




University of Delaware | College of Earth, Ocean, & Environment

2016 ANNUAL REPORT • VOLUME 35

REPORTER

40 YEARS

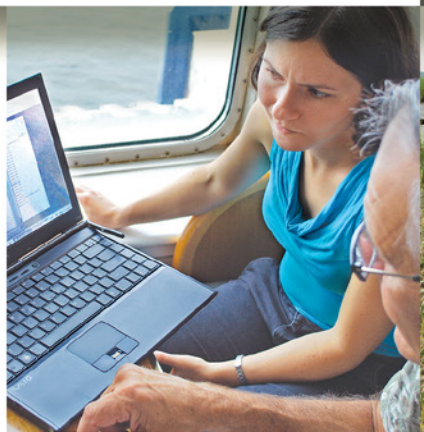
Sea Grant Delaware

of Science Serving the Delaware Coast



Sea Grant 50 YEARS

of Putting Science to Work for America's Coastal Communities




Director's Message

40 YEARS of Science Serving the Delaware Coast

Thank you for your continued interest in Delaware's coast and Delaware Sea Grant.

DELAWARE SEA GRANT

Welcome to the Delaware Sea Grant (DESG) annual report for FY '16. Let's begin with a little history. In 1966 the National Sea Grant College and Program Act was signed into law, and in March 2016, Sea Grant marked the start of its 50th anniversary year. This milestone attests to the way Sea Grant's research, education and outreach activities have contributed real solutions to local, regional and national priorities on healthy coastal ecosystems (HCE), resilient communities and economies (RCE), sustainable fisheries and aquaculture (SFA), and environmental literacy and workforce development (ELWD).

In Delaware, we are celebrating 40 years of "putting science to work" for our coastal communities and other important stakeholders. Originally funded to conduct oyster research in 1968, Delaware Sea Grant was named the nation's ninth Sea Grant College in 1976. Forty years later, we remain focused on using our expertise and collaborative partnerships to address emerging environmental challenges affecting our coastal and marine environments.

As you may be aware, Dr. Dennis Assanis, former provost at Stony Brook University, took office on June 6 as University of Delaware's next president and we are working to bring him up to speed on the College of Earth, Ocean, and Environment (CEOE) and Delaware Sea Grant's activities and expertise. Many changes are imminent as we start this new chapter and DESG is poised to address these challenges in its next round of strategic planning for the 2018–2021 time frame. We look for many of you to be a part of this process.

After serving as Acting President of UD since July 2015, Dr. Nancy Targett will join the University of New Hampshire as Provost and Vice President for Academic Affairs in September. While we are saddened by her departure, we congratulate Nancy and wish her the best. Dr. Targett built a legacy of research, outreach, education and partnership during her 30+ year tenure with DESG and CEOE, most recently serving as our Dean and Sea Grant Director, and her vision will continue to guide us well into the future.

In last year's *Reporter* we mentioned two upcoming national reviews of our Delaware Sea Grant program. The good news to report is that we had a successful federal site review in June 2015. In August we submitted documentation to our National Sea Grant Office, which convened a federal review panel to evaluate all 33 Sea Grant programs. This also was successful. We will keep you posted as the final reports on these reviews become available.

Finally, I must share with you that due to ongoing construction on the Hugh R. Sharp Campus in Lewes, Coast Day 2016 (scheduled for October 2, 2016) had to be canceled. Coast Day is a time-honored tradition for the community, DESG and the University, with annual attendance at approximately 10,000 visitors, so this was not an easy decision. However, in the interest of safety and limited access to facilities, I believe this was the right thing to do. We will keep you updated with other anniversary year events and our plans for Coast Day 2017.

As you review this year's *Reporter*, please note the tremendous successes our researchers, students and outreach staff members have achieved with the help of our countless partners. Delaware Sea Grant will continue to promote its activities and research both locally and nationally throughout the year. I encourage you to visit us at **www.deseagrant.org**.

I look forward to hearing from you if you have questions or feedback.

