

3,000+



Delaware
River Festival
Attendees



1,231
Storm Drain
Markers
Installed



58,450
Pounds of
Oyster Shell
Recycled

\$120,000+ Raised at the Experience
the Estuary Celebration



Years PDE has
Been Working
Toward our
Mission of Clean
Waters, Healthy
Habitats
& Strong
Communities



1,808
Pounds of Trash
Removed During
the Christina
River Cleanup



50,000+
Juvenile Freshwater
Mussels Deployed to
Grow-Out Ponds
in DE & PA



85
Abstracts
Submitted for the
2023 Science
Summit

600+



Social Media
Posts

43



Grant
Proposals
Submitted

19 Living Shorelines Monitored
in 10 Locations in DE, PA, NJ



CELEBRATING 25 YEARS



Partnership for the
**DELAWARE
ESTUARY**

1996-2021



Photo by Pam Smith-Elder



2021 Annual Report

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

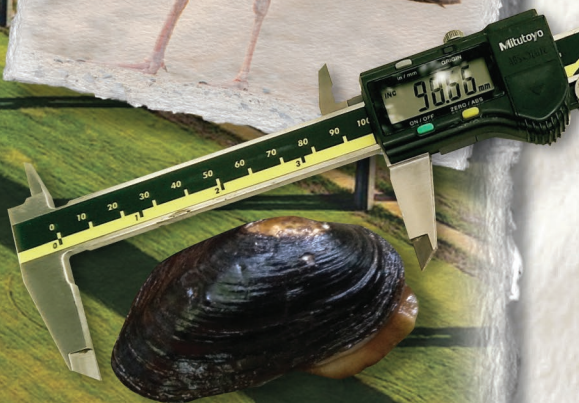


Photo by Gavin Brown

MESSAGE *from the* BOARD CHAIR *and* EXECUTIVE DIRECTOR

Dear Friends,

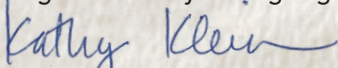
In 2021, the Partnership for the Delaware Estuary (PDE) celebrated 25 years of working for cleaner waters, healthier habitats, and stronger communities. Thank you to our dedicated Board of Directors, amazing staff, energized partners, and supporters like you from across the region who have helped to make our work possible.

At PDE, we realize that the Delaware Estuary means something different to each one of us. Are you captivated by the awe-inspiring beauty of the Delaware River and Bay, grateful that it is the source of our drinking water, or love spending time outside with family and friends? For us, it is all three of these things and so many more. First and foremost, we love the Delaware Estuary because it's the place we call home.

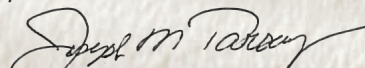
The future holds so much promise and opportunities for the Partnership for the Delaware Estuary. We are committed to better understanding our region's environmental challenges so that we can in turn realize impactful and sustainable solutions and long-term results.

All of us at PDE look forward to the next 25 years and continuing our partnership with you as we strive for cleaner waters, healthier habitats, and stronger communities across our region.

In gratitude for your ongoing support,



Kathy Klein
Executive Director



Joseph M. Tarsavage
Board Chair



2021 BOARD *of* DIRECTORS

Executive Committee

Chair: Joseph Tarsavage – Wood.

Treasurer: Jill E. Voorhees – SWM International

Secretary: Jeffrey Pantazes – AKRF

Nicole E. Brown – Suburban Consulting
Engineers, Inc.

Helen L. Gregory – PSEG Nuclear, LLC

Board Members

Colleen M. Arnold – Aqua America, Inc.

David Bushek – Haskin Shellfish Research
Laboratory, Rutgers University

Laura Copeland – Philadelphia Water Department

Michael Dillon – Manko, Gold, Katcher & Fox, LLP

Craig Durand – TTI Environmental Inc.

Katherine S. Eberhart – Ørsted

Patricia Elkis – Delaware Valley Regional
Planning Commission

Ronald B. Heun, Jr. – Constellation Energy
Generation, LLC

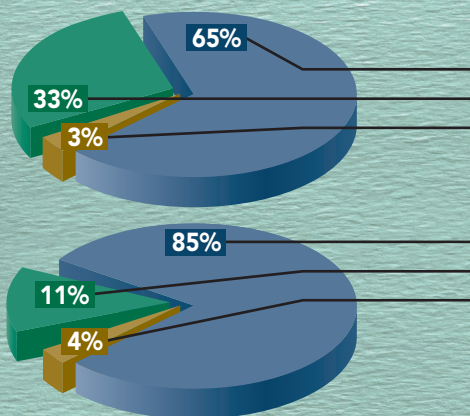
Roxanne E. Jayne – Law Office of Roxanne
E. Jayne, LLC

Kristina Kesack – Lockheed Martin

Scott T. Northey – The Chemours Company

David Small – Verdantas

2021 AUDITED STATEMENT *of* ACTIVITIES*



*Please remember PDE
in your giving!*

FOR THE YEAR ENDED DECEMBER 31, 2021

Support and Revenue:

Government Grants and Contracts.....	\$1,682,709
Contributions and Grants.....	\$ 853,586
Other Revenue.....	\$ 69,356

TOTAL SUPPORT AND REVENUE.....\$2,605,651

Expenses:

Program Services.....	\$2,148,306
Management and General.....	\$ 278,016
Fundraising.....	\$ 101,096

TOTAL EXPENSES.....\$2,527,418

Change in Net Assets.....\$ 78,232

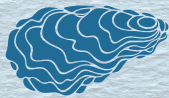
Net Assets at December 31, 2020.....\$1,457,609

Net Assets at December 31, 2021.....\$1,535,841

*Audit not completed at time of publication.

Audited financial statements can be found at www.DelawareEstuary.org.

2021 BY *the* NUMBERS



38,100

Pounds of
Oyster Shells
Recycled



PDE Celebrates
its 25th
Anniversary

220 Feet of Living Shoreline Installed



403



Attended the
Virtual Cience &
Environmental
Summit



479

Storm Drain
Markers
Installed

39



Grant Proposals
Submitted

1,092



Delaware River
Festival In-Person
Attendees



1 Living Shoreline Story
Map Created



Wetland
Assessment Tool
for Condition &
Health (WATCH)
Launched



1,340

Pounds of Trash
Removed During the
Christina River Cleanup



Photo by
Arabelle Osicky



1998

Teacher's Workshop
participants.

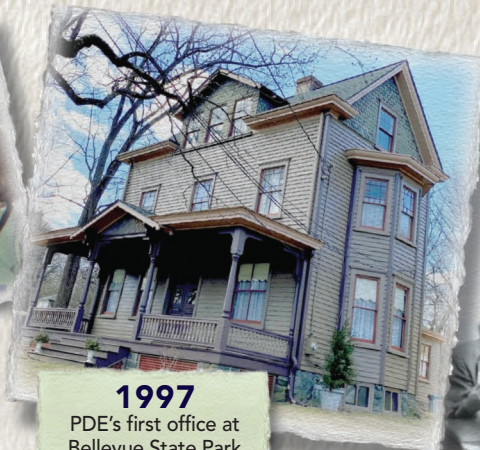
PDE THROUGH *the* YEARS



Photo by Neil Benson

1996

Signing of the
original CCMP.

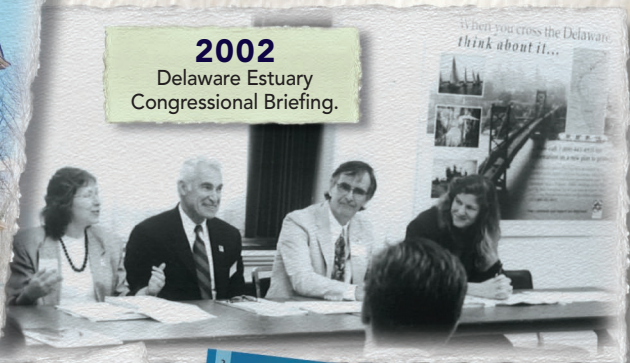


1997

PDE's first office at
Bellevue State Park
in Wilmington, DE.

