowners to install sustainable shoreline stabilization techniques. In this presentation I will discuss the logistics of the cost share program, how it works, project criteria, and challenges, including lessons learned so far.

Organizing a Collaborative Statewide Submerged Aquatic Vegetation (SAV) Network and Initiatives in Delaware

Clauson, Kayla[1], Brittany Haywood[1]
1. Delaware DNREC
Oral

Delaware is a state in which there have been small movements in understanding the presence and restoration needs of submerged aquatic vegetation (SAV) throughout its history. Its estuarine environments have very little SAV presence due to water quality factors, and SAV presence in freshwater environments are not consistently documented. However, as water quality conditions begin to improve there is an increasing interest from Delaware's stakeholders to gain a better understanding of current conditions and the feasibility of SAV restoration efforts for both freshwater and estuarine habitats. Small scale initiatives on the mapping and restoration front have been made, but larger cohesive statewide projects are needed to make strides in understanding the presence of SAV, the needs associated with restoration, and increasing general public understanding of the benefits of SAV species. In 2023 Delaware Sea Grant (DESG) convened a SAV Stakeholder meeting to begin the process of organizing statewide initiatives. As a result, in 2024 the Delaware SAV Workgroup was formed by DESG and the Delaware Department of Natural Resources and Environmental Control (DNREC) and has over 40 members representing state and federal agencies, non-profits, and educational institutions. This presentation will cover how Delaware stakeholders are organized to produce results, the challenges we have and currently face, the priorities that the Delaware SAV Workgroup have developed, and methods for accomplishing collaborative SAV projects.

Determination of 6PPD-Quinone in Aqueous Matrices Using Solid Phase Extraction With Various Polymeric Sorbents and Liquid Chromatography with Tandem Mass Spectrometry (LC/MS/MS)

Cocozza, Arielle[1]
1. United Chemical Technologies
Poster

The degradation of tires on roadways is known to release numerous chemicals into the environment, posing ecological and health risks. To combat this, 6PPD (N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine) is used in tire production due to its role as a rubber antioxidant. However, studies now show that through reactions with environmental oxidants such as ozone, this compound forms 6PPD-quinone (6PPD-Q), a persistent and toxic compound that can pose risks to ecosystems and animal health. It has popularly been linked to the mortality of coho salmon as they migrate upstream to spawn, so much so that only a few hours of exposure of the salmon to contaminated water has proven lethal. Considering these recent discoveries, the EPA released an official Draft Method 1634 in January 2024 to extract and analyze 6PPD-Q in water. This method uses an extracted internal standard (EIS) to measure the concentration of 6PPD-Q by isotope dilution and a native internal standard (NIS) to measure the efficiency of the extraction procedure. The method was developed to be easy to implement into environmental laboratories' current workload. This application outlines solid phase extraction and analysis of water samples using quality control protocols outlined in draft method 1634, comparing both UCT's Enviro-Clean polymeric highly-crosslinked divinylbenzene SPE cartridges and UCT's Enviro-Clean polymeric hydrophilic-lipophilic-balance SPE cartridges. A streamlined sample preparation method was optimized by modifying the procedures outlined in the draft method. Both cartridges demonstrated efficient recoveries over a 3-day method detection limit study and mid-level demonstration of capability studies, with the divinylbenzene cartridges achieving cleaner extracts due to reduced signal-to-noise on the instrument. Both cartridges were also tested using unfiltered tap water, and with these tests, it was discovered during the experiment that maintaining a pH near 5 in the sample was crucial to the extraction of 6PPD-Q from matrix. Using a UCT SelectraCore C18 HPLC Column, an optimized analysis method was developed via LC-MS/MS. The core-shell technology of the column reduces backpressure and system downtime on the HPLC and improves chromatographic resolution. The LC method is shortened from the EPA's outlined run time and injection volume to a 5-minute run time and 10 microliter injection volume. The MS/MS method reached sensitivity levels below the EPA's lowest suggested standard and met all method criteria for linearity and reproducibility.

PFAS 101 and the Impacts to the Delaware Estuary

Colletti, Elizabeth[1], Radhika de Silva, PhD, PE[1]
1. ASA Analysis & Communication
Oral

Emerging contaminants and their impacts are not a new issue for estuaries, but the consequences of PFAS pollution are still in the process of being understood and means of mitigation under development. This talk will provide a highlight of PFAS sources and the impacts to estuaries. Key items to be discussed include: typical sources of PFAS pollution to estuaries; how PFAS impacts estuaries; general status of PFAS regulations at the Federal and state levels for those that drain to the Delaware Estuary; and current mitigation options and associated cost estimate ranges as available. Most of this information will be applicable to any estuary.

Thompson Island Living Shoreline Planning and Phase 1 Implementation

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1. Delaware Center for the Inland Bays, 2. Sovereign Consulting, Inc., 3. Straughan Environmental
Oral

Thompson Island, actually a peninsula, in Rehoboth Bay, Delaware, has over 4,400 linear feet of natural shoreline; including both beach and saltmarshes.. In 2000, the Delaware Division of Parks and Recreation (DSP) obtained title to the property and designated it as a nature preserve, the highest level of land protection in Delaware. The site has cultural significance as a paleo-indigenous burial area, and has several state rare plant and animal species. And, since 2000, the shoreline has eroded as much as 1.38 feet per year. In 2021, the Center for the Inland Bays and the DSP began discussion about building resilience by installing a living shoreline at Thompson Island. Goals of the project include tactics to address wind and wake energy and discourage human access to the property. Sovereign Consulting and Straughan Environmental were contracted to compose a Shoreline Management Plan. Various medium to high energy tactics in several phases will be deployed to preserve one of Delaware's most important cultural resources. Permitting required coordination with the Wetlands and Waters Section, Army Corps of Engineers, US Coast Guard, State Historic Preservation Office (among others).. A public works project, it required navigating the state procurement process and the project bidding for the first phase was conducted in the fall. Beyond DSP, phase one is funded with federal and state grants. Installation of the first phase is anticipated this winter. This presentation will introduce the project to the restoration community and provide an update on progress.

Monitoring PFAS in the Delaware River and Tributaries to Reduce Loading and Protect Water Quality for End Users

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1. Delaware River Basin Commission
Oral

The Delaware River Basin, particularly the urban corridor from Trenton, NJ, to Wilmington, DE, is home to historical and ongoing PFAS research and manufacturing. This river corridor is, therefore, contaminated with PFAS from many dischargers while also being the drinking water source for millions of people. With recently introduced regulations, drinking water systems face the prospect of implementing expensive PFAS treatment technologies to achieve compliance. The Delaware River Basin Commission (DRBC) has been monitoring PFAS in the river and its tributaries for ~20 years, establishing a long-term dataset on its occurrence. Surface water grab samples show that concentrations of PFAS generally increase as water moves downstream along this stretch of the river, although there can be large variations across sampling events. PFAS passive samplers showed the same trend. For sediment, there was no trend in PFAS concentrations. However, PFAS did spike in sediment collected near the Philadelphia International Airport. The data generated from these efforts and the ~20 years of previous data will be used by DRBC to develop a PFAS roadmap that includes source identification in the Delaware River and tributaries to mitigate drinking water treatment costs to citizens of the Delaware River Basin.

An Adaptive Resource Management Framework for the Harvest of Horseshoe Crabs in the Delaware Bay Region

Conroy, Margaret[1], Dave Smith[2], Kristen Anstead[3], Jim Lyons[2], Linda Barry[4], Conor McGowan[5], Bryan Nuse[6]
1. U.S. Fish & Wildlife Service - Northeast Fishery Center, 2. USGS - Eastern Ecological Science Center, 3. Atlantic States Marine Fisheries Commission, 4. New Jersey Division of Fish and Wildlife, 5. USGS - Florida Cooperative Fish and Wildlife Research Unit, 6. Bird Conservancy of the Rockies
Oral

Single-species management of fisheries overlooks the effects on other species within an ecosystem. The solution is multispecies fisheries management, which is challenging, especially when managing an aquatic species encompassing marine and terrestrial ecosystems. This is the situation for the harvest management of horseshoe crab (*Limulus polyphemus*) in Delaware Bay, USA, and the implications on shorebirds, such as the red knot subspecies (*Calidris conatus rufa*), which use the eggs of horseshoe crabs as a vital food source during their annual northward breeding migration. We describe an adaptive management effort (ARM framework) adopted by the Atlantic States Marine Fisheries Commission to maximize horseshoe crab harvest while maintaining the necessary food resources for red knots so that population growth of red knots is not limited by horseshoe crab abundance. This effort required input from multiple stakeholders, development and linking population dynamics models of both species, and a novel optimization technique allowing managers to base annual horseshoe crab harvest recommendations on the most recent abundance estimates. A commitment to full, open, and truthful exchange among the stakeholders is essential to sustaining the collaborative data-driven decision-making approach embodied in the ARM framework for multispecies fisheries management of horseshoe crabs and red knots in Delaware Bay.

Bringing a Cemetery to Life: Living Shoreline Design for Riverside Memorial Cemetery

Davis, Alan[1], Justin Shafer, CFM[2], John Brennan[1]
1. Hazen and Sawyer, 2. City of Norfolk
Oral

Riverside Memorial Park cemetery is located in Norfolk, Virginia along the Elizabeth River and was built in the early 1900s. Over the years large marine vessels passing through combined with storms have caused severe erosion and undercut along the riverbank and have threatened many gravesites to fall over the steep side slopes. Working with the City, a concept for a living shoreline was developed along with additional improvements to reestablish marsh presence and prevent future wave action from degrading the banks. Understanding that time was the biggest constraint, site visits, geotechnical investigations, survey and permitting activities were performed back-too-back or even concurrently in some cases. Concept alternatives were discussed with the City and ultimately a green approach was decided upon to secure the embankment while providing an opportunity for expediting vegetation establishment. Added sand and a rock sill were designed to protect approximately 1,300 linear feet of banks and enhance opportunities for marsh vegetation to thrive. A major goal of this project was to not only protect the cemetery but make design decisions that upon construction would be sustainable for the foreseeable future. This presentation will walk through the complexities of designing a living shoreline while keeping the integrity of the tombstones and gravesites fully intact. The perspective of construction access and sequencing will be discussed from both the engineer bid documents and the awarded contractor.

Hurricane Ida: An Interstate Flood Resilience Plan for the Brandywine in Delaware and Pennsylvania

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1. Brandywine Conservancy & Museum of Art, 2. University of Delaware Water Resources Center, 3. Chester County Water Resources Authority
Oral

Recent record floods such as Hurricane Ida in September 1-2, 2021 caused millions of dollars of damage to public infrastructure and real threats to emergency services and public safety. The Chester County Water Resources Authority (CCWRA), Brandywine Conservancy & Museum of Art (BC), University of Delaware Water Resources Center (UDWRC), and Delaware County are performing a flood study of the Brandywine River and tributaries from Chester County through to Delaware. The work will provide an understanding of the Brandywine Creek during intense storm events and flooding and develop a plan with flood risk mitigation efforts. The Brandywine Flood Study includes the following key elements:

- Flood Working Group
- Flood Identification
- Storm Event Analysis
- Hydrologic Model
- Hydraulic Model
- Flood Relief Analysis
- Summary Report

In this session, the project team will provide an overview of the key elements of the project, discuss the collaborative approach (public engagement and collaboration among stakeholders throughout the watershed) and the technical components of the project such as hydrologic and hydraulic modeling and build out scenarios.

