

Maryland Sea Grant

ANNUAL REPORT 2018



Science Serving Maryland's Coasts

MESSAGE FROM THE DIRECTOR



We are excited to share with you Maryland Sea Grant's 2018 accomplishments in research, education, and communication across our state, and highlight some of our many valuable partnerships both within the University System of Maryland and beyond.

In 2018, we also underwent a four-year review by the National Oceanic and Atmospheric Administration's National Sea Grant Office, which conducts performance reviews of all the Sea Grant programs throughout the country and U.S. territories. An external review panel examined our program's successes. We are grateful to our extraordinary partners who played an important role in the process, helping to represent key work in our four focus areas: Resilient Ecosystem Processes and Responses; Resilient Communities

and Economies; Sustainable Fisheries and Aquaculture; and Effective Environmental Science Education. The feedback from our reviewers—a mix of nationally renowned researchers and policy leaders—was extremely positive.

Our work continues to touch the lives of many Marylanders. We are doing so through our research on important issues including fisheries, sea level rise, and estuarine habitats, while our Sea Grant extension specialists work to promote aquaculture and reduce pollution entering waterways in the state. Our film and magazine work inform the public about cutting-edge science and our continuing work with educators brings more experiential marine science learning to the classroom. This past year we supported numerous undergraduate and graduate fellowships, helping these talented students progress on their path to becoming estuarine and ocean science leaders. Thanks to exceptional collaborations with stakeholders and strong support by congressional representatives, Maryland Sea Grant celebrates these accomplishments in this annual report and extends thanks to everyone for their continued support of our crucial mission.

A handwritten signature in black ink, reading "Fredrika C. Moser". The signature is fluid and cursive, with a horizontal line underneath.

Fredrika C. Moser, Ph.D.

About Maryland Sea Grant

We support research, education, extension, and public outreach efforts designed to help restore and preserve the Chesapeake Bay and Maryland's coastal natural resources. Working with leaders from across our state, we help communities respond to our state's coastal environmental challenges and promote a sustainable coastal economy.

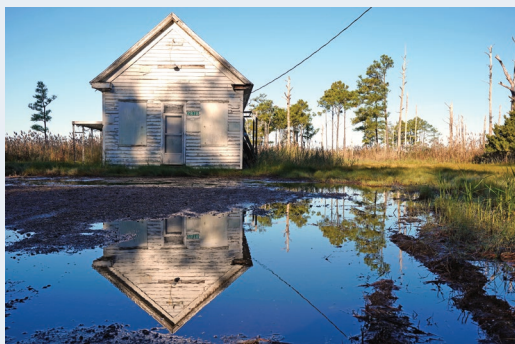
Maryland Sea Grant, part of the University System of Maryland, is a partnership between the State of Maryland and the National Oceanic and Atmospheric Administration. Maryland Sea Grant is administered by the University of Maryland Center for Environmental Science (UMCES).

If you would like to support our work, please visit us at: www.mdsg.umd.edu/donate

2018 PROGRAM HIGHLIGHTS

Extension

Rural communities and climate change



FLOODING ISSUES are a growing concern in many rural areas on the Eastern Shore, like Dorchester County. *PHOTO BY LISA TOSSEY*

In two efforts, Maryland Sea Grant helped coastal communities address their concerns about the consequences of climate change. First, the team worked with University of Maryland anthropologists and scientists to assist residents in connecting with county and state planners to help them address flooding and marsh encroachment on Maryland's Eastern Shore. Second, our Lower Eastern Shore extension specialist worked closely with the Maryland Coastal Bays Program (MCBP), coastal communities, and other stakeholders to conduct a Climate Change Vulnerability Assessment of the program's current conservation and management plan. The resulting assessment provided MCBP with a fuller picture of the many climate change related stressors that may impact their ability to reach their plan goals.

Aquaculture loans and business development

Our aquaculture business specialist served as a member of the Maryland Agricultural and Resource-Based Industry Development Corporation (MARBIDCO) loan review board, which approved \$690,000 in MARBIDCO loan commitments to oyster farmers in 2018. These loans help entrepreneurs obtain funds that would be difficult to secure from a traditional bank,

providing investment capital that will help create employment opportunities and economic benefits to local communities.

Nutrient trading

In order to determine how certain policies would encourage more growers to enter the Maryland oyster aquaculture industry, our aquaculture business specialist partnered with an economist to examine the potential of nutrient credit trading as a way to incentivize growers to invest in aquaculture. They are sharing their findings with the Maryland Department of the Environment and other policy makers to inform changes to nutrient trading policies and help them assess the capacity of the aquaculture industry to supply credits to a water quality trading market.

