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ESTUARY
NEWS

The Year of the Pearl:

A Lot Has Changed – But What Matters Most Has Not

As we celebrate the Partnership for the Delaware Estuary's 30th anniversary in 2026, it's remarkable to look back at how far we've come since the Delaware Estuary Program's first Comprehensive Conservation and Management Plan was put into action.

While 1996 is remembered by many for the Atlanta Olympics, the cloning of Dolly the sheep, the "Macarena," and the Chicago Bulls record-breaking season, our partners were hard at work launching a plan more than six years in the making. That same year, PDE hired its first executive director and opened an office in a church parsonage in Wilmington.

Much has changed since our humble beginnings, but what I wrote for our 10th anniversary still holds true:

“*The key to our organization's success is the dynamic partnerships we have with environmental and community organizations, schools, businesses, local, state, and federal government agencies, and individuals like you who care deeply about the estuary and its future.*”

Throughout this year, we will honor our journey from 1996 to today as we mark our pearl anniversary. I hope you'll join us at a volunteer event, festival, or our annual dinner. Stay tuned for the launch of our new website, which will highlight more ways to explore our estuary and learn about the science-based work that is improving the health of the Delaware Estuary and all who rely on this amazing resource.

With gratitude,



KATHY KLEIN, Executive Director, Partnership for the Delaware Estuary



COMMITTEES CONTACT LIST

Meetings conducted by the Delaware Estuary Program's implementation and advisory committees occur on a regular basis and are open to the public. For meeting dates and times, please contact the individuals listed below:

Estuary Implementation Committee

Kathy Klein

Partnership for the Delaware Estuary
Executive Director (Chair)

- ▶ (302) 354-0307
- ▶ kklein@DelawareEstuary.org

Monitoring Advisory & Coordination Committee

Elaine Panuccio

Water Restoration Scientist,
Water Quality Assessment
Delaware River Basin Commission

- ▶ (609) 883-9500, ext. 307
- ▶ elaine.panuccio@drbc.gov

Toxics Advisory Committee

Jeremy Conkle

Senior Toxicologist
Delaware River Basin Commission

- ▶ (609) 883-9500
- ▶ Jeremy.Conkle@drbc.gov

Science and Technical Advisory Committee

LeeAnn Haaf, Ph.D.

Partnership for the Delaware Estuary
Director of Estuary Science

- ▶ (800) 445-4935, ext. 116
- ▶ lhaaf@DelawareEstuary.org

Water Quality Advisory Committee

Thomas Amidon

Manager, Water Quality Assessment
Delaware River Basin Commission

- ▶ (609) 883-9500, ext. 271
- ▶ thomas.amidon@drbc.nj.gov

ON THE COVER

The original signers of PDE's first Comprehensive Conservation & Management Plan toast the completion of the planning phase of the Delaware Estuary Program in 1996. From left to right: former Pennsylvania Governor Tom Ridge, former New Jersey Gov. Christine Todd Whitman, former Delaware Gov. Thomas R. Carper, and past EPA Administrators, W. Michael McCabe and Jeanne Fox.

FOLLOW US ON:



Piecing Together Coastal Protection:

A Mosaic Approach

By *Jenny P. Shinn*, Field Researcher, Haskin Shellfish Research Laboratory, Rutgers University

In the art world, individual tiles of glass or stone combine to create mosaics that are strong and beautiful. At Tyndall Air Force Base in the Florida Panhandle, a mosaic of methods, materials, and expertise created an elegant solution to coastal erosion.

This innovative solution is the culmination of more than three years of research, design and planning by an interdisciplinary team of scientists from 11 institutions across the U.S. and Australia, led by former PDE Board Member Dave Bushek, Ph.D., director and professor at Rutgers University's Haskin Shellfish Research Laboratory (HSRL).

Answering a Crisis

A few years after Hurricane Michael devastated much of the base and the Panhandle in 2018, the Defense Advanced Research Projects Agency developed the Reefense program to rapidly advance living shoreline technologies by integrating materials science, structural engineering, shellfish breeding, and ecological engineering to mitigate coastal flooding and erosion threatening civilian and military infrastructure. The Rutgers team that included PDE was one of three selected.

A Mosaic of Minds

The assembled team consisted of, biologists, ecologists, engineers, economists, and artists from Louisiana, Mississippi, Arizona, Alabama, Florida, New Jersey, Delaware, and Australia. Ecologists like PDE's Urban Resilience Assistant Manager Ella Rothermel and Estuary Science Assistant Manager Leah Morgan gained perspectives on material design and construction from engineers while engineers learned about reef-forming organisms. Economists tracked costs and benefits, and an industrial artist ensured aesthetics.