Seaports on the East Coast are Victims of Their Success

Dennis, James
Oral

The striking of the Motor Vessel Dali on the Key Bridge in Baltimore last March of 2024, has brought to the forefront how vulnerable critical infrastructure can be to shipping activities. Specifically, large vessels in the Delaware River and Bay can be catastrophic to the environment: natural and human-made. Commerce on our waterways is essential to the progress of our economy and the prosperity of the entire country. However, as ships visit our ports in larger and larger sizes, the waterways that support these vessels and the port infrastructure must make timely accommodations. These responsibilities fall hardest on the US Coast Guard which conducts vessel inspections and coordination when ships are miles out to sea. The US Coast Guard does not need more tasks to perform; they need more tools. One tool is the National Environmental Policy Act or NEPA. With larger ships comes deeper depths for the shipping channels so vessels may navigate freely through the Delaware Bay and River. As seen recently with the striking of the Key Bridge that cost the lives of six people and will cost $1.7 billion to rebuild the bridge, Seaports must be analyzed for not only depth but the potential energy of 100,000+ ton ships that may be passing critical infrastructure or natural areas that are sensitive to disturbance (such as running aground or spilling volatile cargo such as oil). The only way to do that is during the early phases of the NEPA Process and when major stakeholders are forming the Environmental Impact Statement. With a comprehensive analysis, guardrails and policies may be formed for the authorities to mitigate risk.

Improving Ecosystem Rehabilitation through a Mosaic Approach – Advancing a Regional Philosophy in New Jersey

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1. NJSEA - Meadowlands Research & Restoration Institute, 2. NJDEP, 3. Monmouth University, 4. Partnership for the Delaware Estuary
Oral

New Jersey's coastal zone includes ~1,800 miles of coastline and over 300,000 acres of tidal wetlands that provide a variety of ecological services including: breeding and nursery habitat for finfish and shellfish, feeding habitat for a variety of residential and transient species, flood protection, and pollution control. Over time, impacts from agriculture, urbanization, and industrial development have facilitated water pollution, habitat loss, and altered hydrology. Many restoration and mitigation actions have been employed to balance human needs with the conservation of natural resources. Traditionally, restoration efforts have aimed to implement geographically isolated and specific remedies for shoreline erosion or marsh elevation deficiencies. However, there is an increasing realization that in the face of rapidly rising sea levels there is a critical need to take a system-wide approach. The purpose of this panel is to outline and define a more ecologically encompassing strategy for coastal wetland rehabilitation, and the regulatory processes and challenges for its implementation. Presentations and a discussion session will address relevant factors in balancing urgency, innovation and implementation at a time of unprecedented habitat loss and accelerated sea-level rise. Regulatory considerations relevant to landscape-level restoration will be discussed including habitat trade-offs, attending to unintended consequences, historic and future baselines, restoration tools that support project implementation, and weighing the development of project-based co-benefits in lieu of singular objective and beneficiaries. The outcome of this session will be a white paper that codifies a landscape-level restoration philosophy for New Jersey and identifies the regulatory process that supports its implementation.

Integrated Modeling to Assess Delaware River Basin Water Resource Vulnerability to Drought

Dugger, Aubrey[1], Hedeff Essaid[2]
1. National Center for Atmospheric Research, 2. U.S. Geological Survey
Oral

The Delaware River Basin (DRB) provides drinking water to over 15 million people in four states and is managed through a complex governance structure that strives to meet human and ecosystem needs. Internal basin water demands and out-of-basin transfers must be balanced with water temperature requirements for aquatic habitat and minimum flows to repel upstream movement of saltwater that threatens water supplies. Water resource managers need to better understand how operations can meet conflicting water demands, especially during drought. Due to the highly interconnected nature of drought impacts, a multi-institutional team of scientists from hydrology, meteorology, oceanography, multi-sector dynamics, and data science jointly developed an integrated modeling approach to understand drought impacts on the DRB water system under changing climate, land use, and sea level. The resulting integrated framework includes multiple physics-based (WRF, WRF-Hydro, MODFLOW, COAWST), machine learning (ML-Temperature, ML-Salinity), statistical (FORE-SCE), and systems management (WEAP, PyWR) models. Here we present an overview of the framework, include integration drivers (issues, stakeholders, governance), system aspects (human and natural settings, time and space scales), and methods (disciplines, models, uncertainties). We highlight tradeoffs between these dimensions and demonstrate the value of integration through examples where the integrated modeling framework yielded different decision metrics from the standalone models. Our testbed has been bridging differences in thinking, approaches, framing, perspectives, and practices across many disciplines. Given the critical importance of collaboration in integrated modeling, we share our lessons learned on both the technical and social challenges.

Using a Hydro-Terrestrial Modeling Framework to Investigate the Impacts of Climate, Land Use, and Sea Level Change on Hydrology and Salinity during Drought in the Delaware River Basin

Dugger, Aburey[1], Salme Cook[1], Liv Herdman[1], Jared Smith[1], Hedeff Essaid[1], Andreis Prein[2]
1. USGS, 2. Institute for Atmospheric and Climate Science (IAC)
Oral

Water is an important resource for humans and ecosystems and is increasingly threatened by extreme events linked to climate change. Droughts are particularly complex because they can last for weeks to years, occur when water demands are high, and cover large areas across political boundaries with variable water use regulations. The duration and severity of droughts are expected to get worse with climate change and their effects on freshwater resources are expected to be compounded by changes in land use and sea level rise. To tackle this challenging highly relevant societal issue, a multi-organizational and multi-disciplinary team established an integrated hydro-terrestrial modeling framework to understand drought impacts on the Delaware River Basin (DRB) system. The DRB provides drinking water to over 15 million people across four states and is actively managed to prevent salt intrusion from the coastal ocean. The framework links atmospheric dynamics, inland hydrology, and coastal processes to investigate the effects of drought, land use, climate change, and sea level rise on stream salinity and estuary salinity intrusion. Models are forced with consistent datasets representing historic and future conditions in the basin. The historic period is represented by the 1960s major drought-of-record (DRB 60s) that affected the entire Northeastern US. The future period replicates the 1960s period drought under mid-21st-century conditions (Delaware River Basin (DRB) Pseudo Global Warming (PGW)), land use with higher urbanization, and sea level rise. The simulations indicate that future drought generally results in shifts to higher flows in the winter as less precipitation falls as snow, driving lower discharge in spring and early summer. This effect is compounded by increased urbanization, and along with sea level rise led to greater stream salinity and higher intrusion of salt from the coast upstream, which would threaten drinking water resources in the basin.

Risk & Resilience : Sea Level Rise Scenario Visualization for Adaptation and Mitigation Practices

Feinman, Chris[1], Matthew Konfirst[1]
1. US EPA Region 3
Oral

Climate change-induced sea level rise is widely considered a defining issue of this generation, but quantifying and representing its impacts has proven to be a persistent challenge. Reasons for this include the wide variety of scenarios that may come to pass, as well as additional factors like tidal variation and storm surge. This presentation will focus on ongoing work happening at EPA Region 3 surrounding the creation of tools for analyzing and visualizing the impacts of sea level rise throughout the Region and the rest of the United States. It first focuses on SEA Tool, a publicly available web tool that can describe the area and depth of sea level rise scenarios by location, severity, and time. Users may also specify a critical elevation for a given area to receive scenario, tide, and storm surge data which can indicate situations where sea level may exceed that threshold. Similar tools already exist, but they are most useful to those with pre-existing expertise, whereas adaption and mitigation professionals may find this tool specifically useful towards quickly analyzing the relevant data and finding reliable conclusions. The presentation will then move on to discuss current work following the development of SEA Tool which foregrounds the relative risk of inundation. Rather than displaying extents and water depth, this tool can be used to understand the most likely scenarios and their impacts. All described data products are derived from the interagency Global and Regional Sea Level Rise Scenarios for the United States 2022 technical report.

Microplastics Upstream of the Delaware River: Assessing the Antibiotic-Resistant Bacterial Hitchhikers of Microplastic Pollution in Blue Marsh Lake

Felker, Jill[1], Tami Mysliwiec[1], Vinh Lu[1], Hailey Zavecz[1]
1. Penn State University, Berks College
Oral

Microplastics within waterways significantly impact aquatic ecosystems, including habitat contamination and the bioaccumulation of plastic in aquatic life. Along with microplastics' impact on the aquatic environment, human health can be negatively influenced. Microplastic particles in waterways may also serve as transportation systems for microbial pathogens, potentially posing unexplored health implications locally and for downstream populations. This study assesses the presence of microplastics and microbial populations residing on microplastics isolated from Blue Marsh Lake, a tributary to the Schuylkill River, which flows into the Delaware River Watershed. This watershed serves as an essential source of drinking water for Philadelphia residents. Water samples were collected using a modified version of the NOAA microplastic collection protocol at a shoreline sample site. Monthly one-hundred-liter samples were collected, dried, and quantified to determine levels of microplastics in Blue Marsh Lake. Microbial populations on the microplastics were examined to determine if potential pathogens transported via 'microplastic hitchhiking' can spread antibiotic resistance along the waterway. Plastic fragments were isolated and placed on R2A agar for growth, and colonies were evaluated for antibiotic susceptibility using Kirby Bauer disk diffusion techniques. Preliminary findings suggest the presence of high levels of resistant microbial cultures are present in Blue Marsh Lake microplastics. Approximately 50-80% of the bacteria isolated from microplastics were resistant to at least one antibiotic, including ampicillin, tetracycline, streptomycin, erythromycin, and vancomycin. Additional studies are needed to assess these findings' impact on human health in the Blue Marsh Watershed.

Enhancing Spill Response through Modeling and Automation

Fogarty, Joseph[1], Li Zheng[1], Namsoo Suk[1], John Yagecic[1]
1. Delaware River Basin Commission
Oral

While rare, accidental pollution releases in the Delaware River estuary, a river that supplies drinking water to over fourteen million people, necessitate thorough preparation and rapid response. The Delaware River Basin Commission (DRBC) has developed applications that fully automate data retrieval, processing, and simulation for both one-dimensional and three-dimensional hydrodynamic models. These hydrodynamic files are generated nightly, incorporating the latest tidal and flow data, ensuring immediate availability for chemical tracer simulations in the event of a spill — where time-sensitive action is critical. Significant updates from the previous spill model include the integration of a three-dimensional simulation mode, expanded process automation, and the migration of scripts to Python for enhanced performance. The model's response capabilities are demonstrated through a case study. Ongoing developments include staff training, improving automation, conducting quarterly drills, and increasing model parameterization to bolster response readiness.