2002

Delaware Estuary
Congressional Briefing.



2013

Green City, Clean Waters
art contest winners.



2014

Living Shoreline
installation.



2019

DELEP revises CCMP for
the first time since the original
was published in 1996.



2021 FUNDERS, SPONSORS, *and* DONORS

The Partnership for the Delaware Estuary thanks everyone who supported our work with contributions, grants, event sponsorship, cooperative agreements, and donations.

GRANTS, CONTRACTS, & PROJECT FUNDING SUPPORT

3Mgives

The Academy of Natural Sciences of
Drexel University

AECOM

American Planning Association,
Delaware Chapter

Aqua America, Inc.

Aqua Pennsylvania, Inc.

Barneget Bay Partnership

Camden County Municipal Utilities Authority
City of Wilmington

Delaware Alliance for Nonprofit Advancement

Delaware Cares Act

Delaware Center for Inland Bays

Delaware Department of Natural Resources
and Environmental Control

Delaware Nature Society

Delaware National Estuarine
Research Reserve

Delaware Recycling Public Advisory Council

Delaware Sea Grant

Delaware Valley Regional Planning
Commission

Delaware Water Infrastructure
Advisory Council

Drexel University

Dr. Susan S. Kilham Research Fund

DuPont Clear into the Future

DuPont Nature Center

Exelon

Energy Transfer/Sunoco Foundation

EDiS

Esri

Fairmount Water Works

George, Miles & Buhr, LLC

Geraldine R. Dodge Foundation

GreenWatch Institute

Habithèque Inc.

Independence Seaport Museum

John Bartram Association

The Klein Paul Fund

Longwood Gardens

National Fish & Wildlife Foundation

National Geographic Society

National Oceanic & Atmospheric
Administration

National Sea Grant

The Nature Conservancy, New Jersey Chapter

The Nature Conservancy,

Pennsylvania/Delaware Chapter

New Jersey Department of Environmental
Protection

New Jersey Sea Grant

NV5, Inc.

PECO

Pennsylvania Coastal Zone Management
Program

Pennsylvania Department of Conservation
& Natural Resources

Pennsylvania Department of Environmental
Protection

Pennsylvania Infrastructure Investment
Authority (PENNVEST)

Pew Charitable Trust

Philadelphia Water Department

Pinelands Preservation Alliance

Proud Pour

PSEG Foundation

River Network

Rutgers University

Rutgers University, Haskin Shellfish
Research Laboratory

Salesforce Foundation

Schuylkill River Restoration Fund

Stantec Consulting Services, Inc.

State of Delaware

Sussex County Council

SUEZ Delaware

University of Delaware

University of Maryland Finance Center

U.S. Department of Agriculture

U.S. Environmental Protection Agency

U.S. Fish & Wildlife Service

Wakefern Food Corporation

Welfare Foundation

The William Penn Foundation

Winterthur Museum, Garden, & Library

CORPORATE & COMMUNITY ENVIRONMENTAL STEWARDSHIP PROGRAM (CESP)

New Castle County



2016

Oyster Shell Recycling
Program's first pile
of oyster shells.

2021 DONORS

(Campaign year – January 1, 2021
through December 31, 2021)

\$2,500 and Above

Curtis W. McGraw Foundation

Dr. Susan S. Kilham

Kathy Klein & David Paul

\$1,000 to \$2,499

Colleen Arnold, PE

Mary Cebra

Robert K. Dobbs

Patricia Elkis

Roxanne E. Jayne, Esq.

Monroe Energy

Christine Neely

Jeffrey & Lynn Pantazes

George F. Phelps

Pilots' Association for the Bay &
River Delaware

Howard & Mrs. Gail Schaevitz

Joseph & Janine Tarsavage

Zoroastrian Association of Pennsylvania
and New Jersey



Photo by Jim Hansen



2003

Experience the
Estuary Celebration.

\$500 to \$999

Frances B. Carter
Christian Castillo
Michael Dillon
Tom & Melina Ei
Ron Heun
Elizabeth Horsey
Kristina Kesack
Joe & Jeanne McAtee
Shawn McGlinchey
Gus Mergenthaler
Andrew & Kathleen Moody
Hiram H. Munger
Leah Gaffney & Mike Pickel
Thomas C. Roberts
David & Cindy Small
Robert J. Valihura & Debbie Pace
Tracey Whitesell & Terrance Huettl



Photo by Stephanie Rindosh

\$250 to \$499

John A. & Jenifer N. Burghardt
David & Deborah Bushek
George & Karen Cook
Roy Denmark & Judy Hykel
Kevin Donnelly
Durand Family
Katie Eberhart
Exelon Foundation
Jeff & Karen Fleming
Robert Goldman
Helen Gregory
Lesley Fuchs
Courtney Richmond
Judi Jeffers
Bob Kahley
Robert G. Locke & Sarah Thorne-Locke
Kimberly Long
Daniel Martin
Debra McCarty & Richard Stasiorowski
Frank McShane & Vanessa Fenton
Rachel C. Muir
Anne & Gary Murphy
Howard Neukrug
Octoraro Native Plant Nursery
Richard & Suzanne Paul
PSEG Foundation
Jonathan & Carla Rinde
Dawn Rittenhouse



Photo by Beth Baker

\$150 to \$249

Anonymous
Buzz & Kathy Adkins
Ed & Ridgely Biddle
Danielle Buehler
Steven & Margaret Castorani
Marjorie Crofts
Delaware Bay & River Cooperative
James Eisenhardt
David Fiedler
Shawn Frye
Edmond Horsey
William & Martha Hudson
Dave & Bonnie Kitts
Danielle & Karen Kreeger
Hunter & Irene Lott
Kenneth Najjar
Scott Northey
Ellen & Stephen Pearlman
Lawrence Lindsay & Carla Puppin
Bill & Loren Reichert
Krista E. Scheirer
James & Eileen Shissias
Carol Spiker
Whibco Inc.
Mary White
Lisa Wool

\$75 to \$149

Anonymous (6)
Jen Adkins & Andy Cloud
Juni Alam
Michael & Barbara Alushin
AmazonSmile Foundation
Charles App
Ronald G. Ashley
Dave Athey
John Balletto
Maureen Barden & David Othmer
Christopher F. Baum
Warren Bimblick
Bernie Bittner
Jineen Boyle
Nicole E. Brown
Josef A. Burger
Cape May-Lewes Ferry
Senator Tom Carper
Edward W. Christoffers
Kimberly C. Cloud
Joanne Dahme
Jeff Dobbs
Jeanne & Burt Doremus
Ann Faulds & Christopher Robinson
Russ Furnari
Marc & Sharon Gold
Victoria Gordon
Beth & Warren Haas
Debra Harris
Bruce M. Hashinger III
Michael Hogan
James & Elizabeth Holt
James Hook & Wen Chyi Shyu
Ann Baker Horsey



2002

Former PWD Commissioner
Kumar Kishinchand participates
in a storm drain marking
event in Philadelphia.