Safe seafood

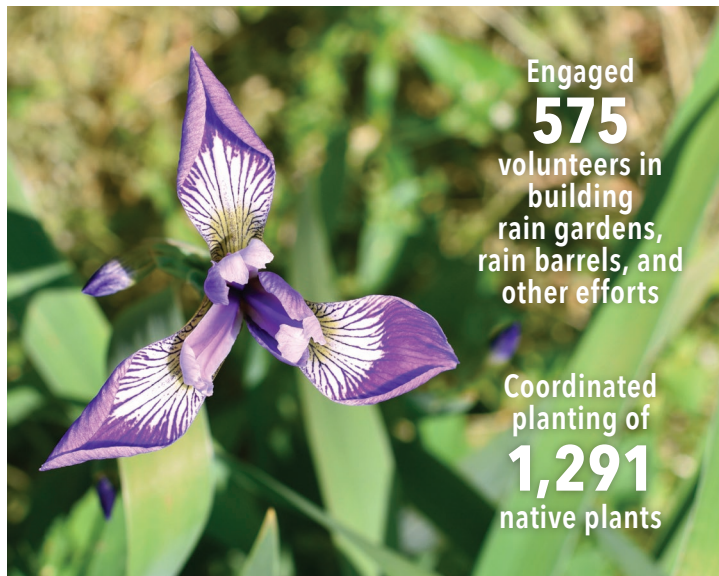
Our seafood technology specialist helped certify 71 seafood processors in safe handling and processing of seafood under the protocols for Hazard Analysis and Critical Control Point, or HACCP, a federal regulation in place to reduce food safety risks in each step of processing operations, from harvest to table. The specialist also provided technical support for crabmeat processors under the Maryland Crabmeat Quality Assurance and Inspection Program, helping to ensure the industry produces safe, quality seafood.



"Processors like us wouldn't know what the handling process is [without HACCP training]. When you go through the training, you understand how important it is."

—Bill Cox, co-owner of the Honga Oyster Company on Maryland's Eastern Shore

EXTENSION AT WORK: Watershed Restoration Specialists



Engaged
575
volunteers in
building
rain gardens,
rain barrels, and
other efforts

Coordinated
planting of
1,291
native plants

“Sea Grant Watershed Restoration Specialist Eric Buehl is our hero! We are a rural county with a tiny staff and very limited resources, but with Eric’s help we’ve been able to get dozens of stormwater and water quality projects in the ground and engage our small towns, students, and underserved communities in our efforts.”

—Leslie Grunden,
*Assistant Director of
Planning, Caroline County*

Communications, Education, and Outreach

Diversity and inclusion

Our communications team works with students to provide real-world science communication experience through writing blogs, producing videos, and crafting stories for our *Chesapeake Quarterly* magazine. In 2018, a Howard University intern wrote a blog post series on freshwater mussels and the bivalve’s role in the Anacostia River ecosystem. The team also worked with a Morgan State University student and alumnus to produce a film about Smithville, an African American community on Maryland’s Eastern Shore that is disappearing in part because of environmental impacts.

Sentinel sites aggregate marsh elevation data

Surface elevation tables, or SETs, provide information about the elevation of marshes—tidal wetlands that offer protections against rising water levels and provide important habitat for birds and fish. Our Chesapeake Bay Sentinel Site Coordinator worked with a team of partners from state and federal agencies as well as academic institutions to develop an

EDUCATION BY THE NUMBERS

6,247 P–12 students reached with our
education programs

106 Undergraduate students supported

36 Graduate students supported

interactive map featuring data from more than 400 SETs around the Chesapeake and Coastal Bays marshland. That information will help communities understand how sea level rise is causing marshes to change.

International marine science education

Through an international partnership, students and teachers from Maryland and South Carolina are sharing data and participating in project-based marine science with educators from Sweden, Germany, and Spain. Built around Maryland Sea Grant’s long-running Biofilms and Biodiversity education program in Baltimore Harbor, the countries share innovative instructional strategies and website tools to educate students about similarities and differences in harbor biodiversity in the United States and Europe.

Research

Menhaden ecosystem-based fisheries management



ATLANTIC MENHADEN (*Brevoortia tyrannus*) are an important fish—both commercially and in local food webs. PHOTO BY NOAA FISHERIES/JERRY PREZIOSO

Menhaden are an important food for striped bass and support an industry that uses these small fish for bait and pet food. Maryland Sea Grant-funded scientists developed a novel statistical model to help determine how many menhaden can be fished without limiting the amount available as food for striped bass. This new model can help managers take an ecosystem-based approach to menhaden management to meet both commercial use demands and marine food web health.