"This is the first living shoreline project I've worked on that had engineers from multiple fields directly involved with the entire project from planning to design, to monitoring,"



Reefense Modules™ fit together near a shore at Tyndall Air Force Base in the Florida Panhandle. These 2-foot-high structures were placed together in what is known as a Living Shoreline Mosaic™.

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Members from Haskin Shellfish Research Laboratory (HSRL), PDE, and nine other organizations from the U.S. and Australia worked on the Reefense project at Tyndall Air Force Base in Florida. From left, Bushek, Morgan, Kreeger, Talia Barry of HSRL, Rothermel, and Shinn.

said HSRL Field Researcher Jenny Shinn, who worked on the project from its 2021 inception. "Their expertise was extremely valuable and collaborating with such a diverse team has made me a stronger scientist."

Together, the group employed a Living Shoreline Mosaic™ strategy, which creates a seascape of interconnected habitats supporting processes that increase shoreline resilience. Conceptualized more than a decade ago by the late Danielle Kreeger, Ph.D., PDE and HSRL piloted the approach in 2008 and refined it at more than 15 living shorelines between Delaware and New Jersey.

"Reefense provided a unique opportunity to flesh out and field test the mosaic concept," said Bushek, who with former PDE scientist Joshua Moody, Ph.D., helped develop it with Kreeger.

Putting It Together

The installation at Tyndall deployed nearly 800, 2-foot high Reefense Modules™, creating a breakwater seeded with thousands of disease-

resistant local oysters. Half-scale modules and 1,500 bags of recycled oyster shells created smaller patch reefs behind the breakwater, and 2,000 marsh plants fortified the shoreline to create a final transition to upland habitats.

One year later, organisms have arrived as the Living Shoreline Mosaic slows waves, captures sediment, and provides habitat. Protective benefits should increase over the next several years as the habitats develop and strengthen into a resilient shoreline.

Project Reefense will live on as a research collaborative of partner institutions seeking opportunities to implement and study living shoreline mosaics across the globe. The approach is garnering



Nearly 800, 2-foot Reefense Modules™, plus several half-size modules went into building the Living Shoreline Mosaic at Tyndall Air Force Base in Florida.

interest across coastal communities – a mosaic of expertise in which the whole is greater than the sum of its parts.💧

RASCL Celebrates 10th Anniversary at March Summit

Making Space for Sustainable Growth and Resilience: The Role of Land Use Planning

You might not recognize the Delaware Resilient And Sustainable Communities League by its formal name, but instead by its cheekier acronym, RASCL (pronounced “rascal”). Comprised of 28 member organizations, for 10 years, RASCL has provided technical expertise and support to Delaware communities to increase their capacity to adapt, mitigate, and respond to environmental changes. It holds coffee hours and other special events to aid communities with tools they need for project implementation, pursuing funding, and connections to the latest in research and understanding of changing conditions and solutions.

“RASCL plays an important role in connecting communities with resources, sharing the latest science and best practices, and bringing together those who are working to make our towns and our state more resilient, said Edie Dondero, mayor of the town of South Bethany Beach. They are an invaluable resource for our communities.”

RASCL also holds annual summits to talk about bigger topics such as disaster preparedness and transportation challenges. In March, RASCL kicked off its 10th anniversary year in Dover with a summit centered on the theme, Making Space for Sustainable Growth and Resilience: The Role of Land Use Planning.

“Land use planning is one of the most effective tools for building community resilience because it occurs on a larger scale and can benefit so many aspects of society when done right – the economy, environment, health, etc. – along with reducing exposure and vulnerability to climate hazards like extreme heat and sea level rise,” said Danielle Swallow, coastal hazards specialist at Delaware Sea Grant.

The 2026 Summit invited not only municipal and county government officials, but land use and transportation planners, resilience practitioners, students, consultants, and others

interested in sustainability. Featured speakers were Mark Teschauer of U.S. Climate Alliance and Katharine Burgess of Smart Growth America.

This year’s RASCL Community Champion Award went to the Open Space Alliance to honor its efforts to acquire and preserve the last large, forested tract in Lewes.

For more information about RASCL, visit derascl.org. To see photos from the Summit, visit PDE’s Flickr page at <https://bit.ly/RASCL2026>.