Robert W. Horsey
Peter Horthy
George Horvath
Richard Huffman
IFS Insurance
Rich & Salli Innes
Charles Karl
Michael Klein
Barbara Klein
Sue & Bernhard Kofoet
Cecilia M. Kunath
Victoria Land
Tim & Judy Long
Donald & Theresa MacBride
Meg McGuire
Drew & Molly Mihocko
Christopher Obropta
Kerry O'Connell
The Oyster House
Angela Padeletti
Prudential
Kristine Qualls
Sari Rothrock
Richard & Margaret Ruhl
Mary Ellen & Robert T. Scott
Therese Horsey Seibert
Jonathan & Gwyneth Sharp
Louisa Hill Spottswood
Kash Srinivasan
Drs. Cynthia & Ralph Stahl
Ann Tegnell
Virginia Thompson
Stephen Thompson
William E. Toffey
Cynthia Tran
Bob Tudor
John Walber
Marianne Walch
Warren Environmental Counsel LLC
Kim West
Sally & Hugh Willig
Thomas Zibinski
Cynthia Zirkle



2014

Wilmington Earth and
Arbor Day Celebration.





2011

The first Delaware Estuary Life Time Achievement Award is awarded to Jonathan Sharp of the University of Delaware for his extensive work in the Estuary.

Photo by
Carol Brightbill

Up to \$75

Anonymous (3)
June Alt & Andrew Blair
Donald & Diane Azuma
Shaun & Jamie Bailey
William Baker
John Bargelski
Chris Bason & Archer Larned
Emily Bea
James & Tammy Beeson
Julia I. Schauer & Boyd J. Benjamin
Robert Benson
John J. Blong
Haley Burns
Chet Bush
Randy Butt
Michael N. Castle
John M. Cheezum, Jr.
Marianne B. Cinaglia
Stephen Clark
Dorothy Colburn
Laura Copeland
Deborah Costas
Dennis Cowart
Sharon & Dan Crampton
Ron Dempsey
Stephen Dobbs
Patrick Ede
William S. & Melonie K. Ettinger
Thomas B. Evans Jr.
Kaitie Evers
Richard & Lorraine Fleming
Anita & Robert Fonash
Carl B. Ford
Lou Gallo
Bea Hickey
Maryann D. Hooker
Ed Hotaling
Patricia Huff
Kate Hutelmyer
Mary Jane Isaacs
Kenneth Koch
Anthony Kopke
Jay Kottoff

Mrs. Laning
Elda Layton
Stacey Layton
Beth Layton Baker
Glenda Lewis
Suzanne S. Marinell
Lewis B. Maul
Tony Mazzarella
Richard McCorkle
Joshua Moody
Daniel Morris
Dolores Morrison
Walter Mugdan
Ben & Susan Myerov
Jennifer O'Connor
Susan Onorato
Dr. & Mrs. Harry W. Otto
Al & Pat Padeletti
Yolanda Pagano
Dennis Palmer
Craig Patterson
Lynn & Joseph Pokrifka
Irene Y. Purdy
Anthony & Kathleen Radocaj
Francesca Ramacciotti
Brian J. Reidy
Roger J. Rider
Meghan Rogalus
Michael & Rachel Rondinelli
Barbara T. Ross
June & Joe Satterfield
John H. Saunders
Jana Savini
Judith Schwank
Andy Shea
Julie Slavet
Steven Stites
Susanne Strippoli Curran
Janet Tarpine
Robert Traver
Jerome W. Virden
Doug Werner
Donna Wetterlund
Kathy Wiz
Metthea Yepsen

In Memory of John T. & Martha Ann Mattern Grey

Dr. David Mattern & Ms. Charlotte Crystal

In Memory of Sophie Homsey

Andrew Homsey

In Honor of Eric Lienhard

Vidhya Amirthalingam
Natalee Elliott
Karen Forst
April Greener
Cynthia Harris
Elizabeth Horsey
Jacqueline Kiwanuka
Kathy Klein & David Paul
Kevin Kruger
Amit Luhadiya
Rachel Parkhurst
Seema Ranchhoojee
Brian Rothman



Bee photo by
Patricia Land

In Honor of Carl N. Shuster, Jr.

George & Mrs. Susan Shuster

In Honor of Sierra's Birthday

Scott Ellis
Nana Jones

In Memory of Brian D. Wolfhope

Capano Management
Louis Capano
Beverly & William Fox
Daniel Simmons
Mr. & Mrs. Zimmerman



2015

Shorty is crowned
PWD's Philly Spokesdog.



2019

Deploying juvenile freshwater
mussels into a pond at
Winterthur in Wilmington, DE.





2021

Delaware River Fest
at Awbury Arboretum.

2021 Science & Environmental Summit Sponsors

AECOM
AKRF, Inc.
Barnegat Bay Partnership – Ocean County College
Chemours
Coalition for the Delaware River Watershed
Delaware Department of Natural Resources and Environmental Control
Delaware River Basin Commission
Delaware Sea Grant
Delaware Valley Regional Planning Commission
Duffield Associates
Exelon Nuclear
Monroe Energy, LLC
National Wildlife Federation
New Jersey Department of Environmental Protection
Penn LPS Online
Pennsylvania Department of Environmental Protection
Philadelphia Water Department
Princeton Hydro
PSEG Nuclear, LLC
Ramboll
Stantec Consulting Services, Inc.
The Water Center at Penn
TTI Environmental, Inc.
Urban Engineers Inc.
Wood
YSI / Xylem

2021 Experience the Estuary Celebration Sponsors

AECOM
Aqua
Artesian Water Company
Brown and Caldwell
Burns & McDonnell
Calpine
Cape Atlantic Conservation District
Chemours
Christiana Care
Colonial Pipeline
Delaware City Refinery
Delaware Department of Natural Resources and Environmental Control
Delaware Valley Regional Planning Commission
Duffield Associates, Inc.
Energy Transfer
Environmental Standards, Inc.
ERM, Inc.
Eugene Mattioni
Exelon
Exelon Generation
Hazen and Sawyer
HDR
Hydrolox
Jacobs
Kleinfelder
Manko, Gold, Katcher & Fox, LLP
Maritime Academy Charter School
Maritime Exchange for the Delaware River & Bay
Monroe Energy
Mott MacDonald
New Castle Conservation District
Normandeau Associates
Philadelphia Water Department
PhilaPort
Pilots' Association For The Bay & River Delaware
PSEG Nuclear, LLC
Rutgers University, Department of Marine & Coastal Sciences
Rutgers University, Haskin Shellfish Research Laboratory
S. T. Hudson Engineers, Inc.
Sovereign Consulting Inc.
SWM International



Photo by Arabelle Osicky



2015

Teacher's Workshop at the
DuPont Environmental
Education Center.

TRC
TTI Environmental, Inc.
University of Pennsylvania, Master of Environmental Studies
Urban Engineers, Inc.
W. Michael McCabe
Wood

2021 Experience the Estuary Celebration Supporters

Liam Abrams
Adventure Aquarium
Juni Alam
Colleen Arnold
Atlantic Capes Fisheries
Bartram's Garden
Bivalve Packing Company
Brandywine River Museum
Nicole Brown
Iris Burt
Delaware Art Museum
Roy Denmark & Judy Hykel
Bob Dobbs
Craig Durand
Katie Eberhart
Tom & Melina Ei
Patty Elkins
Karen Forst
Go Ape!
Rob Goldman
Helen Gregory
Jenn Gius
Harry's Savoy Grill
Ron Heun
Elizabeth Horsey
Jillian Jamieson
Japan America Society
Keen
Kathy Klein & David Paul
Kate Layton
Let's Roam
Frank McShane
Gus Mergenthaler
Northland Airboats
Joey O'Brien
Kerry & Patrick O'Connell
Jeff Pantazes
Opera Philadelphia
Quintessence Theatre Company
David & Cynthia Small
Shake Shack
Joe & Janine Tarsavage
The Couch Tomato
Total Wine & More
Treetop Quest
Julie Varner
Jill Voorhees
Wawa
Meghan Wren

The Partnership for the Delaware Estuary makes every effort to ensure the accuracy of these listings. If you find an omission or a misspelling, please excuse our error and contact us at 1-302-655-4990, ext. 114 so that we may update our records for future donor listings.