James M. Falk

James M. Falk
Acting Director, Delaware Sea Grant

Delaware Sea Grant Advisory Council

The Delaware Sea Grant Advisory Council—the statewide external advisory body to the Delaware Sea Grant College Program—was created in 1974. Its members hail from marine-oriented business and industry, resource management and engineering firms, state government, public interest groups, the pre-college educational sector and the media. Working within the national priorities identified by the National Sea Grant College Program, the council helps further define priority coastal issues relevant to Delaware.

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Partnership for the Delaware Estuary

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Diamond State Port Corporation

Bill Baker
Bill's Sports Shop

Chris Bason
Center for the Inland Bays

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Delaware State Representative

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Marine Education Specialist

Environmental Public Education Office

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Director

Tammy Beeson
Art Director

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Celebrating 40 years of Delaware Sea Grant and 50 years of National Sea Grant

Sea Grant 50 YEARS

In 1966 the National Sea Grant College and Program Act was signed into law, and in March 2016, Sea Grant marked the start of its 50th anniversary year. The year will feature a number of outreach efforts to highlight how Sea Grant has successfully been "putting science to work for America's coastal communities" for 50 years. Help us celebrate on social media by using **#SeaGrant50**!

The National Sea Grant College Program was founded in an era when widespread interest in the oceans was just beginning to emerge. In the wake of World War II, the importance of understanding the oceans was apparent to the U.S. Navy, and the sea was becoming recognized as an important natural environment, as well as a source of natural resources that could be extracted or developed for public benefit.

THE EARLY YEARS

1966: The National Sea Grant Program was created on Oct. 15, 1966 with the signing of Public Law 89-688, The National Sea Grant College and Program Act.

U.S. President Lyndon B. Johnson

1968: The first Sea Grant project award was made to the University of Delaware, focusing on the important problem of revitalizing the oyster industry, which had been a significant source of income and employment, but had been decimated by both disease and pollution.

1970: The National Sea Grant Program, originally assigned to the National Science Foundation, was transferred to the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, under the President's Reorganization Plan #4, in Oct. 1970. During that same year, the DESG program was broadened to encompass the expansion of oyster research and ocean engineering education and establishment of a marine advisory service. In addition, the interdisciplinary professional Graduate College of Marine Studies was established by the University of Delaware Board of Trustees, providing a home base for DESG.

1976: In recognition of its academic excellence and a strong foundation of statewide support, the University of Delaware was named the nation's ninth Sea Grant College and the administration of the new program was formally assigned to the UD Graduate College of Marine Studies. It is the highest status that the National Sea Grant College Program provides.

40 YEARS

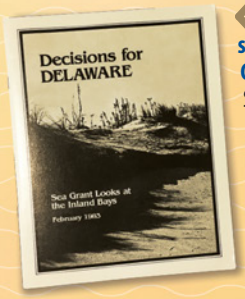
CELEBRATING DELAWARE'S CONTRIBUTIONS TO NATIONAL SEA GRANT

As the National Sea Grant Office started to plan for its 50th anniversary, Delaware Sea Grant was asked to reflect upon its most notable impacts to the state, region and nation. While the cumulative impact of DESG's work is certainly hard to quantify, we noted the following impressive impacts that were the summation of a variety of Sea Grant efforts in research, outreach and education.

DESG citizen water quality monitoring informs 5-star rating for Delaware beaches Improving water quality in Delaware's bays, streams and oceans has long been a goal of DESG. In 1991, DESG started a citizen monitoring program to train volunteers to collect verifiable water samples to help improve and expand the sampling methods. The program has flourished over 25+ years and two of Delaware's most popular ocean beaches have achieved the Natural Resources Defense Council's highest ranking (5-star) since 2011, due in part to the data provided by trained citizen scientists. Ultimately this designation is used by community officials to promote their beaches and boost tourism.