Land use and atmospheric nitrogen input

Researchers found land use—whether urban, agricultural, or forested—can affect how much nitrogen from air pollution can reach waterways. Based on samples from streams across Maryland, the scientists found that atmospheric nitrate loads were five to ten times greater in streams adjacent to urban and agricultural lands than those in pristine forests. This is important for water quality management as excessive nitrogen can cause harmful algal blooms and disrupt water supplies and organisms living in the water.

Evaluation of septic system impacts on water quality

Using sophisticated analytical techniques, researchers showed how septic waste is the primary source of pollution in some streams. They identified hundreds of new chemical

tracers to track septic system effluent in waterways, providing managers with new tools to better measure septic system impact. Such tools can help evaluate the best places to improve septic systems or convert areas to public sewer—helpful here in Maryland, where there are close to half a million documented septic systems with an unknown number of failing systems.

Bay grass diversity

Underwater grasses are critical to the health of the Chesapeake Bay and researchers are studying wild celery (*Vallisneria americana*) to help restoration efforts. A powerhouse among Chesapeake Bay grasses because of its adaptability to a range of habitats and temperatures, researchers grew different types under varying conditions to understand the role genetic diversity plays in a plant's resilience. Restoration managers may use this information to select appropriate strains of wild celery for different restoration sites.



WILD CELERY (*Vallisneria americana*) being grown in the lab. PHOTO BY NICOLE LEHMING

Chesapeake contaminants

Contaminants of emerging concern (CECs), including pharmaceuticals, hormones, and active ingredients in personal care products, are a growing issue in waterways. In the first study of its kind in Maryland's Chesapeake Bay waters, researchers measured levels of these contaminants in water, sediment, and oyster tissue. These findings indicated a need for further investigation of sources of CECs in the Bay watershed, accumulation of CECs in other Bay organisms, and potential ecological impacts.

Research Projects Funded in 2018

Faculty-led Projects

Determining the Resiliency of Juvenile Oysters to Estuarine Stressors and Climate Change: Implications for Restoration and Aquaculture Programs

D. Breitburg • *Smithsonian Environmental Research Center*

Resilience of *Vallisneria americana* in the Chesapeake Bay

K. Engelhardt • *University of Maryland Center for Environmental Science (UMCES) Appalachian Laboratory (AL)*

Managing for Biodiversity and Blue Carbon in the Face of Sea Level Rise and Barrier Island Migration

K. Gedan • *George Washington University*

Tracking Septic System Performance by Using Innovative Mass Spectrometric Approaches and Traditional Nutrient Measurements

M. Gonsior • *UMCES Chesapeake Biological Laboratory (CBL)*

Quantifying Nutrient Sequestration in Chesapeake Bay Submersed Aquatic Vegetation Beds

C. Gurbisz • *St. Mary's College of Maryland*

Quantifying Changes to Nutrient Cycling and Nitrogen Removal in an Estuary as a Consequence of Aeration

L. Harris • *UMCES CBL*

Controlling Fouling and Pests Associated with Water Column Oyster Aquaculture

B. Hubbard • *University of Maryland College Park (UMCP)*

Improving Prediction and Visualization of Coastal Inundation on the Eastern Shore of Maryland

M. Li • *UMCES Horn Point Laboratory (HPL)*

Variation in Retention and Export of Atmospheric Nitrate as a Function of Land Use Across the Chesapeake Bay Watershed

D. Nelson • *UMCES AL*

Development of a Bayesian Approach for Estimating Ecosystem-based Reference Points for Atlantic Menhaden

G. Nessler • *UMCES CBL*

Novel Genomic Tools to Assess Fish Diet and Prey Quality in the Choptank River

L. Plough, C. Fitzgerald* • *UMCES HPL*

Effects of Oyster Biodeposit Resuspension on Nutrient Release and Ecosystem Dynamics in Chesapeake Bay

E. Porter • *University of Baltimore*

Mixotrophic Dinoflagellates: Elucidating the Relative Importance of Grazing and Photosynthesis in Chesapeake Bay

G. Silsbe • *UMCES HPL*

Assessing the Effectiveness of the Anacostia River Tunnel in Reduction of Eutrophication

C. Solomon, S. Gleich* • *Gallaudet University*

Production of Reproductively Sterile Atlantic Salmon to Maximize Cost-Effective and Environmentally-Responsible U.S. Aquaculture

T. Wong • *University of Maryland, Baltimore County (UMBC), Institute of Marine and Environmental Technology (IMET)*

Understanding the Distribution and Ecology of the Mysid *Neomysis americana*, a Key Forage Species in Chesapeake Bay