2015

PDE staff ridding the Delaware River of trash with Living Lands and Waters.

PARTNERSHIP *for the* DELAWARE ESTUARY STAFF

Francesca Blom, Philadelphia Community Coordinator
Sarah Bouboulis, Habitat Coordinator
Haley Burns, DELEP Program Specialist
Kurt Cheng, Shellfish Science Manager
Kaitie Evers, Engagement Specialist
Kelly Faller, Science Fellow
Karen Forst, Grants Manager
Matthew Gentry, Shellfish Coordinator
LeeAnn Haaf, Estuary Science Manager
Elizabeth Horsey, Development Director
Kate Hutelmyer, Engagement Manager
Kathy Klein, Executive Director
Jecy Klinkam, Science Intern
Danielle Kreeger, Science Director
Kate Layton, Communications Coordinator

Jonetta Lucas, Finance Director
Joshua Moody, Ecological Restoration Manager
Sarah Morales, Delaware Community Coordinator
Leah Morgan, Shellfish Specialist
Nancy Nyamumbo, Staff Accountant
Kerry O'Connell, Development Coordinator
Angela Padeletti, Operations Director
Meghan Rogalus, Schuylkill Action Network (SAN) Manager
Erica Rossetti, Urban Waters Program Coordinator
Ellie Rothermel, Data Management Coordinator
Jana Savini, Coastal Collaboration Coordinator
Mikki Schoendorf, Science Intern
Cyndi Slothour, Office Administrator
Ken Williamson, Restoration Specialist

2021 DELAWARE ESTUARY PROGRAM COMMITTEE MEMBERS

STEERING COMMITTEE

Chair: Shawn M. Garvin, Secretary – Delaware Department of Natural Resources and Environmental Control
Aneca Y. Atkinson, Deputy Secretary of Water Programs – Pennsylvania Department of Environmental Protection
Marc Cammarata, Deputy Water Commissioner – Philadelphia Water Department
Vincent Mazzei, Assistant Commissioner for Watershed and Land Management – New Jersey Department of Environmental Protection
Javier Laureano, Ph.D., Director of Clean Water Division – U.S. Environmental Protection Agency, Region 2
Diana Esher, Acting Regional Administrator – U.S. Environmental Protection Agency, Region 3
Steve Tambini, Executive Director – Delaware River Basin Commission
Joseph Tarsavage, Chair – Partnership for the Delaware Estuary Board of Directors

ESTUARY IMPLEMENTATION COMMITTEE

Chair: Kathy Klein, Partnership for the Delaware Estuary
Kelly Anderson, Philadelphia Water Department
Elizabeth Butler, U.S. Environmental Protection Agency, Region 2
Kimberly Cole, Delaware Department of Natural Resources and Environmental Control
Catherine Magliocchetti, U.S. Environmental Protection Agency, Region 3
Kristina Peacock-Jones, Pennsylvania Department of Environmental Protection
Chad Pindar, Delaware River Basin Commission
Jay Springer, New Jersey Department of Environmental Protection

SCIENCE AND TECHNICAL ADVISORY COMMITTEE

LEADERSHIP

Chair (acting): Dorina Frizzera – Getting to Resilience, LLC
Science Advisor: Danielle Kreeger, Ph.D. – Partnership for the Delaware Estuary
Ex Officio Representative: Kathy Klein – Partnership for the Delaware Estuary, EIC Chair

STANDING REPRESENTATIVES

Lance Butler – Philadelphia Water Department
Randall Brown – Pennsylvania Department of Environmental Protection
Kelly Somers – U.S. Environmental Protection Agency, Region 3
Namsoo S. Suk, Ph.D. – Delaware River Basin Commission, Monitoring Advisory Committee, & Toxics Advisory Committee
David Wolanski – Delaware Department of Natural Resources and Environmental Control
Metthea Yepsen – New Jersey Department of Environmental Protection

ELECTED REPRESENTATIVES

Laura Craig, Ph.D. – Princeton Hydro
Sheila Eyler – United States Fish and Wildlife Service
Ronald B. Heun, Jr. – Constellation Energy Generation, LLC
Doug Janiec – Sovereign Consulting, Inc.
Desmond Kahn, Ph.D. – Fishery Investigations
Susan Kilham, Ph.D. (Past Chair) – Drexel University; Department of Bioscience and Biotechnology
Greg Lech – Pennsylvania Fish and Boat Commission, Division of Environmental Services
Joshua Moody, Ph.D. – Partnership for the Delaware Estuary
Jason Morson – Rutgers University, Haskin Shellfish Research Laboratory
Daphne Munroe, Ph.D. – Rutgers University, Haskin Shellfish Research Laboratory
Andrew Reif – United State Geological Survey
Alison Rogerson – Delaware Department of Natural Resources and Environmental Control
Pete Rowe – New Jersey Sea Grant Consortium
David Smith – United State Geological Survey
Kari St. Laurent, Ph.D. – Delaware Department of Natural Resources and Environmental Control
Kenneth A. Strait – PSEG
Elizabeth Watson, Ph.D. – The Academy of Natural Sciences of Drexel University
Bart Wilson – United States Fish and Wildlife Service



Photo by Susan Rogozinski



110 S. Poplar Street, Suite 202, Wilmington, DE 19801
(302) 655-4990 • www.DelawareEstuary.org

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



Photo by Beth Baker

IN THIS ISSUE

SCIENCE AND ENVIRONMENTAL SUMMIT:

Estuaries on the Rise
We have the highlights!

PAGE 6

Model Behavior:
3-D living shoreline model engages public outreach in a fun way

PAGE 4

"Mussels for Clean Water Initiative" for the upper mid-Atlantic region
Spring Cleaning:
Area cleanups are getting into gear

PAGE 11

FRESHWATER MUSSEL PROPAGATION IN A HATCHERY

A mussel propagation hatchery is being designed in Philadelphia, paired with regional mussel rearing centers, to supply the animals needed to support MuCWI.

The lower Schuylkill and Delaware Rivers are especially affected by urban runoff and water quality impairment. Situating the production hatchery in the urban corridor of the Delaware River Basin will promote local mussel projects, such as reestablishing mussel beds in streams, living shoreline projects, and introducing them into man-made stormwater retention ponds.

The hatchery will also serve as a source of animals for diverse research, monitoring, bioassessment, and education throughout the Delaware and Susquehanna River Basins, and neighboring watersheds in the upper mid-Atlantic region.

Regional mussel rearing centers are also being developed where aquaculture practices can be used to produce "taggable" sizes of >20 mm so they are suitable for projects. The current annual production of taggable-sized mussels, focusing initially on foundational species that dominate natural mussel beds, is being increased.

This hatchery will be the first to focus on producing mussels for the main goal of promoting

The Partnership for the Delaware Estuary (PDE) is collaborating with numerous entities to develop and construct the central hatchery. Partnered with John Bartram Association (JBA) to design and construct the central hatchery in southwest Philadelphia. Other partners are working with PDE to develop rearing centers, mussel restoration projects and diverse educational programs, such as JBA, the Philadelphia Academy of Natural Sciences of Drexel University.



Figure 3. Fish gills infested with mussel larvae (i.e., glochidia). After formation of glochidia from broodstock, attachment onto species-specific fish hosts is the next step in propagation. Fish will be maintained in the facility.