DESG research informs development of surgical sutures from shellfish chitin In the 1970s and '80s, DESG scientists were looking for a suitable means for disposing of shellfish waste. They discovered that chitin (pronounced kī'tin), a biopolymer and a structural component of the shells of marine crustaceans, such as crabs, could be dissolved and formulated into a variety of products. The process was patented. Today, chitin and its derivatives are used to make absorbable, non-allergenic sutures, wound-healing dressings for burn victims, cholesterol-reducing medications, dietary supplements and other products.

Delaware Sea Grant efforts inform U.S. wind energy DESG social scientists are leading the way to prepare for a planned development of a wind farm off the Delaware coast. DESG supported research has focused on resident's perceptions and public acceptance of offshore wind energy, as well as willingness to pay for wind energy. In addition, DESG experts have developed policy statements and contributed to the state's discussion on marine spatial planning. The 2.2 megawatt wind turbine, located on the University of Delaware campus in Lewes, DE, continues to provide a platform for scientists to study turbines in a coastal setting.



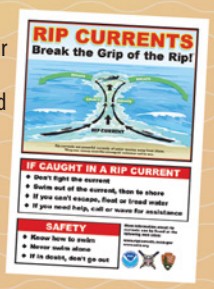
Delaware's Inland Bays supported by Delaware Sea Grant since 1983 Delaware Sea Grant's publication of *Decisions for Delaware*: *Sea Grant Looks at the Inland Bays* in 1983 helped to identify problems affecting water quality in Delaware's coastal bays. The area was experiencing tremendous population growth, along with commercial and residential development. The document outlined strategies that could be undertaken by resource agencies, community officials, citizen groups, university scientists and others to help restore the system. This initial effort by DESG laid the foundation for the bays being designated as a National Estuary in 1994.

Delaware Sea Grant develops practical alternative bait for eel and conch bait Population declines of horseshoe crabs in the 1990s were attributed largely to harvests for eel and conch bait. DESG researched the chemical cue that makes female horseshoe crabs irresistible to eel and conch. This resulted in an inexpensive, effective alternative bait that reduces reliance on the horseshoe crab population, with fishermen only using 1/16 of a male crab instead of 1/2 of a female crab per pot. In 2012, LaMonica Fine Foods scaled up production for a commercial product. In addition to the publication of the bait recipe, a commercial version was made available to the public in 2013.

The impacts below are more national in scope, but illustrate efforts where Delaware Sea Grant played a major role.

Sea Grant ensures seafood safety To aid the seafood industry in complying with FDA regulations, the National Sea Grant College Program spearheaded the formation of a partnership known as the "Hazard Analysis and Critical Control Point (HACCP) Alliance." The goal of this alliance was to ensure the safety and quality of seafood consumed in the United States by developing a unified training and certification program to properly train thousands of seafood inspectors, instructors and workers. DESG, working with many other Sea Grant partners, has been a leader in conducting training, certifying seafood industry businesses and revising outdated HACCP guidelines.

Sea Grant informs rip current awareness Sea Grant programs across the nation have undertaken programs in their states to make beachgoers more aware of the dangers of rip currents. In 2005 DESG was a key player, along with the United States Lifesaving Association, National Sea Grant Office and the NOAA National Weather Service, in helping to develop the national rip current campaign "Break the Grip of the Rip." The campaign's major product was the development of consistent signage that today is posted at beaches across the nation to increase awareness of the dangers of rip currents.



15 years of DESG work informs Delaware's shellfish aquaculture legislation DESG, through its investment in an aquaculture program since the early 1980s, saw the potential for increased production of shellfish in Delaware's Inland Bays. Since 1999, DESG has partnered with the Center for the Inland Bays to conduct research and provide technical assistance, create an oyster reef and develop an oyster gardening program to demonstrate the potential for shellfish enhancement in the bays. After nearly 15 years of DESG effort, aquaculture legislation was signed into law in August 2013, opening the door for a new business opportunity for local watermen.