R. Woodland, D. Quill* • *UMCES CBL*

Abundance and Variety of Microplastics in Surface Waters, Sediments, and Oysters: Relationship to Point-sources and Land Use Practices

L. Yonkos • *UMCP*

Student-led Projects

Continuous Mapping of Channel Features for Monitoring Aquatic Habitat and Sediment Flux in Coastal Systems

M. Baker, A. Rittle* • *UMBC*

New Measures of Aquatic Habitat for Assessing Restoration Resilience

M. Baker, H. Oakland* • *UMBC*

Development and Validation of Novel, Fluorescence-based Tools to Screen for and Identify Urban and Agricultural Sources of Contaminants of Emerging Concern in the Chesapeake Bay

L. Blaney, E. Hain* • *UMBC*

Functional and Taxonomic Diversity of Microbial Communities in Microplastic Particles from the Chesapeake Bay

F. Chen, A. Sosa* • *UMCES IMET*

Potential Pollution Trade-offs for Sustainable Coastal Agriculture Management

E. Davidson, J. Hagedorn* • *UMCES AL*

Analysis of the Spatial and Temporal Structure and Dynamics of the Northern Atlantic Black Sea Bass (*Centropristis striata*) Stock — Impacts of Misspecifications of Spatial Structure of Assessment and Stock on Reliability of Reference Points

T. Miller, R. Brodnik* • *UMCES CBL*

Downpour Dynamics: Amounts, Sources, and Drivers of Nitrate Export during Precipitation Events

D. Nelson, J. Bostic* • *UMCES AL*

Characterizing Genomic Diversity of Wild and Planted Oyster Populations in Chesapeake Bay to Better Inform Restoration

L. Plough, K. Hornick* • *UMCES HPL*

Using an Individual-Based Model to Predict the Genetic Impacts of Hatchery Based Restoration of the Eastern Oyster (*Crassostrea virginica*) in the Chesapeake Bay

L. Plough, K. Hornick* • *UMCES HPL*

Understanding Decisions to Participate in Oyster Aquaculture in Maryland: Implications of Livelihood Diversification on Resilience

J. Shaffer, A. Michaelis* • *UMCP*

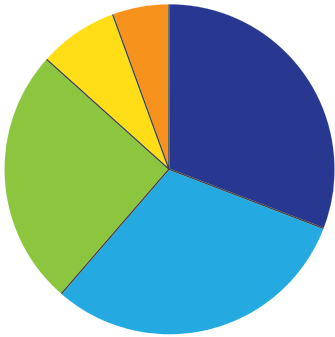
Cross System Comparison of Oxygen Effects on Nitrogen Cycling in Tidal Sub-Estuarines of Patapsco River

J. Testa, D. Hobbs* • *UMCES CBL*

Saltwater Intrusion and Legacy Nutrient Release Across Coastal Farmland

K. Tully, D. Weissman* • *UMCP*

Budget Overview



Grant Funding 2018 (Total: \$3,017,500)

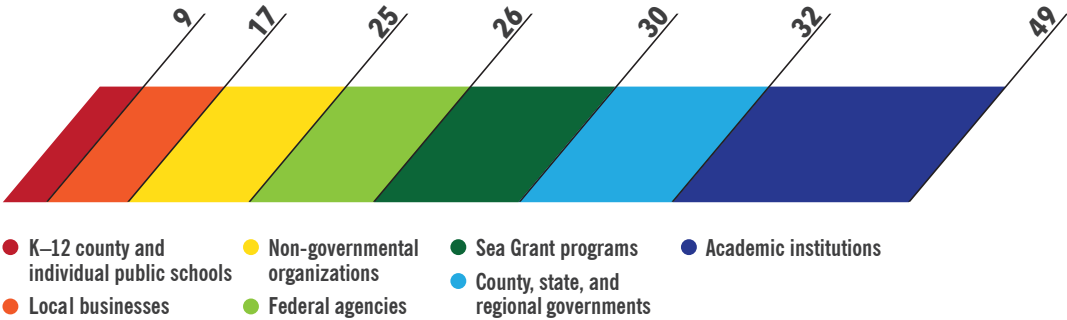
- Education 30.8% (\$930,911)*
- Research 30.7% (\$927,339)
- Extension 25.2% (\$759,865)
- Communications 7.8% (\$234,000)
- Administration 5.5% (\$165,385)

Total funding in 2018, including state funding: \$5,019,414

* Includes funding for research fellows

Partners

In 2018, Maryland Sea Grant worked with 188 partners from a diverse group of programs. For more information about our partners, visit our website at www.mdsg.umd.edu/partners.