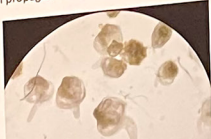


Figure 4. Viable *Elliptio complanata* larvae viewed under a microscope.



Figure 5. Hatchery-propagated juvenile *U. imbecilis* mussels are prepared for deployment in mussel baskets for grow-out in a pond.

Figure 6. Early rearing of Bartram's Garden while the second

- Pilot project and restoration space (PDE)
- Results of the new attempt



ESTUARY NEWS

NEWSLETTER OF THE PARTNERSHIP FOR THE DELAWARE ESTUARY – HOST OF THE DELAWARE ESTUARY PROGRAM





Dear Friends,

I hope that you are doing well, enjoying the longer hours of daylight, and share in my excitement that spring is just around the corner.

We are all feeling energized at PDE as we reflect on the successful 2023 Science and Environmental Summit that was held from Jan. 30 to Feb. 1. It was great to spend face-to-face time with 300 people at the Summit's new venue at Harrah's in Atlantic City. With almost half of the attendees being first timers, it was exciting to make new connections with scientists, students, and community leaders - people who all care about the Delaware River Watershed and are making contributions to help understand and take care of this amazing resource.

At this year's Summit we were very fortunate to have a fantastic lineup of keynote speakers, plenary sessions, and contributed posters. I am so grateful to all of our sponsors and partners who helped to make the Summit such a success. The Summit's program, which included the second Climate Change Forum held in partnership with the Delaware River Basin Commission, provided a wonderful opportunity to take a deep dive into getting a better understanding of the current challenges facing the Delaware River and Bay. To learn more about these challenges and Summit highlights, I hope you take the time to read the articles included in this newsletter and check out the proceedings of the Summit that can be found at www.delawareestuary.org/summit.

Another exciting initiative that has gotten off the ground in 2023 is the second phase of the Water Table project. The William Penn Foundation awarded PDE with a three - year grant to support Phase 2 of the Water Table Project. The Water Table Project is a group that works in partnership with co-leads from the Delaware Valley Regional Planning Commission, Water Resources Association of the Delaware River Basin, and the Philadelphia Water Department. The project is designed to bring together a wide range of stakeholders to address issues related to water resource management and protection in the Delaware Estuary Watershed. Building on the success of the first phase of the project, we have reconvened a Steering Committee and will move projects forward in four priority areas with the help of many partners through a committee process. We will be sure to keep you updated on this initiative in future issues of Estuary News.

Best wishes,

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)

▶ (800) 445-4935, ext. 102

▶ 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

Danielle Kreeger, Ph.D.

Partnership for the Delaware Estuary
Senior Science Director

▶ (800) 445-4935, ext. 104

▶ dkreeger@DelawareEstuary.org

Water Quality Advisory Committee

John Yagecic, P.E.

Manager, Water Quality Assessment
Delaware River Basin Commission

▶ (609) 883-9500, ext. 271

▶ john.yagecic@drbc.nj.gov

ON THE COVER

Leah Morgan, PDE's Shellfish Specialist, stands next to her poster presentation on freshwater mussels at the Delaware Estuary Science & Environmental Summit. Partnership for the Delaware Estuary held its first in-person Summit since 2019 at Harrah's Resort in Atlantic City, New Jersey.

FOLLOW US ON:



MORE TO WATCH

Salt Marsh Diagnostic Tool Gets Digital Upgrade

In 2018, the Wetland Assessment Tool for Condition and Health (WATCH) debuted for diagnosing site-specific wetland problems. Today, WATCH is evolving and growing for a digital audience.

WATCH encourages users to look holistically at all facets of marsh health by evaluating a suite of attributes that are fundamental to the way salt marshes function. By evaluating all of these attributes, a user can increase their confidence that they're correctly diagnosing the real problems taking place in a marsh and not just treating symptoms. To do this, WATCH employs mathematical "and/or/not" statements to evaluate evidence and look for unique combinations of factors that indicate particular problems. For example, a marsh with dying grass might indicate poor water drainage and/or poor elevation. If a person trying to diagnose a wetland problem is unaware of the poor drainage and only repairs the elevation, the grass will likely die. However, if both indicators are addressed, the grass will probably live.

WATCH started as a computer spreadsheet that calculated how each element of a marsh performs at present as well as a projected performance.

This year, the tool's designers are addressing missing aspects and putting WATCH into an online format that will make it more user-friendly.

"Developing an online module will help users to navigate it and find reference data needed to judge a tidal wetland site," said Metthea Yepsen, Chief of the Bureau of Environmental Assessment in the New Jersey Department of Environmental Protection's Division of Science and Research (NJDEP).

NJDEP funded the first iteration of WATCH through an Environmental Protection Agency Wetland Program Development Grant. Staff from several NJDEP programs participated in a steering committee for the project, and its scientific and regulatory staff worked closely with PDE during the development of the tool.

"During the early stages of the NJDEP funding, WATCH exponentially grew in terms of what we were actually developing," said Joshua Moody, Ph.D., a Research Scientist for NJDEP, who initially worked on WATCH while he was PDE's Ecological Restoration Manager. "At the end of that effort WATCH was released as an interactive spreadsheet with six attributes: horizontal position, vertical position,

continued on page 9

Table 1: Output Summary

VIOLATIONS	HORIZONTAL	VERTICAL	BIOLOGY	HYDROLOGY
Future	🚩	🚩	🚩	🚩
Current	🚩	✅	✅	🚩

🚩 deficiency detected

! need more info

✅ meets user criteria

In the online version of the WATCH wetland diagnostic tool, users put in their data and receive information that's easy to understand. Problem areas in a site raise red flags, and areas that are okay get green check marks.

HOW WOULD YOU WANT A RIVERBANK TO LOOK?

A 3-D MODEL LEAVES CHOICES TO THE IMAGINATION

Two kids hunched over a 3-D model of a park next to a river. Caught up in a world of imagination, they deliberated over where they wanted to place the model's brightly-colored pieces to complete the scene in which they could choose between creating a shoreline with natural elements like plants and logs vs. inserting a concrete berm, or bulkhead.

Spread over a green picnic table at Awbury Arboretum in Philadelphia, the set looks similar to a Minecraft or Lego playset. The children weren't the only ones attracted to the model. Jana Savini, Partnership for the Delaware Estuary's (PDE) Assistant Coordinator of Coastal Collaboration, noticed how the model drew people of all ages to PDE's display table only to get caught in the delightful spell of playing with the pieces while learning about estuary science.

This 3-D model isn't just a game, it's an interactive education and engagement tool about living shorelines. It not only gets children and adults engaged in this erosion mitigation tactic, but it also teaches about what living shorelines are made of and what they look like. In return, PDE gets feedback on what people would want a shoreline to look like if they lived near one.

So far, the model has been a hit

at outreach events like the one at the arboretum.