Healthy Coastal Ecosystems

40 YEARS of Science Serving the Delaware Coast

Environmental challenges, if left unchecked, can impact public health, economic stability and the overall quality of life in Delaware. The work of Delaware Sea Grant (DESG) researchers and outreach specialists supports the responsible management of marine resources.

Our Program

- Funds long-term science and policy research in support of ecosystem sustainability
- Develops new technologies, methods and policies to address water quality degradation
- Supports ecosystem-based approaches to manage land, water and living resources
- Restores, protects and enhances ecosystems and their habitats

By the Numbers for 2015–16

#1 In the nation for clean beaches ranking

3 Coastal communities completed Low Impact Development (LID) projects to help improve water quality

50+ Sensors and tide gauges placed in a Lewes marsh measured tidal velocity over an 18 day period

45 Volunteers collected water samples for the Citizen Monitoring Program

7 Funded research projects in the HCE focus area during 2014–16

16 Plankton sampling sites in the Delaware Bay

Highlights

- Since 2011 as the Cape May-Lewes Ferry carries commuters and tourists across the bay, it measures water quality parameters like temperature, salinity, dissolved oxygen and chlorophyll, as well as atmospheric properties like pressure, temperature, humidity and wind speed through DESG operated sensors. In 2015 the sampling equipment was updated to measure carbon dioxide and pH, which can be used to observe conditions affected by climate change, like ocean acidification.

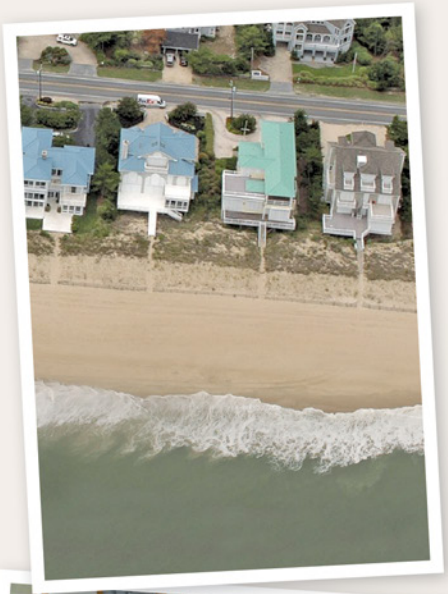
For 25 years now, water quality monitoring volunteers trained through the University of Delaware Citizen Water Quality Monitoring Program have visited assigned monitoring sites to collect data such as clarity and dissolved oxygen, harmful algae and bacteria levels. Stakeholders use this information to assess local water quality standards.

- DESG collaborated with Sea Grant partners in Maryland and New Jersey and other Delaware environmental partners, to expand the free Rain Garden app that gives homeowners and business owners the tools to design and create their own rain gardens.

- DESG is using a brand new optical scanning system to identify and characterize the zooplankton species present in the Delaware Bay. In conjunction, the "Under the Scope" website (https://www.underthescope.udel.edu/) was developed to assist teachers in effectively using zooplankton in their classroom lessons.

Resilient Communities and Economies

40 YEARS of Science Serving the Delaware Coast



Delaware's coastal areas provide vital economic, social and recreational opportunities for millions of residents and visitors each year. Delaware Sea Grant supports the development of resilient coastal communities that sustain diverse and vibrant economies, effectively respond to and mitigate natural hazards and function within the limits of their ecosystems.

Our Program

- Invests in renewable energy solutions
- Assists maritime communities to support coastal tourism and recreation
- Works with communities to plan for and respond to coastal hazards
- Helps communities balance economic development with environmental sustainability

By the Numbers for 2015–16

5 Economic development trainings offered

20+ Communities took advantage of RCE workshops and trainings

2 Waterfront communities assisted in developing marketing and branding approaches for economic development

Celebrated **5** years of UD wind turbine operations

355 Beach profile surveys conducted at five locations

200+ Volunteers assisted with DESG revitalization projects in Laurel

30 Officials educated about hazard mitigation planning to aid in developing strategies for local comprehensive plans

1,708 Rip current and surf rescues reported in DE in 2015

20 Local beach patrols and community officials educated by DESG on using science to minimize surf zone and rip current hazards

Highlights

DESG, through its leadership of the Sustainable Coastal Communities Initiative at the University of Delaware, is advancing a comprehensive waterfront redevelopment plan for the town of Laurel, located on the banks of Broad Creek. The revitalization project, "Reimagine Laurel," has received many awards and accolades already due to its strong stakeholder engagement and community support.