Foundational Support for Evaluating Flood Risk Management and NYC Water Supply Reliability in the Catskill and Delaware Watersheds

Garigliano, Jennifer[1]
1. New York City Department of Environmental Protection
Oral

The 2017 Flexible Flow Management Program obligates the New York City Department of Environmental Protection (NYC DEP) to release water from its Delaware System of reservoirs during times of drought for lower basin salinity control. NYC DEP is currently working with the Center for Western Weather and Water Extremes (CW3E) to develop a research and operations partnership. With CW3E's research and assistance, NYC DEP can enhance reservoir operations and improve reservoirs' inherent ability in reducing downstream flooding. CW3E will be cataloguing atmospheric rivers and extreme precipitation events in the northeastern US, develop decision-making tools for water supply operations, and supporting reservoir management for use during major capital projects. This collaboration between CW3E and NYC DEP expects to support Forecast Informed Reservoir Operations (FIRO) in NYC reservoirs. FIRO will better allow NYC to release water from its reservoirs when major storms are predicted to help alleviate flooding concerns downstream. In addition, FIRO can allow reservoir operators to hold water back if a storm is forecast to pass by a region, allowing that water to be stored for water supply, conservation, and/or recreation. CW3E's research on west coast FIRO operations increased water storage by nearly 20%. These new operations have the potential to improve not just the NYC Water Supply but the entire Delaware Basin.

Breakwater Enhancement, Sediment Placement, and Monitoring at Supawna Meadows National Wildlife Refuge

Hanlon, Heidi[1]
1. US Fish and Wildlife Service
Oral

Supawna Meadows NWR (NJ) is an oligohaline tidal marsh located in the lower portion of the Delaware River. Dominated by stands of *Phragmites* and experiencing both subsidence and horizontal erosion necessitated manipulating the breakwater and adding sediment to reestablish better tidal flow and create native marsh. Long-term monitoring provides insight as to the effectiveness of the breakwater and sediment placement work.

Runnel Creation and Monitoring in Low Marsh at Cape May National Wildlife Refuge

Hanlon, Heidi[1], Yianni Laskaris[1]
1. US Fish and Wildlife Service
Oral

At Reeds Beach in Cape May National Wildlife Refuge (NWR), intensive mosquito control management and grid-ditching practices disrupted the natural marsh hydrology causing increased inundation and prolonged waterlogging. A network of runnels was established to correct impaired ebb flows and enhance tidal exchange in the low marsh habitat. We examine the runnel project and its success in achieving a more resilient marsh system.

Maurice River Channel Dredging and Beneficial Use Placement within the State of New Jersey's Heislerville Wildlife Management Area

Harris, Brian[1], Monica Chasten[2], Tyler Kinney[1], Aleksandra Ostojic[1], Justin Shawler[1], Keith VanDerSys[3], Daniel Gallegos[1]
1. US Army Corps of Engineers Research and Development Center, 2. US Army Corps of Engineers, Philadelphia, 3. NJDEP
Oral

The US Army Corps of Engineers partnered to dredge 75,000 cubic yards of sediment from the Maurice River federal navigation channel and beneficially used the sediment for marsh rehabilitation within the State of New Jersey's Heislerville Wildlife Management Area located along the Delaware Bay. The project was completed in 2023, nearly 25 years since the last channel maintenance when sediment was hauled away for disposal. This Beneficial Use of Dredged Material (BUDM) effort not only cleared the navigation channel for improved commerce, but reduced maintenance costs, and provided sediment to a region experiencing dramatic erosion rates. The Heislerville Dike, damaged during Hurricane Sandy, is a critical component protecting natural resource areas and preventing wave-induced erosion that could destabilize river morphology. Partnering with the NJDEP, USACE's goal was to enhance adjacent wetlands to buffer hydrodynamic forces, increase resiliency, and sustain wildlife habitat. Although vibracores indicated predominantly fine-grained material in the channel, a significant amount of elevation gain occurred due to unexpected coarse sand and oyster shell. The team adaptively managed the dredging leading to successful creation of natural infrastructure, while the fine-grained material enhanced adjacent mudflats. USACE is continuing to partner with the NJDEP and University of Pennsylvania to monitor the placement and channel infilling. This project represents a good news story for BUDM as additional areas will be utilized in the future, reducing maintenance costs for the Maurice River navigation project and keeping sediment in this system for increased resilience. Another project is planned for Fall 2025.

Sensitivity of Delaware River Salinity Intrusion to Changes in Freshwater Flow

Hesson, Molly[1], Phil Duzinski[2], Ramona McCullough[3], Kimi Artita[4], Joe Anarumo[1]
1. Sage Services LLC, 2. Philadelphia Water Department, 3. Sci-Tek Consultants, 4. CDM Smith
Oral

The City of Philadelphia Water Department (PWD) has developed a 3-dimensional model of the Delaware River to study current and future conditions that influence the drinking water supply to Philadelphia. Given the location of Philadelphia's largest drinking water treatment plant in the freshwater tidal Delaware River, 3-dimensional modeling is necessary to support analysis of drinking water supply quality during drought conditions. PWD performed a series of sensitivity analyses with the 3-dimensional model to understand how salinity concentrations change in response to varying streamflow from the two largest sources of freshwater to the tidal Delaware River, the Schuylkill River and the Delaware River at Trenton. Sensitivity analysis results demonstrate that during drought conditions salinity is sensitive to incremental changes in streamflow at Trenton, that water added to the Schuylkill River to reduce salinity is half as effective as water added to the Delaware River at Trenton, and that all drought flow combinations simulated led to an exceedance of DRBC Zone 3 chloride criteria.

Submerged Aquatic Vegetation Monitoring and Restoration Efforts in Delaware's Inland Bays

Hoffman, Taylor[1], Jazz Petersen, Andrew McGowan[2]
1. Delaware Center for the Inland Bays, 2. Barnegat Bay Partnership
Oral

Submerged aquatic vegetation was nearly eliminated in Delaware's Inland Bays over the last century and remains severely limited today. For the last two years, the Delaware Center for the Inland Bays (Center) has monitored eight sites to determine if widgeon grass (*Ruppia maritima*) beds could establish if planted. Monitoring light, temperature, salinity, biofilm accumulation, and wave action have revealed interesting patterns, demonstrating that widgeon grass in the Bays does not respond to abiotic factors the same way as it does in other populations. This past year we began to seed beds using seed collected from residential canals in Little Assawoman Bay. Current efforts include habitat suitability monitoring, seed collection, germination and viability studies, and seed plantings.

A Comparative Analysis of the Delaware River Bottom Sediments Pre- and Post-Army Corps Main Channel Deepening Project (2013-2020)

Hughes, Catherine[1], John Madsen[1], Dewayne Fox[2]
1. University of Delaware, 2. Delaware State University
Oral

Side-scan sonar has been proven as an effective method to identify and map a variety of sediment types and geomorphological features in freshwater, estuarine, and marine environments. Despite the broad application of side-scan sonar in marine habitats, there has been limited research applying side-scan sonar in riverine environments, principally due to shallower depths and higher turbidity levels. This research aims to fill this gap along a portion of the Delaware River from the Tinicum Range, Pennsylvania/New Jersey downriver to the Bellevue Range, Delaware/New Jersey which experiences heavy vessel traffic and has historically provided important spawning habitat for Atlantic Sturgeon, an endangered species. Channel deepening efforts, which dramatically alter the river bottom, in the Delaware River date back to 1898. The most recent United States Army Corps of Engineers Main Channel Deepening Project began in March of 2010 with the goal to deepen the Delaware River Navigation Channel from 40 to 45 feet, spanning from Philadelphia, Pennsylvania, and Camden, New Jersey, to the mouth of the Delaware Bay. This research evaluates sediment types and geomorphological features before and after the completion of channel deepening efforts from the Tinicum to Bellevue Ranges. Repetitive and detailed mapping of this region provides a comprehensive understanding of how the river bottom adapts to ongoing anthropogenic activities such as dredging and how Atlantic Sturgeon habitats are impacted. Results from these mapping efforts provide valuable information which can inform regional managers on future dredge practices.

Northeast Rising: Implementing Climate Resilience through Community Building and Climate Justice on the Brandywine River in Downtown Wilmington, Delaware

Igou, Karen[1], Gerald Joseph McAdams Kauffman[2]
1. Green Building United, 2. University of Delaware
Oral

Green Building United (GBU) and the University of Delaware (UD) will discuss a NFWF Delaware Basin Conservation Act supported program to design and build climate justice and flood resistance solutions in the Northeast neighborhoods on the Brandywine in Wilmington (Del.). These solutions have been identified through years of meaningful engagement with long standing community leaders by Green Building United and the University of Delaware. GBU, UD, and Northeast Rising (our community leadership team) have engaged with this community, devastated by the once in two century rains of Tropical Storm Ida on Sep 1-2, 2021. GBU has built access for the Northeast neighborhood community coalition to achieve climate justice and equitable governance in their under resourced neighborhoods. Through multiple community engagement opportunities, this community, while coping and adapting to chronic flooding in the low lying, industrial areas along the I-95 corridor in the largest, majority black city in Delaware, has made clear their climate adaptation priortities. GBU and UD have sought to meet these expectations by designing and implementing tangible climate resilience solutions such as (a) expanding community coalition and engagement (Northeast Rising), (b) establish and supply a Community Emergency Response Team (CERT) and communication system, (c) install community rewilding and rain garden projects as requested by community residents, and (d) assist the City with design and implementation of a flood resistance park and living shoreline, based on years of hydraulic research, at the breach point at the 11th St bridge on the Brandywine to alleviate flood risk and trauma, (e) design and implement Johnston Park flood remediation and upgrades including the installation of a community water spray park to serve as a cooling station and high heat climate resilience solution, and (f) design and implement additional projects as prioritized by the community such as Prices Run stream daylighting and/or flood remediation projects on City lots.

The Importance of Patch Shape at Threshold Occupancy: Functional Patch Size Within Total Habitat Amount

Keller, Jeff[1], Patrick Sullivan[2]
1. Habitat by Design, 2. Cornell University
Oral

The habitat amount hypothesis (HAH) stresses the importance of total patch amount over the size of individual patches in determining species richness within a local landscape. However, the absence of some species from patches too small to contain a territory would be inconsistent with the HAH. Using the association of territory size with body size and the circle as optimal territory shape, we tested several HAH predictions of threshold patch occupancy and richness of 19 guilds of primarily insectivorous breeding birds. We characterized 16 guild-associated patch types at high spatial resolution and assigned one type to each guild. We measured functional patch size as the largest circle that fit within each patch type occurring in a local landscape. Functional patch size was the sole or primary predictor in regression models of species richness for 14 of the 19 guilds. Total patch amount was the sole or primary variable in only 3 models. Quantifying patch size at high resolution also demonstrated that breeding birds should be absent from patches that are too small to contain a territory and larger species should occur only in larger patches. Functional patch size is a readily interpretable metric that helps explain the habitat basis for differences in species composition and richness between areas. It provides a tool to assess the combined effects of patch size, shape and perforation on threshold habitat availability, and with total patch amount can inform design and/or evaluation of conservation, restoration or enhancement options for focal taxa or biodiversity in general.