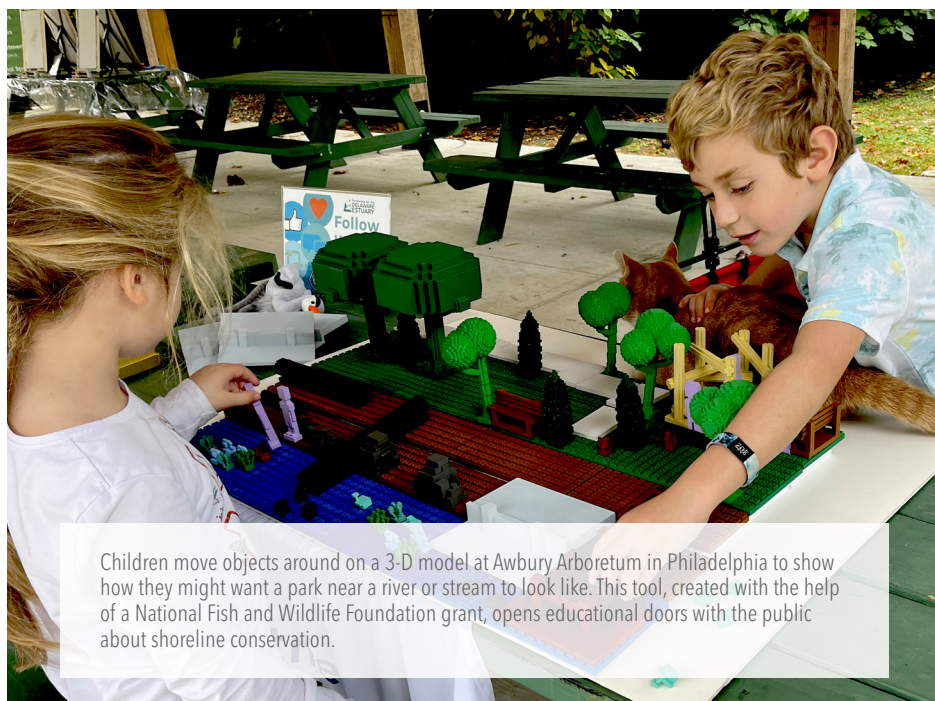
"This model helps us start these conversations and collect direct information regarding what people think is important along their waterways," said Ella Rothermel, PDE's Data Management Coordinator.

A living shoreline is an erosion control method often seen along the banks of rivers, creeks, and streams. They use natural elements such as native plants and grasses, shellfish habitat, and more, and provide various ecological

benefits. Living shorelines can fit into virtually any setting, including urban areas near parks.

PDE created the 3-D living shoreline model with help from a \$125,000 National Fish and Wildlife Foundation grant to expand living shorelines into Philadelphia. The overall goal of the grant is to conduct outreach to find out what people want shorelines to look like and then develop relevant designs based on their feedback. The model is spurring conversations around the impacts of people's choices and the many,

continued on page 10



Children move objects around on a 3-D model at Awbury Arboretum in Philadelphia to show how they might want a park near a river or stream to look like. This tool, created with the help of a National Fish and Wildlife Foundation grant, opens educational doors with the public about shoreline conservation.

Collaborate Northeast and PDE Working for Strong Communities in Wilmington

By Kristie Arlotta, PDE's Delaware Community Assistant Coordinator

The northeast area of Wilmington, Delaware, has many assets. It has a prime location near major transportation corridors and is close to a downtown area with live theater, shops, dining and vibrant night spots. It is also near the Brandywine River, often called Brandywine Creek.

Much of this community, however, also sits on former marshland that was filled in and paved over long ago. The result of this legacy is a community that have many negative environmental impacts and block access to the Brandywine and impact water quality. And with climate change these issues are being exacerbated. The Northeast neighborhood is 89 percent African American, 38 percent of its households are living in poverty, and nearly 25 percent of the area's housing units are vacant.

While there are a number of dedicated groups and institutions working to improve life in the greater northeast Wilmington area, several years ago it became clear that addressing these intertwined and long-standing challenges demanded a collaborative approach. Hence, Collaborate Northeast (CNE), a catalyst organization, was founded in 2020 to foster collaboration among the residents, businesses, community organizations, and other stakeholders. CNE is doing important revitalization and environmental justice work in northeast Wilmington and it hopes to help its residents to create a more equitable and resilient community. Last year, Partnership for the Delaware Estuary (PDE) joined forces with this group to help facilitate resilience projects in the area, including brownfield remediation and possibly the installation of a rain garden or similar green infrastructure.

Partnership for the Delaware Estuary is working with CNE to facilitate their community environment initiative. Late last year, CNE held its first resilience workgroup meeting, which had more than 30 stakeholders, including the Delaware Department



Collaborate Northeast held a community workshop in Wilmington on Nov. 30, 2022

of Natural Resources and Environmental Control, the City of Wilmington, the University of Delaware, Green Building United, Christina and Brandywine Rivers Remediation and Restoration Project (CBR4), and more. This group is working to coordinate all of the environmentally-focused efforts going on in the area and applying for grant money to finalize and begin implementation of the Northeast Wilmington Resilience Plan.

The mission of Collaborate Northeast is to coordinate and facilitate place-based redevelopment in Northeast Wilmington in a sustainable, creative, and community driven manner to ensure that economic and environmental resiliency is incorporated into every aspect of revitalization. Collaborate Northeast receives funding from Healthy Communities Delaware, which has enabled them to contract with four cross sector consultants to facilitate work in three focus areas – engagement, environment, and in the community economy.💧

STRONG COMMUNITIES/STRATEGY C2.6: ENGAGE KEY STAKEHOLDERS TO COORDINATE SCIENCE AND MANAGEMENT OF THE DELAWARE ESTUARY

MAKING WAVES



SENSATIONAL SCIENCE SUMMIT

With a diverse group of attendees, the 2023 Delaware Estuary Science & Environmental Summit delivered non-stop insight into our environmental world.

PDE's 10th biennial conference had presentations about climate change, environmental justice, water quality, blue crab populations, freshwater mussels, and more at Harrah's Resort in Atlantic City, New Jersey.

"[The Summit] really opened my eyes to the big picture of how all of us are important and the need to work together in maintaining the Delaware River and Estuary," said Barron Lacy, Executive Director of 9th Street Youth and Community Center in Chester, Pennsylvania. Lacy was one of 16 community leaders who attended the Summit as part of the Urban Waters Federal Partnership initiative that PDE leads for the Delaware River.

Keynote speakers included Ray Najjar, Ph.D. Professor of Oceanography in the Department of Meteorology and Atmospheric Science at Pennsylvania State University, Philippe Hensel, Ph.D., of the National Oceanic and Atmospheric Administration's National Geodetic Survey (NGS), and Catrin Einhorn, biodiversity reporter for the

New York Times. Back by popular demand was the climate forum from the Delaware River Basin Commission's Panel on Climate Change. Climate forum panelists included Shawn Garvin, Secretary of the Delaware Department of Natural Resources and Environmental Control, Shawn La Tourrette, Commissioner of the New Jersey Department of Environmental Protection, Rohit T. "Rit" Aggarwala, Commissioner of the New York City Department of Environmental Protection, and Adam Ortiz, Regional Administrator of EPA Region 3. Each panelist highlighted environmental problems and progress in each of their jurisdictions, but the overall message called for a united front in the fight against climate change.

"We're all worse off unless we act together, unless we are creative, unless we figure out a new set of solutions for how we make a world that we are not accustomed to, because the old way is just not going to suit us in a new environment," Aggarwala said.💧

STRONG COMMUNITIES/STRATEGY C2.5: PUBLISH AND SHARE OUTREACH MATERIALS AND SCIENTIFIC RESULTS

More photos of the event are available on our Flickr page:[bit.ly/PDEScienceSummit23](https://www.flickr.com/photos/pdesummit23/)

10th Biennial Conference



1. PDE's Executive Director Kathy Klein, left, and PDE's Senior Science Director Danielle Kreeger, right, present Meghana Parameswarappa Jayalakshamma of the New Jersey Institute of Technology with her certificate for winning best student oral presentation at the Delaware Estuary Science & Environmental Summit. Her topic was microplastics in stormwater. 2. DNREC Secretary Shawn Garvin, left, and New Jersey DEP Commissioner Shawn La Tourrette speak on a climate forum panel on Day Two of the Science Summit. 3. Keynote speaker Ray Najjar, Ph.D., a professor of oceanography at Penn State University, spoke at the Summit about the rapidly changing climate of the Delaware Estuary and Basin. 4. Catrin Einhorn, biodiversity reporter for the New York Times, talks about how to pique the public's interest in scientific topics. 5. Keynote speaker Philippe Hensel, Ph.D., Supervisory Geodesist at NOAA's National Geodetic Survey, tosses a bag of candy to an audience member who correctly answered a trivia question during his keynote speech. 6. A Science Summit attendee listens to a keynote speaker during the Science Summit. 7. People loved the oversized horseshoe crab plushie that PDE had on display at the Summit. 8. Klein, left, and Kreeger, right, present PDE's Shellfish Coordinator Matt Gentry and a student at Drexel University (second from left), and Sam Solomon of the New Jersey Institute of Technology, with their certificates after tying for best student poster presentation at the Science Summit. Gentry's presentation was on Physiological Plasticity and Response to Food Availability of Two Native Freshwater Mussel Species. Solomon's topic was on Impact of Climate Change on the Salinization of Coastal Wetlands.