In September, a DESG led Coastal Flood Research, Modeling and Monitoring Workshop brought together more than 40 state, federal and academic experts to discuss improved coastal resilience in the Mid-Atlantic region. Through shared and collaborative research, these Mid-Atlantic coastal researchers aim to integrate resilience into local, state and regional policy planning initiatives as a critical step towards mitigating future risks.

Rip currents are strong narrow currents that can pull even the strongest swimmers away from shore. For over a decade, DESG has been part of a national movement to educate beachgoers about rip current hazards. Important progress has been made by participating Sea Grant programs like DESG that have worked with local beach patrols to track and predict rip current activity and to teach beachgoers how to spot rip currents, why they're dangerous and what to do if swimmers get caught in one.

Sustainable Fisheries and Aquaculture

40 YEARS of Science Serving the Delaware Coast

Delaware Sea Grant plays a leadership role in developing innovative technologies for all sectors of the seafood industry, including fishing, aquaculture, seafood processing and consumer safety, to ensure a safe and sustainable supply of seafood products now and for future generations.

Our Program

- Supports the seafood industry with trusted research and expert training
- Helps consumers make smart decisions about seafood consumption
- Educates recreational fishermen about the control and impact of invasive species
- Provides state officials and community members with research-based information about the development of an aquaculture industry

By the Numbers for 2015–16

1,000

Consumers reached through seafood and aquaculture outreach trainings

Hits to www.seafoodhealthfacts.org

660,000+

100+ **Seafood processors trained to meet required FDA Seafood HACCP regulations**

12 **Workshops hosted for state officials and local community members to enhance their knowledge on the potential impacts of aquaculture development**

20 **Bait and tackle shops received invasive species outreach materials**

Highlights

- Seafood specialist Doris Hicks was awarded the 2015 Earl P. McFee Award, conferred by the Trans-Atlantic Fisheries Technology Conference. The international award is a unique professional distinction given annually to an individual from industry, government or academia that has made "exemplary contributions to the field of seafood science and technology."
- DESG continues to offer regular training programs on food safety and sanitation control for food educators, seafood processors and food safety investigators, regionally, nationally and internationally. In addition, DESG provides a 3-Day Basic Seafood HACCP course to tackle specific seafood safety issues related to helping the industry process safer products. When combined with an internet course, the 3-Day HACCP course satisfies the training requirements of the U.S. Food and Drug Administration and state health departments.
- DESG launched an outreach campaign encouraging local anglers to throw leftover bait and packing seaweed in the trash instead of in waterways. This one simple change can help prevent the introduction of non-native and potentially invasive species into Mid-Atlantic fisheries. The project is part of a collaborative effort between DESG and partners at the Smithsonian Environmental Research Center, University of Maryland at College Park, University of Wisconsin at Madison and five other Sea Grant College programs in the Mid-Atlantic region.

Environmental Literacy and Workforce Development

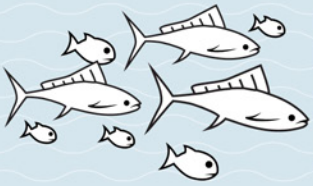
40 YEARS of Science Serving the Delaware Coast

The complexity of high-priority marine issues calls for an educated public that can understand the link between science and society and the need for an integrated approach between the two.