Vouchering Specimens at the Delaware Museum of Nature and Science

Kempken, Ashley C.[1], Alex Kittle[1], Matthew R. Halley[1], Elizabeth K. Shea[1]
1. Delaware Museum of Nature and Science
Poster

The Delaware Museum of Nature and Science (DelMNS), formerly known as the Delaware Museum of Natural History, was established in 1957 and opened to the public in 1972. The museum boasts engaging exhibits, programs, and large natural history collections. With over 2.3 million individual shells in the mollusk collection, over 113,000 birds from around the world, and other invertebrate, vertebrate, and paleontological specimens, the scientific collections preserve an incredible biodiversity record. The collections are publicly accessible online via several data aggregators including iDigBio.org, GBIF.org, VertNet.org, and InvertEBase.org. DelMNS is an active, growing, mid-Atlantic repository for specimens collected around the world. Ongoing, ethical scientific collecting is critical to documenting and understanding the Earth's biodiversity. Morphological and genetic data derived from collections provide a baseline to examine changes in species distributions over time, and to study the effects of invasive species, habitat loss, trophic structure, and climate change. Specimens are also critical resources for basic research on disease vectors and host-parasite relationships. Collecting, fixing, and vouchering specimens into a permanently managed scientific collection is essential for ensuring repeatability of research, achieving open science goals, and leveraging current scientific efforts for potential future research and education. The DelMNS digital and physical holdings are regularly used in research and education. Vouchering new specimens from today's research will contribute essential data to understanding our changing world.

The Potential of Non-Plastic Oyster Shell Bag Materials in Delaware Bay Living Shorelines

Klinkam, Jecy[1], Leah Morgan[1], Jenny P. Shinn[2], Toni Rose Tablante[3]
1. Partnership for the Delaware Estuary, 2. Rutgers University, Haskin Shellfish Research Laboratory, 3. American Littoral Society
Poster

Plastic mesh bags are commonly used for retaining oyster shells to build living shorelines, however, they are likely to contribute to microplastic pollution over time. This study compares the durability of three commercially available non-plastic alternatives (cellulose, biopolymer, and co-polyester mesh) against traditional plastic to help balance ecological functionality and durability. The performance of each material was evaluated under the following conditions: (1) long-term, outdoor storage, (2) controlled laboratory experiment with varied salinities, and (3) field installations in tidal estuarine and non-tidal freshwater environments. Key metrics included material integrity, biofouling, shell retention, and visual degradation rates over time. Material testing began in the spring of 2023 and is ongoing. Initial results revealed that the biopolymer and co-polyester performed comparably to plastic in the first six months of installation but showed signs of degradation in intertidal conditions after a year and a half of installation. Cellulose bags degraded completely within a month of installation and may not be suitable for living shoreline projects where the material is consistently subjected to wave energy and sunlight. Evaluation of materials will continue through 2025; however, preliminary results suggest that these plastic alternatives are potential pathways for reducing plastic use in coastal restoration projects while maintaining the efficacy and function of restoration tactics. This is the first step in necessary long-term trials of materials under estuarine conditions to conclusively inform living shoreline work in Delaware Bay.

Delaware Valley Early Warning System: Real-time Decision Support During Major Spill Response

Kulis, Paula[1], Kelly Anderson[2], William Cesanek[1]
1. CDM Smith, 2. Philadelphia Water Department
Oral

On March 24, 2023, a chemical spill occurred at the Trinseo Altuglass plant, with a latex emulsion entering the adjacent tidal freshwater Delaware River. This spill's proximity to critical drinking water sources, including the Philadelphia Water Department (PWD)'s Baxter Water Treatment Plant, elevated the potential risk to human health. This presentation discusses the Delaware Valley Early Warning System (EWS), and the ways in which the EWS web application and communication services helped inform decision-making. The EWS spill response network and modeling framework supported emergency response and decision making, via both automated response protocols and supplemental custom spill transport model simulations. Once the EWS logged the spill report, it immediately alerted plant operators and agencies involved in spill response. It also triggered the EWS's automated real-time transport model that predicted chemical plume movement in the river with the tide. The automated model simulations provided real-time decision support. Custom tidal transport simulations were also completed in the days following the spill to enhance decision support. The custom simulations made use of emerging information on spill duration and exact spill characteristics. Custom simulation results were provided to PWD plant operators, agencies involved in spill response, and other water purveyors. Model results showed that spill timing and release duration are important for producing accurate model results.

The Role of Nitrification in the Tidal Fresh Delaware Estuary

Kulis, Paula[1], Kinman Leung[2], Katie Lavallee[3], Michael Owens[4], Jeff Cornwell[4], Eileen Althouse[1], Grace Inman[1]
1. CDM Smith, 2. Philadelphia Water Department, 3. Woods Hole Group, 4. Cheaspeake Biogeochemical Associates
Oral

It is accepted that nitrification is one of the major causes of dissolved oxygen (DO) depletion in the tidal fresh Delaware Estuary. For this reason, the Philadelphia Water Department (PWD) has put significant effort into quantifying this DO sink and the drivers that impact it. For the last decade, PWD has been collecting and analyzing water quality data to characterize water quality in the Tidal Fresh Delaware River, including sediment data, data on algae, nutrient cycling data, and nitrification data. Nitrification data shows a large degree of variability in nitrification rates, which is significant in this system where nitrification is thought to dominate the DO budget. This presentation will discuss the impacts of nitrogen cycling for overall water quality and aquatic life sustainability, and it will also discuss the driving factors that influence nitrification rates in the tidal river. We will discuss established relationships based on peer-reviewed research, and data collection efforts in the Upper Delaware Estuary spanning 2013 through 2023. Observed variability in the estuary is evaluated based on expected relationships with temperature and background concentrations of other water quality constituents. Understanding the drivers of nitrification rates in the Upper Delaware Estuary and the role of nitrification in both the DO and nitrogen balances is critical to improving the water quality in the Upper Delaware Estuary, and maximize benefits to aquatic life in the river.

Community Engagement and Nature Based Solutions in the Face of Historic Flooding in Eastwick

Lacour, Erin[1], Lamar Gore[1]
1. United States Fish and Wildlife Service
Oral

A combination of development, loss of wetland habitat, and climate change resulted in devastating and recurring flooding in the community of Eastwick in southwest Philadelphia. The United States Fish and Wildlife Service (USFWS), the city of Philadelphia, The Nature Conservancy, and the United States Army Corp of Engineers (USACE) are partnering and developing alternative strategies to divert flooding away from the community. The USFWS and The Nature Conservancy are working on a feasibility study to identify where water can be diverted and stored elsewhere along Darby Creek and in adjacent low-lying areas using Nature Based Solutions. Concurrently, John Heinz National Wildlife Refuge at Tinicum is undertaking multiple projects to restore freshwater tidal wetland and increase Tinicum Marsh's water storage capacity downstream of Eastwick. Together, the USFWS, the city of Philadelphia, and the Eastwick community launched the Flood Mitigation Council of Eastwick. During a series of monthly meetings, this council of residents will be informed of all alternative flood mitigation strategies developed by the partnering agencies, and empowered to choose which flood mitigation projects are best for their community. This presentation is a progress update on ongoing efforts to implement Nature Based Solutions and how we are engaging a systemically excluded community.

Analysis of Mussel Biodiversity Utilizing Metabarcoding and qPCR Techniques

Loguidice, Amelie[1], Ashley Holland[1], Aimee Hunter[1], Brielle Spencer[1], Jacqueline Swann[1], Jennifer Rienzi[1]
1. Rowan College at Burlington County
Poster

This study aimed to map the biodiversity of freshwater mussels in Palmyra Cove along the Delaware River in Palmyra, New Jersey. We conducted surveys in 10 locations to identify and document the different species of freshwater mussels present. Data collected included eDNA samples, Global Positioning System points (GPS), phytoplankton species abundance, water temperature, pH, turbidity, and dissolved oxygen levels to analyze the relationship between phytoplankton abundance, chlorophyll, water quality, and mussel diversity for baseline measurement. Our results will provide valuable insight into the distribution and abundance of freshwater mussels at the Cove and highlight the importance of monitoring and conserving these ecologically significant organisms.

Monitoring and Modeling of Urban Creeks in Philadelphia

Mahat, Anish[1], Eileen Althouse[1], Kinman Leung[2], Zachary Eichenwald[1]
1. CDM Smith, 2. Philadelphia Water Department
Oral

The Philadelphia Water Department (PWD) has developed hydrodynamic and water quality models for the non-tidal reaches of the Cobbs Creek and Tacony/Frankford Creek that are exercised to understand in stream water quality dynamics and aid in addressing water quality concerns. The models were initially developed as requirements for Green City, Clean Waters, PWD's Combined Sewer Overflow (CSO) Long-Term Control Program and are regularly updated with ongoing monitoring data. The non-tidal creek water quality models were developed as a system integrating USEPA Storm Water Management Model (SWMM) with Environmental Fluid Dynamics Code (EFDC) hydrodynamic and water quality models to simulate fecal coliform bacteria and dissolved oxygen. These models continue to be used for regulatory reporting, most recently to simulate the water quality conditions of the non-tidal creek CSO receiving waters and evaluate the progress of the implementation of Green Stormwater Infrastructure (GSI) and CSO controls at Year 10 of the 25-Year Green City, Clean Waters program. Our work will provide useful information and guidance for researchers, practitioners and regulatory personnel, offering an overview of the model development and validation process. It also highlights how PWD uses water quality models for analyses, utilizing tools designed to compare model results against applicable water quality criteria. We will discuss the monitoring data collected by PWD and other agencies, including bacteria, nutrients, dissolved oxygen, periphyton, and sediment oxygen demand (SOD), and how this data informs model development. Lastly, we will share lessons learned from monitoring and modeling of urban creeks in CSO impacted areas.

CHARRM: Finding Efficiencies Among Mid-Atlantic Resource Managers, Restoration Practitioners and Research Scientists in the Mid-Atlantic Region

McCulloch, Danielle[1], Jessie Murray[2]
1. U.S. Fish and Wildlife Service, 2. NOAA Fisheries
Oral

The Coastal Habitat and Aquatic Resource Research and Monitoring (CHARRM) workgroup facilitates communication and collaboration among Mid-Atlantic State and Federal regulatory / resource agencies, restoration practitioners, and research scientists on coastal habitat restoration and associated data collection issues. Hosted by the U.S. Fish and Wildlife Service and NOAA Fisheries, regulatory and resource managers collaborate on current topics and drive action items. Objectives include: 1) ensuring data collection around restoration work meets shared objectives and answers outstanding resource questions; 2) creating an open forum to share knowledge and discuss current and emerging topics; and 3) increasing efficiencies among resource/ regulatory agencies, restoration practitioners, and research scientists. CHARRM provides a model for streamlining regulatory permitting related to ecological restoration work, to share lessons learned from using new restoration tactics, and to facilitate an open dialogue between the regulatory and restoration practitioner community. This presentation will introduce CHARRM, summarize CHARRM accomplishments, and describe how CHARRM communication strategies and products drive action and increase efficiency. We will also share CHARRM resources, which include results from our listening sessions, recorded learning webinars, restoration-related fact sheets, and the status of our first collaborative permit guidance document. Join us to get involved or learn more about how this group can help you and your coastal habitat restoration-related work.