SAN MVP:

For Nick Ramsey, SAN is About Collaborating for Common Goals

One minute Nick Ramsey was talking to a roomful of people about watershed projects in the Maiden Creek Watershed, and the next minute, he held a trophy in his hands.

Ramsey, a district conservationist with the United States Department of Agriculture in Leesport, Pennsylvania, is the 2022 recipient of the Kevin Munley MVP Award from the Schuylkill Action Network (SAN). The organization honored Ramsey with the award last November at the SAN Annual Meeting, held at The Rookery at Berks Nature in Reading, Pennsylvania.

"Nick is an incredible resource to the agricultural community and regional partners who work with farmers in Berks County," said Meghan Rogalus, PDE's SAN Manager. "He has continued to bring in and manage significant federal dollars to protect natural resources and sustain farming operations in the watershed and is an integral member of the SAN agriculture workgroup."

The SAN is a network of more than 100 partners who collaborate to improve water resources in the Schuylkill River Watershed. Each year, the group gets together to reflect upon the year and share stories about projects performed in the Schuylkill River Watershed. Due to the COVID pandemic, the November meeting was the SAN's first in-person event since 2019. The 2022 meeting not only featured presentations on various successful SAN projects, attendees also took advantage of the sunny fall day by taking guided tours of the Berks Nature property.

Each year, the SAN Planning Committee votes on an MVP who has shown exemplary service and dedication to the organization and improvement of the Schuylkill River Watershed. The award's namesake, Kevin Munley, was a watershed manager with the Southeast Region of the Pennsylvania Department of Environmental Protection and a strong SAN supporter before passing away in 2012.

"It's nice to be recognized," Ramsey said humbly upon receiving the award. He immediately thanked agency partners and his staff. "I don't do any of this alone."

Ramsey, a native Pennsylvanian, has been with the USDA for nearly 20 years. During that time, he has worked with several SAN partner agencies.

"We see the SAN as a collaboration, as a connection," Ramsey said. "We all work together to secure the same projects and the same goals."

Kim Fies, ACE Technician with the Berks County Department of Agriculture and co-chair of the SAN Agriculture Workgroup, credited Ramsey's long career with USDA at the annual meeting.

"You have seen the work he has been able to do through his leadership, commitment, and stability and guidance in the entire watershed program," Fies said. "His ability to communicate with the farmers build that level of confidence and that trust is so very key."

While Ramsey's USDA office handles various agriculture-related projects in Berks and Schuylkill counties, he has a professional and personal affinity for the Schuylkill Watershed. Not only does he live in the area, but he and his wife have a small farm near the headwaters of the Schuylkill River.

"I take a lot out of what I do at home, and I always make sure that I'm doing my part for what's best for the watershed," Ramsey said. 💧



Nick Ramsey holds the recipient of the Schuylkill Action Network's 2022 Kevin Munley Most Valuable Player award.

STRONG COMMUNITIES/STRATEGY C2.6: ENGAGE KEY STAKEHOLDERS TO COORDINATE SCIENCE AND MANAGEMENT OF THE DELAWARE ESTUARY

biology, hydrology, soil, and water quality.”

WATCH had some missing pieces, however, such as how sediment plays a role in marsh health and how people could access the tool in a way that’s easier to use than a spreadsheet.

“That is what this recent effort was about,” Moody said.

To address the missing pieces, Moody and other WATCH designers, including PDE’s Estuary Science Manager LeeAnn Haaf, Ph.D., made some changes to the tool. A new attribute was added that allows users to evaluate how an abundance of sediment might affect marsh conditions at a site to provide context for how the marsh develops over time.

To increase accessibility, designers developed an online platform that helps guide the user through inputting data, and tracking progress, and output interpretation. There was also an issue with people being able to easily understand the diagnostic insight that WATCH provides. For example, the spreadsheet version of the tool allowed users to put in data, but the information they were getting back was a little hard to interpret. In the updated online version of WATCH, diagnostic information now includes a small grid that raises red flags on problematic areas and gives green check marks on the ones that are okay. The diagnostic information further provides short sentences to provide additional insight into a site’s potential problems.

Yepsen said she and other designers created WATCH for restoration practitioners from universities, state and local governments, environmental non-profits, and consulting companies. Even with updates that make it more user-friendly, WATCH still requires a general understanding of tidal wetlands and wetland monitoring.

This year, designers hope to integrate WATCH into a Rutgers University website that integrates mapping elements and other tidal wetland restoration planning tools. The team also plans to make reference data even easier to find and access, something Yepsen said she hopes will increase the number of WATCH users.💧

HEALTHY HABITATS/STRATEGY H1.4: PROTECT, ENHANCE, AND IMPROVE NON-TIDAL WETLANDS

ESTUARY EXCURSIONS

Cool Spring Park has a Cool New Trail

By Sarah Bouboulis, PDE’s Habitat Projects Coordinator

The next time you’re in Wilmington, Delaware, take a stroll along a new eco trail at Cool Spring Park & Reservoir.

Partnership for the Delaware Estuary (PDE), along with partners from the City of Wilmington and a community group called the West Side Grows Together community organization, recently installed a five-stop “Eco Trail Tour” at the park at West 10th and North Van Buren streets.



PDE, the City of Wilmington, Delaware, and West Side Grows Together (Wilmington, DE) show off the final touches they put on signage at Cool Spring Park & Reservoir in Wilmington, Delaware. The signs are part of a five-stop Eco Trail at the park.

Over the past few years, the city and other partners have installed a rain garden, stormwater planters, a meadow, and a vegetative buffer around the reservoir to absorb stormwater and beautify the space with native plants. PDE and West Side Grows Together also installed a series of signs that loop throughout the park & reservoir to welcome patrons and provide information about the functions of the different garden features. Delaware-based artist Molly Schafer designed the signs, which are written in English and Spanish, and feature the native plants found at each stop, as well as insects and other wildlife that might use them for food or shelter. Signs also have QR codes that direct people to a website where they can take a deeper dive into learning about the topics highlighted in the signage.💧

STRONG COMMUNITIES/STRATEGY C1.4: CONNECT PEOPLE TO NATURAL AREAS AND WATERFRONTS IN THE DELAWARE ESTUARY

often overlooked, benefits that natural components can provide.

"We have been using the model at events to ask what people would like to see along the rivers and creeks they interact with," said Ella Rothermel, PDE's Data Management Coordinator. "Unlike lower in the Estuary, where most of our living shorelines are away from public view, the idea of a living shoreline along the urban stretch of Delaware and Schuylkill Rivers is still pretty novel for the general public. Since these are highly-utilized areas, we want input from community members about what they'd like to see and we want to know what kind of outreach and messaging surrounding these projects will be best received and most impactful. This model helps us start these conversations and collect direct information regarding what people think is important along their waterways. Since the aim of this grant is to create a plan for the expansion of living shorelines and living shoreline outreach into Philadelphia, the model really helps us tick a lot of boxes in terms of understanding public interest."