Our Program

- Leads formal education programs for K–12 students
- Hosts professional development opportunities for teachers and educators
- Provides experiential learning opportunities for college students
- Offers docent-led tours of UD's Hugh R. Sharp Campus in Lewes
- Produces video, audio, print and digital products to support DESG key messages and initiatives

By the Numbers for 2015–16



Visits to www.deseagrant.org
91,000+

Twitter
½ Million
impressions

Facebook
4,800
reached weekly

Instagram
500
followers

Highlights

University of Delaware graduate students Erica Wales and Frances Bothfeld, and Symone Johnson, a graduate student at Delaware State University will spend the next year in Washington, D.C. as Dean John A. Knauss Marine Policy Fellows.

DESG launched a new digital video series, "15 Second Science," which has rapidly gained popularity on social media, resulting in over 50,000 views. Video content is generated from timely topics, and provides a new, innovative outreach tool for collaboration between DESG content specialists, educators and communicators.

Educators from Delaware and Maryland gathered to learn how solar and wind energy could help to address the challenges of climate change, as part of the MADE CLEAR project.

Sea Grant Delaware

Research Projects

2016–2018

Sea Grant's tagline is "*Science Serving America's Coasts*." We do that by funding research to address issues of coastal significance that is then shared with stakeholders through outreach and education programs, creating a "three-legged" stool approach, with each area needed to balance the combined program.

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Wei-Jun Cai / Dana Veron

Delaware Bay monitoring for coastal health and resilience DESG developed, installed and maintained water quality and atmospheric monitoring equipment aboard vessels of the Cape May-Lewes Ferry fleet, with the Delaware River and Bay Authority. New equipment, including pH and carbon dioxide sensors, will allow DESG researchers to explore the relationships of nutrients, pH and bay water acidification, to explain and possibly predict Delaware Bay water quality shifts over time. Computer simulations constructed with the data collected will help scientists determine how wind affects water forcing and mixing, and influences nutrient supply on phytoplankton populations. Data will be publicly available for citizens, researchers and other supporting agencies.

James Kirby / Fengyan Shi

Coupling geomorphological and ecological processes in numerical simulations of Delaware salt marsh evolution DESG researchers are refining a model of water, sediment, plants and their interactions to help determine how marshes respond to changing flooding regimes. Delaware's bayshore is dominated by low-lying marsh ecosystems, and their resilience as sea level rise accelerates is not well understood. Combining computer simulation modeling with data from Brockonbridge Gut, Murderkill River and Bombay Hook National Wildlife Refuge will assist researchers and resource managers in understanding the threats associated with sea level rise in our coastal marshes.

Jonathan Cohen

Variability in Delaware Bay zooplankton across spatiotemporal scales: climatic, seasonal and reproductive influences This project builds on earlier work surveying zooplankton distribution and abundance in Delaware Bay. Zooplankton include not only copepods, but juvenile crabs, fish and jellyfish. Representing an important component of the food web, and juveniles of commercially important species, this data will inform fisheries managers and scientists about the condition and patterns of abundance in the bay. Educational programming will also be built around the survey and analysis techniques.

Kathryn Coyne

Development of immobilized algicidal bacteria for prevention and mitigation of harmful dinoflagellate blooms Harmful algal blooms (HABs) are a major environmental and public health issue in the coastal U.S. Most toxic HAB species are within one class of phytoplankton: the dinoflagellates. HAB dinoflagellate toxins can travel up the food web and threaten human health and marine life. Previous DESG research demonstrated that a bacterium, *Shewanella* sp. IRI-160, isolated from Delaware's inland bays, produces an algae-killing compound that specifically targets dinoflagellates, but not other phytoplankton. Building on this, the researchers will evaluate porous matrix support materials for immobilization of *Shewanella* sp. to allow its use as an algicidal compound to naturally reduce or control HABs in coastal waters.

Nobuhisa Kobayashi / Fengyan Shi

Barrier beaches in the face of storms and surges: new simulation models for better understanding Current computer simulation models used to study and predict changes in the size and shape of barrier islands due to wave and wind action do not fully capture storm impacts and unexpected consequences for coastal systems, including breaches and flooding. Nor do models include accelerating sea level rise and the compounding effects on storm surge and damage. Researchers will redevelop models to account for dynamic changes in coastal barrier systems during large storm and surge events, including anticipated sea level rise, to enhance awareness of pending threats and to inform FEMA dune guidelines for protecting our coast.