Danielle Swallow, Coastal Hazards Specialist at Delaware Sea Grant and member of the Resilient and Sustainable Communities League (RASCL) steering committee, addresses the audience at the annual RASCL Summit.

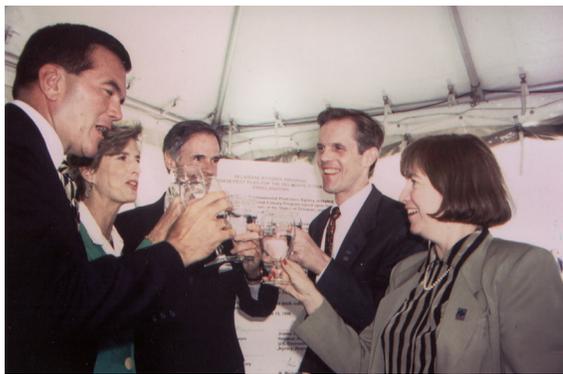
30 Years in Focus

Three Decades of Photos, Stories, and Impact

This year, as we celebrate our pearl anniversary, we invite you to journey with us through three decades of milestones, memories, and moments that have shaped who we are. Like a pearl, each layer of effort, collaboration, and discovery has

brought us to where we are today. Through four issues of Estuary News, take a look back at the photos that tell our story. This edition takes us from 1996 to 2003, and the next issue will take us from 2004 to 2011. ♦

1996 to 2003



1996 - The original signers of the Comprehensive Conservation Management Plan gather to celebrate this milestone by raising a glass of clean water. Photo by Neil Benson.



1998 - Participants at PDE's second watershed workshop for teachers proudly display their cardboard watershed models. Launched in 1997, the summer workshop aimed to bring estuary education into the classroom through hands-on, field-trip-based excursions throughout the estuary - where teachers became the students.

1996

1997

1998

1999



1997 - PDE moves into its first office at Bellevue State Park in Wilmington, Delaware, with help from the Delaware Department of Natural Resources and Environmental Control. The parsonage was a great home to PDE in its early years.



2002 - Former Philadelphia Water Department Commissioner Kumar Kishinchand, EPA Regional Administrator Don Welsh, and two 5th grade students participate in a storm drain marking event in Philadelphia, helping raise awareness about preventing stormwater pollution. Storm drain marking remains a key part of PDE's work today, carrying on the message: No Dumping, Drains to River!

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2002 - Two years after the first Pennsylvania Coast Day event took place, PDE unveiled our shad costume, which still makes special appearances today. Now called Delaware River Festival, the event is hosted on both sides of the river at Penn's Landing in Philadelphia and Wiggins Park in Camden, drawing thousands each year to celebrate the river.



2002 - Kathy Klein accepts an Environmental Quality Award from U.S. Environmental Protection Agency Region II in New York City in April. The award was presented by Jane M. Kenny Regional Administrator and William J. Muszynski, Deputy Regional Administrator of Region II.

2000

2001

2002

2003



2003 - PDE hosted the 4th annual Experience the Estuary Celebration at Lloyd Hall in Fairmount Park. Each fall, PDE hosts our annual celebration, which features a silent auction, oyster raw bar, and dinner. Save the date for this year's event on October 8, 2026!

New Jersey STAP Report Delivers Latest on Sea Level Rise

By LeeAnn Haaf, PDE's Director of Estuary Science

Sea level has been rising more and more, first by 0.5 inches per decade, but now by 2 inches per decade. What's ahead? More rise.

Over the past 2,000 years, New Jersey's sea level has risen approximately 100 inches, or about half an inch per decade, primarily due to subsidence, a geological process where the ground sinks and global sea level rises. Since the late 19th century, rates have accelerated to about 2 inches per decade from 1993 to 2021, which is faster than the global average. Looking ahead, New Jersey is likely to see 0.7-1.3 feet of sea-level rise, or 2 inches per decade, by 2040.

This information comes from the 2025 report from Rutgers University's Science and Technical Advisory Panel (STAP) on Sea Level Rise for the New Jersey Climate Change Resource Center on behalf of the New Jersey Department of

Environmental Protection.

In 2025, Rutgers University reconvened, for the third time since 2016, to provide updated science on sea-level rise and coastal storms. The 2025 STAP report delivers the latest findings to help policymakers prepare for rising seas and stronger storms. It also serves as a vital resource for scientists, insurance companies, and state, county, and municipal planners, and decision makers regarding this changing coastline.