Program Governance*

Governance Board

- Robert L. Caret**
Chancellor
University System of Maryland
- Peter Goodwin**
President
University of Maryland Center for Environmental Science (UMCES)
- Mary Ann Rankin**
Senior Vice President and Provost
University of Maryland, College Park

External Advisory Board (EAB)

- David Blazer**
Maryland Port Authority
- Mark Bryer**
The Nature Conservancy
- Scott Budden**
Orchard Point Oyster Co., LLC

- Jana Davis**
Chesapeake Bay Trust
- Erik Fisher**
Chesapeake Bay Foundation
- Martin Gary**
Potomac River Fisheries Commission
- William Matuszeski**
U.S. EPA Chesapeake Bay Program (retired)
- Thomas Miller**
UMCES Chesapeake Biological Laboratory (AAC liaison)
- Adam Ortiz**
Department of the Environment, Prince George's County
- Ann Swanson**
Chesapeake Bay Commission
- Dave Wilson**
Conservation Community Consulting, LLC

Academic Advisory Committee (AAC) Institutional Affiliation

- Chesapeake Bay Foundation
Chesapeake Research Consortium
D.C. Water Resources Research Institute, University of the District of Columbia
Hood College
Jug Bay Wetlands Sanctuary
Maryland Department of Natural Resources
NOAA National Estuarine Research Reserve
NOAA Cooperative Oxford Lab
Towson University
UMCES Appalachian Laboratory
UMCES Institute of Marine and Environmental Technology
U.S. Geological Survey
U.S. Naval Academy
Washington College

* As of July 15, 2019

Visit www.mdsg.umd.edu/governance for a full list of Maryland Sea Grant's advisory and governing bodies.

Maryland Sea Grant Staff*

Main Office

Fredrika Moser
Director

Michael Allen
Associate Director for Research
and Administration

Kevin Bruce
Information Technology
Coordinator

Jenna Clark
Research Programs Manager

Jeannette Connors
Personnel and Travel Coordinator
and National Marine Educators
Association (NMEA)** National
Office Manager

Kimberly Cox
Business Manager

J. Adam Frederick
Assistant Director for Education
and NMEA** National Office
Coordinator

Rona Kobell
Science Writer and Editor

Nicole Lehming
Graphic Designer and Producer

Eva May
Science Management
and Policy Intern

Toye Stokes
Program Administrative Specialist

Taryn Sudol
Chesapeake Bay
Sentinel Site Coordinator

Lisa D. Tossey
Assistant Director for
Communications

Extension Offices

Bill Hubbard
Assistant Director and
Extension Program Leader
College Park, MD

Laurie Arnold
Administrative Assistant II
Cambridge, MD

Kelsey Brooks
Northern Maryland
Watershed Restoration Specialist
Cockeysville, MD

Eric Buehl
Mid and Upper Eastern Shore
Watershed Restoration Specialist
Queenstown, MD

Jennifer Dindinger
Lower Eastern Shore
Watershed Restoration Specialist
Cambridge, MD

Shannon Hood
Aquaculture Associate Agent
Cambridge, MD

Jorge Holzer
Fisheries Economics Specialist
College Park, MD

Chengchu (Cathy) Liu
Seafood Technology Specialist
College Park, MD

Kelly MacBride-Gill
Watershed Steward Programs
Coordinator
Derwood, MD

Kate McClure
Coastal Climate Specialist
Queenstown, MD

Matt Parker
Aquaculture Business Specialist
Clinton, MD

Amanda Rockler
Central Maryland
Watershed Restoration Specialist
Derwood, MD

Teri Smith
Business Manager
College Park, MD

Jacqueline Takacs
Southern Maryland
Watershed Restoration Specialist
St. Mary's City, MD

Donald Webster
Regional Specialist
Queenstown, MD

* As of July 15, 2019

** Maryland Sea Grant hosts the
national office for the National
Marine Educators Association

Visit www.mdsg.umd.edu/our-office for full addresses and contact information for our staff.

NOTE OUR NEW ADDRESS!



MARYLAND SEA GRANT

5825 University Research Court
Suite 1350
College Park, Maryland 20740
Ph: 301.405.7500 / Fax: 301.314.5780

www.mdsg.umd.edu

Cover photograph: Aquaculture Associate Agent Shannon Hood
assesses the set of juvenile oysters, or spat-on-shell, at the Horn Point
Oyster Hatchery on the Choptank River. PHOTO BY LISA TOSSEY

Publication Number UM-SG-PI-2019-01