Tye Pettay / Kathryn Coyne

Diversity within the harmful alga *Heterosigma akashiwo*: environmental drivers and strain toxicity Harmful algal blooms (HABs) can permanently damage the environment and threaten human health and marine life. Commonly found in Delaware's inland bays during summer and early fall, HAB outbreaks can cost local fisheries millions of dollars for a single event. One species of raphidophyte, responsible for damaging blooms on the West Coast, appears to have multiple strains present in the inland bays that vary with salinity. Laboratory experiments exploring the variation between strains and its relationship to environmental conditions, will assist researchers and resource managers in understanding, predicting and responding to HAB events in Delaware and other coastal systems.

Coastal imagery for resiliency (CI4R): a coupled three-dimensional survey of coastal morphodynamics and biology Storm events can cause major changes on both bay and ocean beaches, and DESG researchers are ready to document the effects using rapid deployment equipment before and after the next Big One. With aerial and underwater mapping data, the researchers expect to precisely document shifting sands on Delaware Bay and Atlantic Ocean shorelines. Results will highlight the shoreline's dynamic features, and provide beach nourishment managers data that can inform decision making regarding sand placement and future restoration efforts.

Art Trembanis / Doug Miller

Shawn Polson / Eric Wommack / Patrick Gaffney

Deciphering the role of commensal microbial communities in the health and fitness of the Eastern Oyster, *Crassostrea virginica* The eastern or American oyster, *Crassostrea virginica*, is an economically and ecologically valuable inhabitant of East Coast waters. Overfishing, habitat degradation and lethal diseases have reduced oyster populations and harvests. DESG researchers are assessing the microbiome (entire communities of microorganisms) of natural and restored oyster populations, including aquaculture lines of *C. virginica*, to understand the microbiome's role in oyster health and disease. Cutting edge DNA sequencing technology will provide detailed views of the oyster holobiont, including the individual oyster genotype and its associated bacterial and viral microbiome. Results will inform oyster restoration efforts and ongoing Mid-Atlantic oyster aquaculture research and programs.

Surf zone injuries and beach safety along the Delaware coast: associated hydrodynamic and morphological factors While rip current awareness is common, beachgoers are less aware of other surf zone injuries (SZI). DESG researchers are leading emerging research into the statistics of surf injuries and beach conditions. The current work combines statistical health information from local facilities, surf patrol observations, beachgoer surveys, hydrodynamic measurements and modeling and studies of crash test dummies on local beaches. Contributors hypothesize that SZI increase for certain wave heights and beach slopes, but decrease as wave heights exceed undetermined thresholds above a typical beachgoer's risk tolerance. DESG outreach will continue to provide this research to the public in readily usable formats.

Jack Puleo

Delaware Sea Grant funds research projects on a two-year cycle. Projects reflect the current focus areas of the strategic plan. Full project abstracts are available at

www.deseagrant.org/research

Sea Grant Delaware

NOAA

University of Delaware | College of Earth, Ocean, & Environment

40 YEARS of Science Serving the Delaware Coast

The Delaware Sea Grant College Program helps people wisely use, manage and conserve our nation's valuable marine and coastal resources. We do this through an integrated program of excellence in research, education and outreach built upon active partnerships with state and federal agencies, the private sector and citizens.

www.deseagrant.org | 302-831-8083

Coast Day™

Due to ongoing construction on the Hugh R. Sharp Campus in Lewes, Coast Day 2016 is canceled. Please visit **www.decoastday.org** for details and to learn how you can still help us celebrate our coast in October and throughout the year.

DELAWARE SEA GRANT COLLEGE PROGRAM
REPORTER

UNIVERSITY OF DELAWARE
NEWARK, DELAWARE 19716-3530

6. Reduce automobile pollution. Use fuel-efficient vehicles or carpool. Recycle motor oil.

7. Protect ocean wildlife. Don't dispose of fishing line, nets, unused bait/packaging, or plastic items in or near the water.