The report is available for download at: bloustein.rutgers.edu/report-new-jerseys-rising-seas-and-changing-coastal-storms/.^{♾️}



“ Sea level has been rising more and more, first by 0.5 inches per decade, but now by 2 inches per decade. What's ahead? More rise. ”

UPDATES

Take A Hike!

PDE Offers Virtual Tour Through Tidal Marsh



What does a tidal marsh sound like first thing in the morning? What's it like to walk among cordgrass and phragmites and hear some of the wildlife that live in these swampy areas? Now you can enjoy the sights and sounds of nature in a tidal marsh, compliments of Partnership for the Delaware Estuary's new story map.

No boots, boats, or bug spray required.

Hear clips of wildlife and see how many species you can identify. Play games and test your knowledge of nature. Go through the different zones of a marsh from the upland transition zone to creek channels and find out the difference between biophony, anthropophony, and geophony. Visit: bit.ly/TidalMarshVirtualHike.^{♾️}

Delaware Releases Revised Climate Action Plan

2025 Plan Addresses Rising Heat, Flooding, and Health Risks

In January, Delaware released its “2025 Climate Action Plan”, a practical guide to reduce emissions, strengthen resilience, and secure a safer future for the First State.

Gov. Matt Meyer said. “We’ve seen real progress towards ambitious targets to cut pollution and strengthen resilience, but now we accelerate – because protecting our environment means protecting our families, our economy, and our future.”

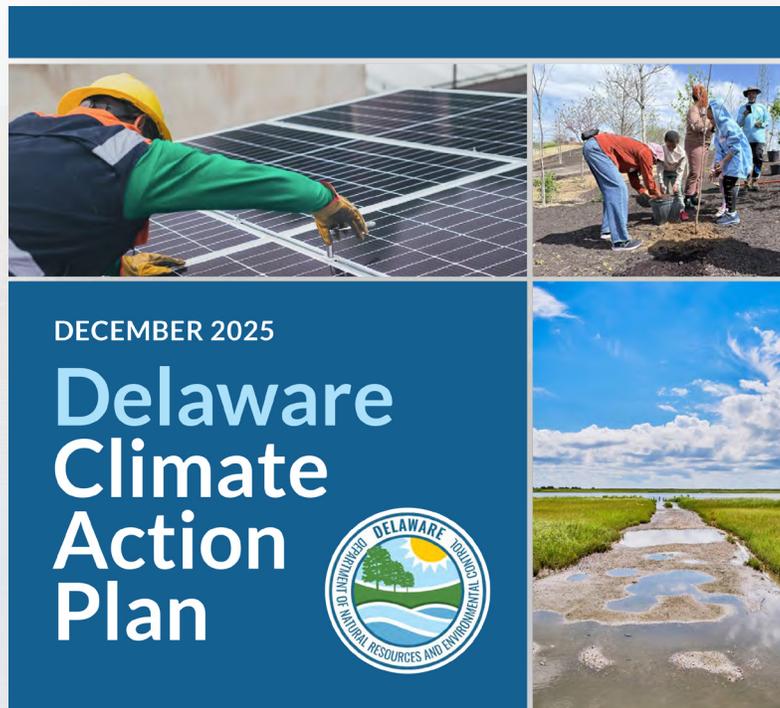
In addition to identifying near-term actions and long-term strategies for emission reduction and resilience, the 2025 Plan outlines climate risks and future scenarios, highlights recent progress, discusses workforce needs, and directs an all-of-government approach to responding to climate change. It also includes a chapter dedicated to the important intersection between responding to climate change and land use.

Greg Patterson, Secretary for the Delaware Department of Natural Resources and Environmental Control, said the plan is flexible. “Actions may change over time based on increased understanding of climate impacts, technology advancements, and stakeholder input,” he said. “While DNREC plays a leading role in implementing the Plan, no single policy or agency can solve this issue alone. It will take all of us working together.”

The 2025 Climate Action Plan outlines a path to near net-zero emissions by 2050 and steps to improve community resilience. It supports transparency, accountability, and a collaborative approach to climate planning, with regular updates due in 2027 and 2029. The next Climate Action Plan will be published in 2030.

“Our Climate Action Plan puts people first by protecting clean air and water for every Delawarean, creating good-paying clean energy jobs, and making our communities safer and more equitable,”

Visit de.gov/climateplan to explore the full plan and data. The 2025 Climate Action Plan is also available in Spanish. For any questions, please email govcomm@delaware.gov. 💧



A STATEWIDE PLAYBOOK FOR ADDRESSING CLIMATE CHANGE IN THE FIRST STATE



Danielle Kreeger, Ph.D.