Development of a Multidimensional Coastal Wetland Migration and Maintenance Data Layer for NJ ResTOrS

McKenna, Kimberly[1], Dr. Thomas Herrington[2], Dr. Richard Lathrop[3], Dr. Joshua Moody[4]
1. Coastal Research Center at Stockton University, 2. Urban Coast Institute, Monmouth University, 3. Center for Remote Sensing and Spatial Analysis, Rutgers University, 4. Division of Science & Research, NJ Dept of Environmental Protection
Oral

The New Jersey Restoration Tool & Organization Suite (NJ ResTOrS) is a group of web tools developed to provide New Jersey coastal restoration practitioners with the resources to plan, coordinate and implement coastal restoration projects that support community resilience, ecosystem health and carbon sequestration. Many of these tools can be used in tandem to guide users through the various stages between project siting and implementation. One component that is largely missing from this sequence is accounting for the ability of a coastal wetland to provide any level of self-maintenance, either pre or post restoration, horizontally or vertically. The level of self-maintenance is informative not only for restoration tactic selection, but for understanding the degree at which a tactic needs to be applied to leverage desired results. Currently, Stockton, Monmouth, & Rutgers Universities and NJ DEP are developing a new data layer to be included in NJ ResTOrS that aims to bundle existing horizontal (i.e., transgression or progradation) and vertical (i.e. elevation trajectories & natural sediment availability) datasets, and integrate them into a composited, easily accessible, geospatial layer. This layer will not only provide insight into multidimensional aspects of site-specific vulnerability, wetland health trajectories, and restoration project needs, but will also inform spatial variability regarding site-specific potential to adapt to climate change. This talk will present the approach and proposed data layers and will query the audience regarding data gaps and sources, regionally specific needs, and the quality of the approach to refine product development in the coming months.

Climate Change Projections for NYC Watershed and Upper Delaware Headwaters Region

Mead, Jerry[1]
1. New York City Department of Environmental Protection
Oral

Climate change is impacting the entire Delaware River Basin, and the headwaters of the New York City Watershed are no exception. Temperatures, precipitation levels, and other changes have the potential to impact the entire region. The New York City Department of Environmental Protection (NYC DEP) is currently working to determine what changes can be expected and their impacts to the watershed. Key initial findings include a high certainty that temperature increases will occur by mid and late century while there is less certainty that a slight increase in precipitation will occur during that same timeframe. However, a key finding is that there will likely be more extreme precipitation events by mid to late century. Lower snowpack that melts earlier in the year is also predicted which has the potential to affect both streamflow and inflow into NYC's reservoirs. Less water availability during warm and dry summer months could limit the amount of releases that come from NYC reservoirs to meet flow targets and to repulse lower basin salinity during times of drought. This indicates that additional measures need to be taken to mitigate climate change throughout the basin, in particular the lower basin which currently relies almost solely on NYC reservoir storage to repulse salinity.

Monitoring Nekton Biodiversity at the Delaware National Estuarine Research Reserve

Mensinger, Michael[1], Drew Faulhaber[1]
1. State of Delaware/DNREC/CCE/DCP/DCMP
Poster

Estuaries are susceptible to climate change pressures that may impact nekton community assemblages. The Delaware National Estuarine Research Reserve implemented a long-term Blackbird Creek nekton monitoring project to better understand short-and long-term nekton changes. Blackbird Creek was stratified into seven salinity zones and a 300-meter section of each zone was randomly sampled from April to October 2017-2019 and 2021-2023 to determine spatiotemporal nekton biodiversity patterns and to assess any long-term changes in species composition.

Creating Resilient Marsh and Beach Habitat in Delaware Bay: The Evolution of a Regional Restoration Strategy in the Face of Climate Change

Modjeski, Alek[1]
1. American Littoral Society
Oral

Restoration and resiliency goals extend beyond just repairing impacted subtidal, intertidal, and coastal/marsh habitats, to include integration of elements that increase the ecosystem's resilience to future impairments while expanding ecosystem services and functions. This presentation will look at the current habitat restoration work and adaptive management strategies that can bring us closer to a more programmatic regional restoration strategy in Delaware Bay That addresses current and future impacts from sea level rise and climate change. Evolution of restoration strategies from reef to hybrid breakwaters and beach management practices for shorebirds and horseshoe crabs will be discussed.

Living Shoreline Feasibility in Delaware County, Pennsylvania

Nemec, Zach[1]
1. Pennsylvania Sea Grant
Oral

Delaware County is one of three Pennsylvania counties a part of the Delaware Estuary Coastal Zone and is the fifth-most populous county in the state. The 12-mile coastline has been historically dominated by commercial and industrial uses resulting in a predominately harden shore. Hard shoreline structures like bulkheads have a finite life cycle and cannot easily adapt to heightened, projected coastal hazards like sea level rise, high tide flooding, and storm surge. Alternatively, living shorelines are a nature-based solution made up natural material such as native vegetation and bivalves, rock sills, and large wood to stabilize shoreline along estuaries, bays, and tidal rivers. Living shorelines can absorb and mitigate the impacts of these coastal hazards, reduce erosion, improve water quality, provide habitat for fish and wildlife, and promote recreation. To better educate and engage coastal municipalities on this nature-based solution, I evaluated the feasibility of living shorelines at three public sites in Delaware County using Partner for the Delaware Estuary's Living Shoreline Feasibility Model (LSFM). During August 2024, I recorded the physical characteristics, ecological conditions, site access, and community resources metrics for each site and inputted them into the LSFM. All sites showed low to moderate implementation complexity based on various community resources scenarios and low design complexity. More community input is needed to better understand the implementation complexity. Living shorelines are possible in Delaware County and should be explored more including further community engagement.

Celebrating 75 years of Sport Fish Restoration in the Delaware Estuary

Newhard, Josh[1], Gabe Gries[1]
1. U.S. Fish and Wildlife Service
Oral

The Sport Fish Restoration Act (also known as the Dingell-Johnson Act) has provided state agencies with significant funds since its enactment in 1950. The Act has resulted in numerous, significant, and wide-ranging fisheries conservation successes from Striped Bass recovery to artificial reef deployment. As a partnership between the U.S. Fish and Wildlife Service and state agencies, angler-supported dollars are used to restore and manage freshwater and saltwater fisheries. Multiple projects that are ongoing and/or have been completed within the Delaware Estuary will be highlighted.

Investigating The Use of Diatoms as Inundation Indicators on Living Shorelines

O'Brien, Erin[1], Mihaela Enache[1], Joshua Moody[1]
1. NJDEP Division of Science and Research
Oral

"Living shorelines" describes a suite of restoration techniques that aim to stem erosion while providing ecological benefits, and monitoring is foundational to understanding their development and effectiveness. A key aspect of living shorelines is their biological community, which will be sensitive to site-specific physiochemical conditions, including inundation. Inundation can be difficult to calculate from elevation measurements alone due to the distance from established tide gauges and inaccurate datums, and logger deployments can be expensive and require long durations. Diatoms are microscopic algae that can provide many advantages for ecological monitoring due to their sensitivity to environmental changes in aquatic systems. The purpose of this project was to determine if diatoms can be used as an indicator of changes in tidal inundation after living shoreline project implementation. To investigate, a soil core was taken from a living shoreline in Money Island, NJ, installed in 2016 using coir bio-logs, shell bags, and oyster castles and monitored annually. Monitoring metrics included elevation via RTK-GPS. Elevation data were used to sub-section the core for analysis at five time periods from pre-installation through 2024. Diatom relative abundance and community composition were evaluated in each section using microscopy. Preliminary results show a shift in diatom species composition and diversity during and after installation. This shift in diatom communities reveals that important changes occurred in habitat characteristics, including inundation after installation. Results will be used to evaluate how diatom species can be utilized in the assessment of living shoreline development.

Water Monitoring and Research in the Delaware River Basin: The Next Generation of USGS Water Science

Pajerowski, Matthew[1]
1. U.S. Geological Survey
Oral

Beginning in 2018, U.S. Geological Survey (USGS) intensified its monitoring and scientific studies in the Delaware River Basin (DRB) after it was named the pilot basin for the Next Generation Water Observing System (NGWOS) program, which aims to modernize, expand, and optimize USGS monitoring with new capabilities, technologies, and methods. The DRB was selected as a nationally important, complex interstate water system, whose many uses include drinking water for over 17 million people. The history of USGS water monitoring throughout the basin has long supported better understanding of the river system and informed decision-making by resource managers. The NGWOS program brought to the basin a greater focus on high-fidelity monitoring of water quantity and quality. Critical gaps were identified in existing monitoring networks and new monitoring stations were established to collect additional data on flow, water temperature, salinity, reservoirs, and evapotranspiration. In addition, cutting-edge technologies were deployed, such as new sensors, autonomous vehicles, and advanced communications equipment that improved delivery of data. The USGS has leveraged the increased monitoring data to expand its research and modeling activities in the basin. New studies in the basin have focused on salinity in the Delaware River and its tributaries, both from landscape sources like deicing salts and saltwater encroachment from the estuary. Efforts to model chloride and dissolved solids will complement broader efforts to develop water availability models that account for competing water uses as well as drought, reservoir management, and changes in land use, water use, climate, and sea level.

Advancing Beneficial Use of Fine-Grained Dredged Sediment: Marsh Edge Berms Constructed in Seven Mile Island Innovation Laboratory (SMIIL), New Jersey

Perkey, David[1], Lenore Tedesco[2], Kelsey Fall[3], Thomas Huff[4], Monica Chasten[5],
1. US Army Corps of Engineers- ERDC, 2. University of Delaware, Newark, Delaware, 3. U.S. Army Corps of Engineers-ERDC, Vicksburg, Mississippi, 4. U.S. Army Corps of Engineers-Philadelphia District, Philadelphia, Pennsylvania
Oral

Due to impacts of sea level rise, many coastal management strategies are seeking ways to beneficially use dredged sediment in restoration, nourishment, and construction projects. The placement of sediment in shallow, near-marsh areas is a promising application of dredged material to increase accretion and provide protection to marshes and intertidal flats. However, dredged material often includes fine-grained (<63 μm) sediments (FGS) that raise questions concerning dispersion, stability, and environmental impacts of the placement project. In 2020, ~30,500 m^3 of FGS was placed along the southern edge of Gull Island, centrally located within the Seven Mile Island Innovation Laboratory (SMIIL), to evaluate the feasibility of using FGS for beneficial use (BU) projects in near marsh environments. The placement was unconfined and resulted in the formation of two intertidal muddy berm-like features up to 0.7 m thick spanning approximately 500 m of marsh edge. Turbidity plumes during dredging were localized to within 100 m of the placement site. Three years later, approximately 60-70% of the berm volume remained in place. Laboratory and field observations indicated that the berm material was cohesive and largely resistant to erosion in the low energy environment. Further, when eroded the berms produced large, aggregated clasts which limited the dispersal of FGS. This suggests that shallow water features can be constructed with FGS in similar low energy environments with limited dispersal during and following construction, while being robust enough to help stabilize the marsh edge and improve marsh survivability against sea level rise.