8. Be considerate of sea life and their habitat. Don't feed sea birds, turtles, or marine mammals, or disturb their nursery grounds.

9. Get involved. Take part in a beach cleanup or other ocean-oriented activity.

10. Care about the ocean! Pass on your knowledge!

Please recycle this book by sharing it with a friend.

www.deseagrant.org

2016 Readership Survey

Complete the brief survey on the reverse side of this card and mail to be entered to win a coast inspired prize package valued at over $200.
Or you can enter online at **www.deseagrant.org/survey**.

Respond by Dec. 31, 2016

Enter for a chance to win a Coastal Prize Package!

PLACE STAMP HERE

DELAWARE SEA GRANT COLLEGE PROGRAM
REPORTER

University of Delaware
Environmental Public Education Office
222 South Chapel Street, Suite 102
Newark, DE 19716-3530

Name _____

Address _____

_____

City _____ State _____ Zip_____

Daytime Telephone _____

☐ I would like to subscribe to Delaware Sea Grant's e-newsletter.

(Provide email address) _____

1. Do you use Delaware's bays, beaches or coastal areas for recreation or pleasure? ☐ Yes ☐ No
2. When compared to 10 years ago, do you think the health of our coastal and marine resources are:
   ☐ Much better ☐ Somewhat better ☐ About the same ☐ Somewhat worse ☐ Much worse ☐ Don't know
3. Which broad issues affecting Delaware's coast are most important to you? *(Check your top three choices.)*
   - ☐ Safe and sustainable seafood supplies
   - ☐ Vibrant and economically sustainable coastal communities
   - ☐ Communities resilient to coastal storms and hazards
   - ☐ Healthy coastal ecosystems
   - ☐ Climate change and/or sea level rise
   - ☐ Environmental literacy for all age groups
4. If Delaware Sea Grant could help to solve one major coastal problem in Delaware, what should it be?

   _____

   _____

5. After reading this issue of *Reporter,* which actions, if any, do you plan to take within the next six months? *(Check all that apply.)*
   - ☐ Read more about environmental issues
   - ☐ Attend an environmental event
   - ☐ Take part in a Sea Grant workshop, lecture or seminar
   - ☐ Visit **www.deseagrant.org**
   - ☐ Visit DESG on YouTube, Facebook, Instagram or Twitter
   - ☐ Other *(Please specify):* _____
6. How would you rate the overall quality of this report?
   ☐ Excellent ☐ Very Good ☐ Average ☐ Good ☐ Poor

   Comments or suggestions:

   _____
7. How would you prefer to receive future issues of this report?
   ☐ Print ☐ Printable PDF ☐ Website ☐ Online video digest
8. What is your age? ☐ Under 20 ☐ 20–29 ☐ 30–39 ☐ 40–49 ☐ 50–59 ☐ 60–69 ☐ 70 +
9. Is your occupation directly/indirectly related to Delaware's coastal environment? ☐ Yes ☐ No
10. May we contact you about future Delaware Sea Grant activities?
    ☐ Yes, by mail ☐ Yes, by email ☐ Yes, by phone ☐ No thanks
11. Other comments or suggestions:

    _____

    _____

    _____

Sea Grant Delaware

10 Things You Can Do to Help Our Ocean

1. **Learn all you can about the ocean.**
2. **Be a smart shopper and seafood chef. Ask restaurants and grocery stores about the source of their seafood. Find out how to properly prepare your catch. Visit www.seafoodhealthfacts.org.**
3. **Conserve water. Be careful when taking a bath or shower, washing your car, watering your lawn.**
4. **Limit your use of household pollutants, including herbicides, pesticides, lawn fertilizers and nonbiodegradable cleaning products.**
5. **Reduce waste. Recycle, re-use and compost whenever possible.**

(turn over)

Fill out your survey today!