In December 2025, the environmental community lost a champion of the Delaware Estuary. An accomplished aquatic and marine ecologist, Danielle Kreeger, Ph.D. devoted more than 30 years to advancing the science of freshwater and saltwater ecosystems. Her passion and innovative thinking advanced our understanding of wetlands, bivalves, and the critical role of ecosystem services in climate resilience in the Delaware Estuary and beyond. Danielle will be remembered for her many contributions to the Delaware Estuary, PDE, and other partner organizations and leaves a legacy as an ecologist, researcher, mentor, educator, scientist, and advocate. Danielle's obituary can be viewed by visiting bit.ly/3NTiHar.



SAN Recognizes a Good Year's Work at Annual Meeting

The Schuylkill Action Network (SAN) held its annual meeting in November at Albright College in Reading, Pennsylvania, celebrating 22 years of collaboration for a cleaner, healthier Schuylkill River Watershed. Attendees received updates on ongoing work to improve agriculture, engagement, pollution prevention, and more.

The SAN gave special awards, including its Most Valuable Player Award to Meghan Rogalus, Watershed Manager in the Watershed Support Section of the Pennsylvania Department of Environmental Protection,

an Impact Award to Alexa Smith of Schuylkill Conservation District, and a Legacy Award to Dan Koury of the Pennsylvania Department of Environmental Protection.

Thank you to all who participated and to the Philadelphia Water Department and Aqua, an Essential Utilities Company, for their ongoing support of the SAN. Thank you to the Center for Excellence in Local



Rogalus, Smith and Koury show off their SAN awards.

Government at Albright College for sponsoring this event.

Celebrate 30 Years With Us:

Give \$30 For 30!

March marks the Partnership for the Delaware Estuary's 30th anniversary—our pearl anniversary, a milestone that reflects three decades of protecting and restoring the tidal Delaware River and Bay. To honor this important year, we're inviting you to join our "\$30 for 30" years campaign.

Your gift of \$30 or more will help fuel the next chapter in PDE's history of supporting clean waters, thriving habitats, and resilient communities throughout our estuary.

Your generosity keeps this work going. Thank you for being part of our story – and our future.💧



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ESTUARY EVENTS

CHRISTINA RIVER WATERSHED CLEANUP

Saturday, April 11, 9 a.m. to noon, Vandever Ave. Wilmington

Want to make a positive impact in your community? Register today for the Christina River Watershed Cleanup! This annual event brings volunteers together at sites throughout New Castle County, Delaware and Landenberg, Pennsylvania from Brandywine Creek State Park to PDE's cleanup site at Vandever Avenue in Wilmington. Just a few hours of litter pick up helps keep our neighborhoods, parks, and waterways cleaner and healthier. For information, visit christinarivercleanup.org.

CHESTER RIVER FESTIVAL

Saturday, May 9, 11 a.m. to 2 p.m., Subaru Yards, Chester, Philadelphia

Celebrate community and clean water this May at the Chester River Festival. This annual event offers games, educational booths, fishing lessons, entertainment, food trucks, and the chance to bond with fellow community members in a joyful atmosphere. For more information, visit delawareriverfest.org/chester.



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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. To find out how you can become one of our partners, call PDE at (800) 445-4935 or visit our website at www.DelawareEstuary.org.

Partnership for the Delaware Estuary, Inc.

Kathy Klein
▶ (302) 354-0307
▶ kklein@DelawareEstuary.org

Environmental Protection Agency

Irene Purdy, Region II
▶ (212) 637-3794
▶ purdy.irene@epa.gov
Megan Mackey, Region III
▶ (215) 814-5534
▶ mackey.megan@epa.gov

Pennsylvania

Jason Minnich
PA Department of Environmental Protection
▶ (717) 787-0124
▶ jaminnich@pa.gov

Delaware

Rachael Phillos
DE Department of Natural Resources and Environmental Control
▶ (302) 735-3411
▶ Rachael.Philllos@delaware.gov

New Jersey

Natalie Young
NJ Department of Environmental Protection
▶ (609) 940-4512
▶ natalie.young@dep.nj.gov

Delaware River Basin Commission

Chad Pindar
▶ (609) 883-9500, ext. 268
▶ chad.pindar@drbc.gov

Philadelphia Water Department

Will Whalon
▶ (267) 207-0937
▶ william.whalon@phila.gov

Editor

Kate Layton
▶ (302) 255-6878
▶ klayton@DelawareEstuary.org

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