Creation of an Outdoor Exploration Space

Quimby, Alison[1], PDE Staff [2]
1. City of Wilmington, 2. Partnership for the Delaware Estuary
Oral

If you had to create a rule book for outdoor adventure, would you know where to start? In late 2019, The City of Wilmington, in collaboration with the Partnership for Delaware Estuary, started imagining ways to connect our wonderful constituents with the nature around them. While going on a day trip to the Delaware beaches is a great time, the City of Wilmington was hoping to encourage adventure in our own back yard. Convenient access to free outdoor space can help people of all ages destress from their busy lives and rejuvenate their spirits. This is why the City of Wilmington created their first outdoor exploration space. Adults can use this space to enjoy nature, read a book or even eat lunch when the local farmers market is happening. School aged children can use this space with their teachers for a change of location to enjoy a cool breeze while learning about any subject. This fun idea took around five years, four different park locations, and lots of helping hands to create this new gathering place. This presentation will explore the challenges and the positive results of the creation of an outdoor exploration space in Cool Spring Park.

City of Wilmington GHG Reduction Program: Working to Achieve 50% Reduction By 2030

Quimby, Alison[1]
1. City of Wilmington
Oral

The City of Wilmington (City) began implementing strategies to reduce greenhouse gas (GHG) emissions in 2008, when Mayor James Baker adopted the U.S. Conference of Mayor's goal of reducing the City's GHG emissions 20% by 2020. Under that program the City implemented GHG reduction strategies ranging from energy efficiency initiatives at City-owned buildings and facilities to producing and using renewable energy from solar arrays and a Renewable Energy Biosolids Facility (REBF). To assess progress toward the GHG reduction goal, the City developed and maintains a GHG inventory using a tool which tracks emissions dating back to 2010 and have capability to project potential reductions from planned projects. The inventory shows that the City not only met but exceeded the 20% by 2020 goal, achieving a reduction of 40% through 2020. Building on this work, the City is following the State of Delaware's lead and working towards a reduction of 50% GHG reduction by 2030. The City's Department of Public Works (DPW) recently received an Energy Efficiency and Conservation Block Grant to support the development of a GHG Reduction Plan. Through this planning effort the DPW will engage stakeholders from across the City organization, identify and quantify GHG reduction strategies to enable achievement of the 50% reduction goal, and develop an implementation plan to guide implementation of the reduction strategies. This presentation will provide an overview of the City's successful GHG Reduction Program, including completed and planned reduction strategies and the GHG inventory tool used to support planning efforts.

The New Jersey Tidal Wetland Monitoring Network: Background, Trends, Management Implications, & Data Availability

Raper, Kirk[1], Kelly Faller[2], Joseph Grzyb[3], Ceili Pestalozzi[4], LeeAnn Haaf[2], Metthea Yepsen[5]
1. NJ DEP Division of Science & Research, 2. PDE, 3. Meadowlands Research & Restoration Institute, 4. Barnegat Bay Partnership, 5. NJDEP Division of Science & Research
Oral

New Jersey has over 300,000 acres of tidal wetlands that play a critical role in the ecological and historical heritage of New Jersey. The New Jersey Tidal Wetland Monitoring Network (NJTWMN) was formalized in 2019 and includes more than 15 partner organizations. The goal of the network is to consistently monitor tidal wetlands across the state to track and assess wetland health and long-term trajectories. Results can be used to inform decisions regarding coastal wetland protection, enhancement, & restoration, and to improve coastal communities and ecosystems resilience. NJTWMN partners support this mission by following standardized protocols, sharing data, identifying research needs across the region, and engaging the public about the importance of tidal wetlands in New Jersey. A current objective of the NJTWMN is to determine how tidal marsh elevation dynamics throughout New Jersey are changing relative to local sea level rise. To accomplish this, partner organizations monitor wetland elevation, accretion rates, and vegetation at >230 established Surface Elevation Tables (SETs). Elevation changes are evaluated with sediment accretion rates to determine if enough sediment is being captured to allow the marsh to keep pace with increasing sea-level. Preliminary results indicate that 46% of the 196 analyzed SETs have elevation change rates below the rate of long-term SLR. When compared with recent 19-year SLR rates, 59% of SETs have lower elevation change rates. In this session, NJTWMN partners will give an overview of the network, report on regional results and management implications, and introduce a web-based platform for data viewing and acquisition.

Community-Driven Modeling for Flood Risk Resilience in the Darby-Cobbs Watershed

Ricks, Jazmin[1], Ahmad Haseeb Payab[2]
1. University of Pennsylvania/The Water Center, 2. Drexel University/Civil, Architectural, and Environmental Engineering
Oral

Managing urban flood risks in the Darby-Cobbs watershed, which spans four counties and 31 municipalities, poses significant challenges exacerbated by climate change. In response, we developed the Darby Cobbs Flood Resiliency Assessment Tool (DC-FRAT) using Stella, a system dynamics model, to help watershed communities understand the complex relationships between land use, climate, and water systems. The model incorporates key risk parameters—exposure, hazard, and vulnerability—enabling users to explore various flood risk management (FRM) scenarios. As an interactive tool, DC-FRAT allows users to explore how geographically distributed vulnerability factors, resilience investments, and hazard severity impact flood exposure and risk. Engaging a diverse range of stakeholders through the Watershed Partners Team (WPT) and the Watershed Adaptation Corps (WAC) was central to our approach. Local residents provided critical insights into their communities' stormwater and flooding challenges through interviews and surveys. This community-driven data collection informed the model's design, allowing users to visualize how changes in one part of the watershed may affect flooding, runoff, and socio-economic impacts elsewhere. While DC-FRAT is not designed to prescribe specific recommendations or guide concrete action plans, it serves as a valuable resource for learning and fostering collaborative discussions. The tool empowers community members to act as local experts, fostering a sense of ownership and encouraging its use in flood risk management decision-making. Our findings highlight the importance of collaboration and community input in creating sustainable flood management solutions. Ultimately, DC-FRAT positions stakeholders to make informed decisions that support their long-term resilience to climate change and flood-related risks.

Progress on a Programmatic Approach to Assessing Salt Marsh in Delaware and New Jersey for Utilizing Low-cost Low-disturbance Restoration Methods

Ripple, Kaity[1], Brian Marsh[1], Jim Feaga[3], LeeAnn Haaf [4]
1. U.S. Fish and Wildlife Service, 2. Ducks Unlimited, 3. Partnership for the Delaware Estuary
Oral

Available salt marsh habitat has declined, and the remaining habitat is degrading in many areas. Confounding factors, such as sea level rise, invasion of non-native species, development and human infrastructure, and legacy effects from land use history have all contributed to the loss and degradation of this habitat. As a consequence, the resilience of coastal communities and the populations of some marsh obligate wildlife species are declining. Several regional partners have been advancing a Delaware Bay-wide salt marsh strategy by assessing sites and planning for low-cost and low-disturbance marsh restoration. The restoration techniques we are proposing will address legacy effects from salt marsh agricultural practices, mosquito ditching, and erosion of marsh from wave energy. We are currently progressing project sites through assessment, design, and permitting. We expect implementation of projects at these sites totaling over 1,000 acres to serve as proof of concept for our restoration techniques and for expansion of work at these same sites or for new cohorts of sites brought into this landscape scale and team-based approach. We see this as a programmatic approach by including many ongoing sites to assess salt marsh problems, develop restoration designs, apply for permits, construct projects, and monitor. We will present on the data obtained to date and where the work is headed.

Life History, Population Status, and Restoration of American Shad and River Herring in the Delaware River Basin

Rothermel, Ellie[1], Sheila Eyler[2], Lance Butler[3], Greg Lech[4], Ron Huen[5], Kelly Faller[1]
1. Partnership for the Delaware Estuary, 2. U.S. Fish and Wildlife Service 3. Philadelphia Water Department, 4. Pennsylvania Fish and Boat Commission, 5. PSE&G
Oral

American shad and river herring are migratory fish that spend years of their life in the ocean before returning to their natal Delaware River and tributaries to spawn. American shad and river herring have been, and continue to be an important part of the cultural and ecological landscape of the Delaware River Basin. For centuries, these species have been central to the livelihoods and traditions of Indigenous communities, early European settlers, and commercial fishers. At the peak of historic harvest in the late 1800s, more American shad were landed in the Delaware River Basin compared to any other river system along the Atlantic Coast. By the early twentieth century, American shad and river herring populations in the Delaware River had suffered dramatic declines, with current numbers at or near historic lows. Several factors have contributed to these changes in both distribution and abundance, including degraded water quality in the mid-1900s that essentially created an impassable barrier and prevented migration for much of the year. Another factor was the construction of dams on many tributaries that historically supported spawning runs. These dams blocked access to critical upstream spawning and nursery habitats, which are essential for reproduction and early life stages of these species. In recent decades, the commercial and recreational harvest of these species has been subject to strict management regulations, and a number of habitat restoration activities have occurred or are being planned in an attempt to prevent further declines and support population recovery in the Delaware River Basin.

Community Science Data Informs Restoration in an Urban Ecosystem

Sarver, Matthew[1], Katie Bird[1]
1. Sarver Ecological
Oral

Community science data is a critical but underutilized resource for informing restoration planning for biodiversity in urban systems. We present a surprisingly robust urban biodiversity dataset derived from iNaturalist and eBird data and tips for using such data to inform urban restoration and raise community awareness of urban biodiversity.

A New Conceptual Sediment Budget for Delaware's Sandy Estuarine Beaches

Shawler, Justin[1], Aleksandra Ostojic[1], Sean McGill[1], Alexander Renaud[2], Ashley Elkins[1]
1. Coastal and Hydraulics Laboratory, US Army ERDC, 2. USACE Philadelphia District
Oral

Coastal sediment budgets often terminate at the mouths of large estuaries such as the Delaware and Chesapeake Bays, despite the complex management challenges and continuation of the open-ocean sediment transport system along these estuarine coasts. As a result, we lack a detailed understanding of the sediment transport pathways of sandy material from estuarine beaches out to the depth of closure and along the coast towards navigation channels. To address this understanding, this work uses the Delaware Bay coast from Pickering Beach to Lewes Beach, DE as a case study of applying the U.S. Army Engineer Research and Development Center's Sediment Budget Analysis System (SBAS) and Volume Change Toolbox to sandy estuarine coasts. To develop the sediment budget, we analyzed 25 years of beach change data, including nourishment records, beach profiles, lidar digital elevation models, and classification of aerial imagery to discern beach erosion and overwash along the more remote shoreline sections. At each bay inlet we analyzed available bathymetric survey data and dredging records to determine average shoaling and dredging rates. Key highlights include: (1) increased accretion of downdrift beaches following the large-scale nourishments at Broadkill and Fowler beaches; (2) widespread volume loss of many beaches despite nourishment; and (3) evidence of beach rollover via overwash along many unoccupied bay beaches. The results of this project can be used to better inform regional sediment management efforts along this coast through better comprehension of sediment sources and sinks.