Using a concept similar to Lego, the model has movable pieces that

attach to a textured board to create a scene that looks like a park next to a waterway. Users can include people, trees, rocks, benches, logs, and even fish, plants, and wildlife. What makes this unique and fulfills the educational goals of the model is it has built-in constraints that as people move the pieces around the board, the components stay consistent with a real living shoreline and surrounding area. Color-coded pieces will only fit in specific zones. Park areas are green, riverbank areas are brown/yellow, and water areas are blue. Trees and benches only fit in the upland areas and fish will

“ This is meant to initiate a conversation about how hardened shorelines block off ecological connections ”

only go in the water. Turtles and wetland plants, on the other hand, can go in the water or on the intertidal portion of the model, but not in the upland portion.

"There is still some freedom," said Rothermel. "People have wanted to put the pathway in the

water to represent a floating water trail. Although it doesn't fit perfectly there, those are still interesting ideas and we can accept creativity."

There are also pieces in the model for people to create seawalls and bulkheads, which are erosion control methods

that use harder materials such as concrete. If someone places a seawall in the model, the base extends far away from the wall itself, blocking all the pegs around it so you can no longer have any animals or plants nearby, similar to how real seawalls/bulkheads work.

"This is meant to initiate a conversation about how hardened shorelines block off ecological connections," Rothermel said.

Prior to developing the interactive model, PDE used to set up a living shoreline diorama at outreach events. The diorama was a popular attraction, but children were often

disappointed to learn that its glued-down pieces were just for looks.

"It was a really great illustration of the differences between hardened structures and living shorelines, but we wanted to create something people could actually interact with and have fun using," Rothermel said.

Philadelphia-based MakeltSo Engineering worked for about four months with PDE to develop and design the model and pieces created with a 3-D printer, and PDE already is talking with the company to develop new pieces for the model.💧

HEALTHY HABITATS/STRATEGY H1.3: DEVELOP AND IMPLEMENT NATURAL AND NATURE-BASED TECHNIQUES TO STABILIZE AND RESTORE ERODING SHORELINES, AND TO BUILD AND PROTECT WETLANDS, INFRASTRUCTURE, AND OTHER KEY RESOURCES

STRONG COMMUNITIES/STRATEGY C2.7: MONITOR, DEVELOP, AND PROMOTE OPPORTUNITIES TO ASSESS IMPACTS OF OUTREACH



Philadelphia-based company MakeltSo helped PDE develop the living shoreline model and created it with a 3-D printer.

SCHUYLKILL SCRUB

March 1 through May 31

**Locations Throughout the Schuylkill River Watershed**

The Schuylkill Scrub is a series of litter cleanups held each spring within the Schuylkill River Watershed. Coordinated by the Schuylkill Action Network (SAN), Schuylkill Scrub cleanups keep trash out of waterways that provide drinking water to millions of people. To aid the cleanups, there is an app and website dashboard called CleanSweep. Through CleanSweep, volunteers can find cleanups in their area, register to participate in a cleanup, report litter "hot spots," and much more. The SAN is a collaborative network of nonprofits, government agencies, water utilities, and academia working together to protect clean water in the Schuylkill River Watershed.

6TH ANNUAL CAMDEN ENVIRONMENTAL SUMMIT

Wednesday, April 19, 9 a.m. to 3 p.m.

Hilton Garden Inn on the Camden Waterfront, Camden, New Jersey

Do you care about environmental and community issues? Then come to the Camden Environmental Summit. Organized by the Camden Collaborative Initiative and the Camden Community Partnership, the Summit supports solutions-oriented partnerships to improve the environment, health, and quality of life for Camden residents. This year's Summit will address air quality, stormwater management, climate resilience, brownfield redevelopment, illegal dumping, and health and environmental education.

For more information, visit: <http://bit.ly/3TgWamB>

WILMINGTON EARTH & ARBOR DAY CELEBRATION

Friday, April 21 • 11 a.m. to 2 p.m.

Cool Spring Park, 10th and Van Buren streets, Wilmington, Delaware

Get a jump on your Earth Day celebrations by joining the City of Wilmington's Earth & Arbor Day event. PDE will have a booth feature food, music, and environmental education, all within the theme, "Invest in Our Planet."

CHRISTINA RIVER WATERSHED CLEANUP

Saturday, April 22 • 8 a.m. to 11 a.m.

Locations throughout the Christina River Watershed

Celebrate Earth Day through community service. For just a few hours of your time, you can make waterways throughout the Christina River Watershed cleaner and healthier. This is a fun event for individuals and groups to enjoy nature and do their part for the healthier environment. Find a cleanup location near you and sign up to volunteer by visiting <http://christinarivercleanup.org/>.

BRANDYWINE SHADFEST

Saturday, May 20 • 10 a.m. to 3 p.m. in Brandywine Park Wilmington, Delaware

Celebrate the restoration of the historic Brandywine River and the return of the American Shad with a family-friendly 5k, and festival hosted by Brandywine River Restoration Trust (BRRT) and over a dozen environmental organizations. There will be live music, face painting, fishing lessons, story-telling, games, fun and educational exhibits, food, and craft vendors. For more information visit BRRT.org and follow @brandywineriverrestoration on social media.



US POSTAGE
Non-Profit Org
PAID
Wilmington, DE
Permit #1885

110 South Poplar Street, Suite 202
Wilmington, DE 19801

ADDRESS SERVICE REQUESTED



GET ESTUARY NEWS ONLINE AND SAVE PAPER!

IT'S EASY!

- ✓ E-mail KOConnell@delawareestuary.org and say you want to receive only electronic copies.
- ✓ Provide your name
- ✓ Confirm your email address

THE PARTNERSHIP FOR THE DELAWARE ESTUARY

CONNECTING PEOPLE, SCIENCE, AND NATURE FOR A HEALTHY DELAWARE RIVER AND BAY

The Partnership for the Delaware Estuary, Inc. (PDE), is a nonprofit organization established in 1996. PDE is the host of the Delaware Estuary Program and leads science-based and collaborative efforts to improve the tidal Delaware River and Bay, which spans 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
▶ (800) 445-4935, ext. 102
▶ kklein@DelawareEstuary.org

Environmental Protection Agency

Irene Purdy, EPA Region II
▶ (212) 637-3794
▶ purdy.irene@epa.gov

Megan Mackey, EPA Region III
▶ (215) 814-5534
▶ mackey.megan@epa.gov

Pennsylvania

Sue Weaver
Department of Environmental Protection
▶ (717) 783-8055
▶ suweaver@pa.gov

Delaware

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

New Jersey

Lynette Lurig
Department of Environmental Protection
▶ (609) 633-1314
▶ lynette.lurig@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
▶ (800) 445-4935, ext. 113
▶ klayton@DelawareEstuary.org

Estuary News encourages reprinting of its articles in other publications. *Estuary News* is produced four times annually by the Partnership for the Delaware Estuary, Inc. (PDE), under an assistance agreement (CE-99398516-1) with the U.S. Environmental Protection Agency (EPA). The purpose of this newsletter is to provide an open, informative dialogue on issues related to PDE. The viewpoints expressed here do not necessarily represent the views of PDE or EPA, nor does mention of names, commercial products or causes constitute endorsement or recommendation for use. For information about the PDE, call 1-800-445-4935.



PRINTED ON RECYCLED PAPER

Unless otherwise noted, all photos are property of the Partnership for the Delaware Estuary.