ASAP: The Apprenticeship In Shellfish Aquaculture Program

Shinn, Jenny[1], Diana Burich[2], Michael Acquafredda[1], Lisa Calvo[3]
1. Rutgers University, 2. New Jersey Sea Grant Consortium, 3. Sweet Amalia Oyster Farm
Oral

The New Jersey Sea Grant Consortium and the Rutgers University Haskin Shellfish Research Laboratory have developed the Apprenticeship in Shellfish Aquaculture Program (ASAP), a new training program aimed at building a robust pipeline for the aquaculture workforce. ASAP is a summer-long program geared towards New Jersey high school students aged 16+. Through a combination of in-person instruction, hands-on training, and paid on-farm work experience, ASAP participants learn the inner workings of the shellfish aquaculture industry, gain entry level work skills, and discover what it takes to get food from farm to table. The goal of ASAP is to promote interest in aquaculture career paths in young adults and to build a competent, dynamic workforce. ASAP has four components: 1. School engagement and recruitment; 2. A week-long skill-building "boot camp," 3. A paid 150-hour apprenticeship on commercial shellfish farms or other aquaculture facilities; and 4. Bi-weekly virtual cohort meetings to connect apprentices with professional development resources. After a 2022 pilot program, ASAP was fully rolled out in 2024. To recruit students, project coordinators engaged 780 students at 11 public high schools across five counties in an aquaculture literacy lesson. Over 30 applications were received and ultimately 13 students were selected to participate in the program. During "boot camp," the apprentices learned shellfish husbandry skills and general principles of permitting, regulation, food safety, marketing, and business planning. After, the apprentices began their 8-week on-farm work experience, working side-by-side with shellfish grower mentors, to earn their stipends and "Shellfish Farming Practice Certificates". All enrolled students completed the program. Their responses in a post-participation survey, along with feedback from the growers, will be used to improve and inform ASAP in 2025.

Oh, the Places You'll Go...Delaware Marsh Migration Model

Smith, Kenny[1]
1. Delaware DNREC
Oral

The Delaware Department of Natural Resources and Environmental Control has undertaken an effort to update the marsh migration model they produced in 2017. This effort will incorporate the most updated data for 9 spatial data sets and use the 3 sea level rise scenarios the state has created. This effort is to better understand the availability of areas that will be suitable for migration of tidal wetlands. With this information we plan to reach out to partners and provide this information focusing on the importance of these migration pathways and what can be done to conserve these areas. This model has been QA'ed through GIS analysis but has also been field QA'ed for any discrepancies. This presentation will outline the process we went through and the layers we used, some analysis of results, and the outreach possibilities for this effort.

Assessing School Campus Pollinator Habitat - An Inventory of Pollinators to Establish Baseline Data for Ongoing Community Science Studies, Campus Habitat Improvements and Conservation Education Initiatives

Smith, Ron[1]
1. Episcopal Academy
Oral

School campuses offer great potential for habitat improvement and expansion for invertebrates. Distributed across municipalities throughout the watershed, there is opportunity to establish pockets of critical habitat and corridors linking isolated patches to support pollinators, other insects and a diversity of other invertebrate groups that provide essential ecosystem services. Providing forage and cover that can be in close proximity to other valuable sites, natural installations on school grounds can be part of successful conservation efforts. Taking inventory of existing plant species, habitat diversity and size and invertebrates present can yield data that can be used to propose new plantings and projects that, along with other landscape decisions, can support insect populations and communities. On the campus of Episcopal Academy, students from the environmental science program are collecting data on native and invasive species present, richness and abundance of invertebrates and frequency of visitation by pollinators to plants in bloom. The data will serve as a baseline for future studies, elementary education opportunities and habitat improvements on and adjacent to the campus.

Stream Restoration and Pollutant Removal in McIntire Park: Integrating Environmental and Community Goals

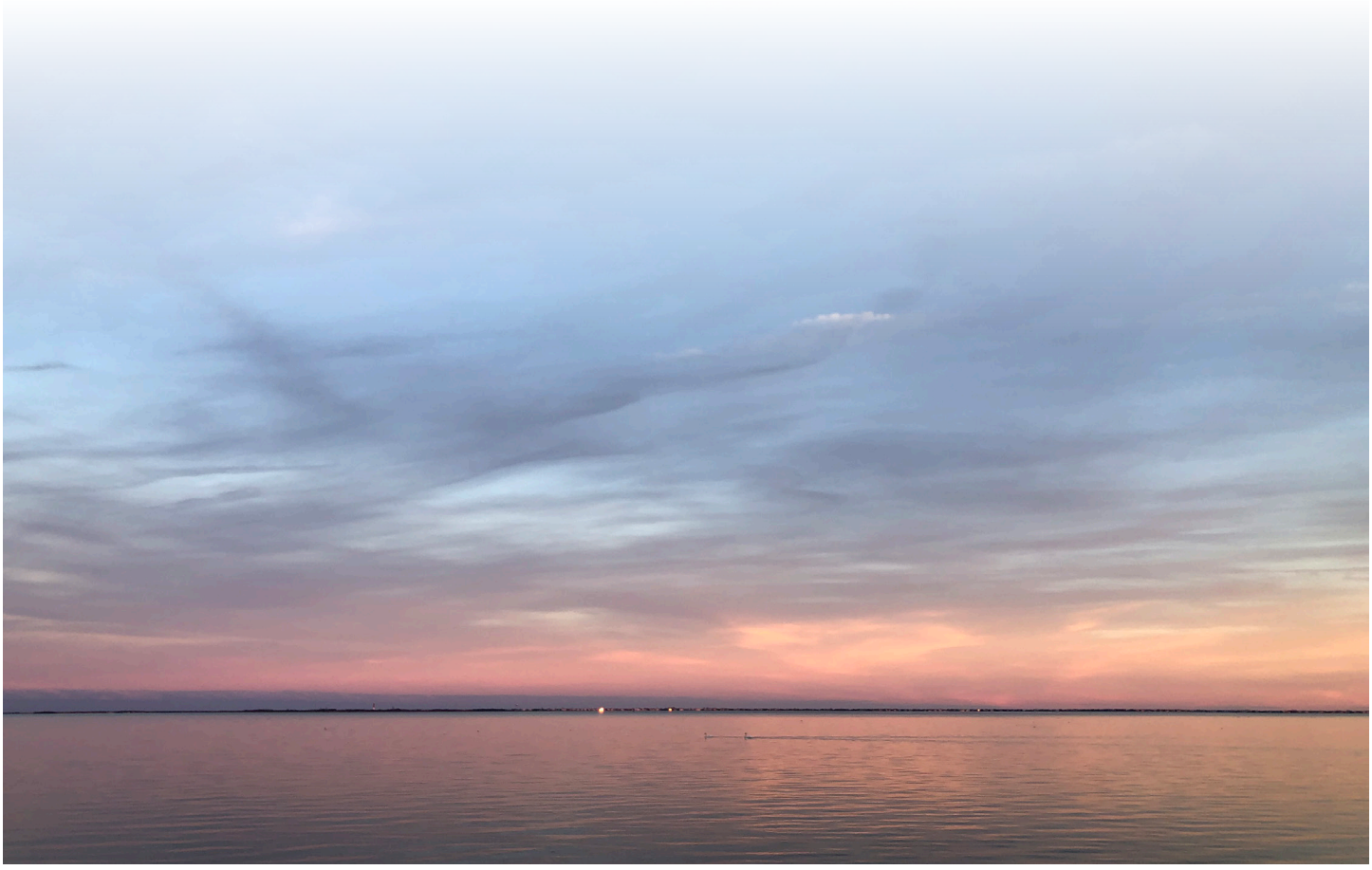
O'Banion, Ryan[1], Dan Frisbee[2]
1. Hazen and Sawyer, 2. City of Charlottesville DPU
Oral

In April 2019, the City of Charlottesville (City) received SLAF grant funds from VADEQ for the design and construction of a stream restoration project in McIntire Park, matched by the City Stormwater Utility's Capital Improvement Program (CIP). The Schenks Branch Tributary was selected for evaluation and design for pollutant removal credit generation towards the Chesapeake Bay TMDL pollutant reduction targets. The goals of the project are to increase water quality, provide a lift in ecological habitat, and facilitate community accessibility and education opportunities. Special consideration and coordination were taken to seamlessly integrate the project into the planned Botanical Garden of the Piedmont grounds. Hazen and Sawyer (Hazen) and the City collaboratively developed a design that accounted for site considerations, utility constraints, and future park and public amenities while exceeding water quality goals, balancing the reuse of materials on site, and designing within the available budget. Hazen also developed digital communication tools to educate and inform the community about the importance of water quality and the role of stream restoration in meeting regulations, achieving carbon sequestration, and providing resiliency and educational opportunities.

Developing Habitat Requirements for Submerged Aquatic Vegetation (SAV) Preservation and Restoration in the Delaware River Watershed

Somers, Kelly[1], Michael Mansolino[1], Todd Lutte[1], Joel Hoffman[2], Cayla Sullivan[3]
1. US EPA Region 3 Mid-Atlantic, 2. US EPA Office of Research and Development, 3. US EPA Region 2
Poster

Submerged aquatic vegetation (SAV) provides foraging, spawning, nursery, and protective habitat for fish, birds, and other wildlife, including many ecologically important species. Preserving and restoring SAV is important to the health and resiliency of the Delaware River Watershed. The Delaware River is impacted by many physical and environmental stressors, including shoreline hardening, urban and agricultural runoff, nutrient enrichment, climate change, industrial development and dredging. SAV is particularly vulnerable to the impacts of climate change; future changes in salinity, velocity, water levels, and temperature are measurable factors that could impact the growth and vitality of SAV. However, there are few studies on environmental factors that influence the spatial variation in SAV habitat in the Delaware River Watershed. Understanding the factors that determine SAV habitat suitability is necessary for the successful restoration and preservation of SAV. We sampled fifty stations throughout the tidal freshwater and oligohaline portions of the Tidal Delaware River for a suite of physical, chemical, and biological metrics that potentially account for spatial variation in distribution, percent cover, and species composition of SAV beds. The data collected will be used to develop a habitat suitability model to determine environmental factors that relate to SAV distribution and composition, as well as thresholds for preserving and restoring SAV in the watershed. Long term, the model could be used to identify key locations for protection of SAV to help mitigate losses resulting from climate change and human impacts. Furthermore, the results from this project could lead to future work on where to prioritize restoration pilot projects.



The Final Piece of the Delaware Wetland Health Assessment Puzzle: Condition of Wetlands in the Pocomoke Watershed

Stouffer, Alison[1]
1. Delaware DNREC
Oral

Wetlands have a rich history across the region and their aesthetics have become a symbol of the Delaware coast. However, many wetlands that remain are degraded by the impacts of a multitude of direct and indirect stressors and are therefore functioning below their potential. Since 1999, DNREC's Wetland Monitoring & Assessment Program has been evaluating wetland health in Delaware on a watershed basis; the assessment of the Pocomoke watershed completes the statewide evaluation of wetland condition. In 2022, a total of 54 random, non-tidal wetlands were assessed based on the presence and intensity of stressors related to habitat, hydrology, and buffer elements. Additional assessments were conducted to evaluate the local ecological value that a wetland provides to the landscape. Data are extrapolated to generate an overall watershed condition report that discusses trends in wetland acreage, identifies common stressors by wetland type, summarizes overall health of wetland types, and provides management recommendations based on these results. Overall, the Pocomoke watershed scored an A-, with only 11% of the watershed being considered severely stressed.

Future Climate to Intensify Extreme Floods and Shift Flood Generating Mechanisms in the Delaware River Basin

Sun, Ning[1], David Judi[1], Hongxiang Yan[1], Mithun Deb[1], Zhaoqing Yang[1]
1. Pacific Northwest National Lab
Oral

The Delaware River Basin (DRB) faces significant flood risks stemming from diverse flood generating mechanisms influenced by topographic transitions from mountains to coastal plains. For example, a rain-on-snow event in spring 2005 accelerated snowpack melting, leading to significant flooding. Then, in the summer of 2011, heavy rainfall from Hurricane Irene caused widespread flooding in the region. Looking ahead, the projected warmer and wetter climate in the region is anticipated to significantly intensify the severity of future flooding. This study used a process-based hydrological model to predict future floods and assess the mechanisms that drive flooding as the climate changes. We found that, historically, the Upper Basin (northern DRB) has predominantly experienced early spring floods caused by rain-on-snow (ROS), while floods in the Lower Basin (southern DRB) have primarily been driven by short, intense rainfalls with no strong seasonal pattern. Future projections under 20 climate scenarios suggest a region-wide intensification of flooding (i.e., greater peak discharge). Notably, the Upper Basin's primary flood mechanism is projected to shift from ROS to intense short rainfall events, leading to more sporadic flood timing compared to the historical spring ROS floods. This climate-driven amplification in flood risk and shift in timing highlights the need for adaptive flood management strategies.

Delaware Bay Habitat Restoration Project Monitoring

Tablante, Toni Rose[1]
1. American Littoral Society
Oral

The American Littoral Society has restored beaches in New Jersey for the past ten years to create ideal horseshoe crab spawning and shorebird foraging habitat. Our team conducts several research and monitoring studies designed to track population recovery metrics in response to our habitat restoration and conservation actions. These efforts include horseshoe crab, fish, and reef studies.

Scotch Bonnet Island Marsh Elevation Enhancement Project: Beneficially Using Dredged Sediments to Stabilize Drowning Marshes in New Jersey

Tedesco, Lenore[1], Monica Chasten[2], Jason Hearon[3], Julie Blum[1], Keith VanDerSys[4], Lisa Ferguson[1], Brian Harris[4]
1. The Wetlands Institute, 2. US Army Corp of Engineers, Philadelphia District, 3. NJ Fish and Wildlife, 4. US Army Corp of Engineers, Research and Development Center, 5. University of Pennsylvania
Oral

Scotch Bonnet Island is a low-lying marsh island in the Cape May Coastal Wetlands Wildlife Management Area, NJ whose elevations have fallen into the lower limit of low marsh elevation. The platform is undergoing rapid marsh loss through conversion to open water and dissection via tidal creek expansion. The project aims to stabilize the marsh platform using sediment addition with materials from maintenance dredging of the NJ Intracoastal Waterway to uplift 4 acres of low marsh. Marsh condition assessments show that the 86-acre marsh platform has lost more than 30 acres to open water conversion since 1941 during a time of human disturbance and sea level rise. SLAMM modeling using moderate sea level rise rates indicates another 20 acres will be lost by 2050. The project goal is to increase marsh elevation to stable low marsh elevations and reduce marsh dissection. Sediment placement thickness will be as thick as 3 feet to account for consolidation. Past studies of similar placements indicate elevation losses may be as high as 30-40%. Ecological elevation goals are set between MHW and MHHW based on derived tidal datums that correct for local relative sea level and are designed to result in rapid vegetation recolonization. Extensive pre-placement site characterizations include site usage by marsh-dependent birds and diamondback terrapins, pool usage, water chemistry of pools and channels, and vegetation distribution. Geotechnical surveys are documenting platform response to dredged sediment loading. Multispectral and LIDAR UAV mapping are documenting pre- and post-placement elevation and vegetation classification and will continue post-placement.

Making a Splash in Southern New Castle County: Restoring a Historical Seasonal Pond Complex

Whitman, Brigham[1], Matt Sarver[2]
1. Delaware Wild Lands, 2. Sarver Ecological
Oral

Delaware Wild Lands has collaborated with Sarver Ecological to restore Coastal Plain Seasonal Ponds (CPSP) in southern New Castle County. The CPSPs, or Delmarva Bays, represent the easternmost point of a wider system of ephemeral freshwater wetlands in the Blackbird-Millington corridor. CPSP sites were identified using historic aerial imagery and sub-surface soil analysis. The project removed 45 acres of land from agricultural production, excavated eight historic CPSPs to their original depth and hydroperiod, plugged agricultural drainage ditches, and built berms to hold more water on the landscape. Additionally, the project restored the native ecosystem by planting the area with native grasses and forbs to stabilize the soil and establish early successional habitat that will support wildlife. The upland areas around the ponds were planted with over 20,000 bare root seedlings and will ultimately transition into mature hardwood coastal plain forest. After excavation, the CPSPs were improved with the addition of coarse woody debris (logs and tree stumps) to provide the necessary habitat structure for wildlife that will colonize the ponds. The project will strengthen and support nearby CPSP habitat threatened by sea level rise, benefit SGCN wildlife species, improve water quality in the Blackbird Creek Watershed and the Delaware Bay, and engage the local community in hands-on conservation practices.

Enhancement of Methodology for Calculating Net Carbon Emissions for Natural and Working Lands

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1. NJDEP, Division of Science and Research, 2. NJDEP, Climate Change & Clean Energy
3. Greenhouse Gas Management Institute
Oral

Since 2008, NJDEP has regularly released Greenhouse Gas (GHG) Emission Inventory Reports to document its GHG emissions and reduction progress. The NJDEP's Division of Climate Change Mitigation & Monitoring (C2M2) was awarded Environmental Protection Agency (EPA) funding through a Climate Pollution Reduction Grant (CPRG). A portion of those funds was designated for updating and enhancing the methodologies used by the State to comprehensively quantify and estimate GHG sources and sinks associated with New Jersey's Natural and Working Lands (NWL). While the current method has provided New Jersey with reasonable estimates, new information is now available that could more comprehensively assess GHG emissions and carbon sequestration in NWL. In response to this enhanced data resolution and availability, NJDEP is developing a spreadsheet-based tracking tool to support documentation, estimation, and reporting of results. The tool will contain the following features: modules for user-defined data, including both activity data and emission calculation parameters, QA/QC functionality, summary of estimates in tabular and visual form at different aggregation levels, and documentation of metadata. Additionally the tool will have the time series of New Jersey's GHG emission and removal estimates, from base year 1990, which will be disaggregated by NWL categories and subcategories as data allow. The methodology to estimate GHG will be aligned with the Standard Operating Procedures for the NWL ensuring transparency and clarity for inventory compilers, data providers, and other users of the GHG inventory. While methodology and tool are under development, DEP is seeking feedback regarding its structure, functionality, and output.

Coastal Marsh Restoration: An Ecosystem Approach for the Mid-Atlantic - Joint Agency Guidance

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1. U.S. Fish and Wildlife Service, 2. NOAA Mid-Atlantic Habitat Conservation Branch
Oral

This presentation will offer an overview of recently released guidance on a framework to comprehensive, ecosystem-based coastal marsh restoration that offers a greater likelihood of success at each project. This guidance was developed by NOAA and USFWS, who strive to proactively address and mitigate the impacts of climate change, sea level rise, and centuries of human alteration; while fulfilling agency mandates to protect and enhance habitats for a range of estuarine species. This presentation highlights the agencies' common goals, provides guidance for partners, and addresses some potential issues of concern (e.g. different species/habitat priorities). Together, the primary focus is on the collective benefits of an ecosystem approach to habitat conservation and restoration, which requires balancing the risk of doing too little — or proceeding too slowly — with the mutual commitment to restore ecosystem function and the wide array of benefits while avoiding harm to our individual trust resources. We offer guidance to assist with project planning, design, permitting, monitoring, and adaptive management. While this guidance may apply to other coastal marsh settings, it has been developed primarily by practitioners from the U.S. Mid-Atlantic and southern New England coastal regions and is focused on techniques that have been successfully implemented within this geographical context. Guidance about the regulatory process is intended to support well-conceived and designed projects in efficiently obtaining the necessary authorization for construction. The technical guidance included about restoration techniques highlights the need to consider geomorphic, hydrologic, and ecological factors during project planning, design, and implementation. We also provide examples to develop a greater collective understanding of successful project approaches and desired outcomes among coastal restoration practitioners. Finally, we offer examples of monitoring and adaptive management including how these protocols can be developed and implemented post-construction.

City of Wilmington Urban Pollinator Corridor and Food Resilience Project: A Community Approach to Conservation and Sustainability at the Neighborhood Level

Wilson, Kerry[1], Michele Wales[1], Tannicka Johnson[2]
1. Delaware Nature Society, 2. St. Michael's School
Oral

Delaware Nature Society is working with communities at the neighborhood level to provide access to nature and nature-based solutions in various ways. We are working with multiple partners including community leaders, preschools, homeowners, Green Building United, City of Wilmington Parks and Recreation and Public Works (to name a few) to identify areas to restore the pollinator corridor, improve drainage, and "bring the butterflies back". Additionally, our Coverdale Farm and Preserve staff is leading the work with our six-food resilience and justice gardens. Through these projects we are connecting the pollinator corridors and food networks providing relevance and resources for both. These spaces are not only serving wildlife, but they also have people at the center of them. The urban interface provides both challenges and opportunities for this work. We will discuss our work from partnering to our on the ground successes and challenges.

More Mud, More Marshes: Quantifying the Restoration Potential of Using Dredged Material from State-managed Navigation Channels to Benefit Salt Marshes Within New Jersey Back Bays

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1. The Nature Conservancy, 2. Stockton University Coastal Research Center
Oral

Scalable restoration approaches are critical for sustaining healthy coastal habitats in the face of climate change. The beneficial use of dredged material for restoration, an approach that pairs coastal restoration with navigational dredging, is a promising nature based solution. Quantities of available sediment (mud, sand, fines) are highly variable in coastal areas, as are the location and condition of coastal wetlands. To set a foundation for regional restoration planning efforts, The Nature Conservancy and Stockton University Coastal Research Center completed a GIS-based desktop analysis comparing the number of acres of tidal marsh need with dredging resources (based on the sediment volumes in navigational channels and CDFs) in 17 of NJ's HUC 11 Watersheds. Marshes at risk of loss or conversion "marsh need" was estimated 2 ways based on a) current condition b) future risk of loss due to sea level rise. This study estimated and compared the restoration potential of (state) dredged sediment to sediment volumes needed to restore marshes from 2020-2050. An estimated 27,074 acres of low marsh (51% of marshes in the study area Sandy Hook to Cape May) are at risk of conversion or loss. Even if 100% of the sediment dredged from state channels (were used for marsh restoration, the marsh need in acres far exceeds the amount of available sediment. These findings highlight the importance of keeping sediment in the estuarine system and for the value of coordination between local, state and federal navigation dredging entities and the restoration community.

Abstracts *Listed alphabetically by title*