

# CLIMATE CHANGE and Our Coast



DELAWARE SEA GRANT COLLEGE PROGRAM

## REPORTER

Volume 28 | 2009 Annual Report

### *Using Technology, Innovation, and Cooperation to Tackle Coastal Challenges*

Those of us who live along the coast look to it for sustenance and recreation, for economic value, and for pleasure. It is important to recognize that these needs are not mutually exclusive — they are all connected. Maintaining and supporting healthy coastal ecosystems and the ecological services they provide ultimately result in greater economic benefits for our communities.

The Delaware Sea Grant College Program, housed at the University of Delaware, is a leader in providing sound scientific information on issues affecting our coasts and our coastal economies. Our research and understanding of the coastal environment helps people make or

save money, protects lives, gives resource managers and community leaders fact-based information that informs their decisions, and enhances public understanding of coastal issues.

The coastal environment is facing significant challenges associated with climate change and growth. Delaware Sea Grant is ensuring that our state and nation are prepared for those challenges. We are developing the next generation of technologies that allow us to better monitor our waterways, understand vital habitats for valuable aquatic species, and keep our communities safe from coastal hazards. We are guiding our nation toward carbon-free energy independence through innovative work with marine-based renewable energy resources. And we are doing this by cooperating with government leaders, businesses, educators, environmental organizations, and concerned citizens. Our goal is to ensure that society benefits from the sea — today and in the future.



Kathy Atkinson

In this report we highlight just a few of the many ways that Delaware Sea Grant is leading efforts to better understand and deal with our coastal challenges. I hope that you will visit our web site — [www.deseagrant.org](http://www.deseagrant.org) — to learn more about our work and find out how you can get involved. Together we can make a difference!

*Nancy M. Targett*

Dr. Nancy M. Targett  
Director, Delaware Sea Grant  
Dean, University of Delaware College of Earth, Ocean, and Environment

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# Delaware's Dynamic Coast

Delaware's coastline is — literally — shaped by short- and long-term environmental conditions. Coastal storms, for example, can erode beaches, flood low-lying areas, and cause wind damage to homes. Accelerated rates of sea-level rise may inundate marshes and worsen flooding.

Delaware Sea Grant is studying the many factors influencing our coastlines and sharing that knowledge with government agencies and the public. The result is an improved ability to make informed decisions about how we cope with this dynamic environment.

## Coastal marshes, their services, and sea-level rise

Sea Grant researcher Chris Sommerfield is studying how sediments are carried by rivers, tides, and storm surges and get trapped in coastal marshes — low-lying ecosystems that help to reduce upland flooding during storms, absorb pollutants, and serve as important habitat for wildlife.

This work is particularly relevant in the face of rising sea levels. Coastal marshes build up through a combination of vegetative growth and deposition of muddy sediments supplied by tidal creeks during spring tides and storm surges. If coastal marshes can't outpace rising sea levels, they and the services they provide could disappear.

"In part, our ability to predict marsh stability rests on a firm understanding of the underlying sediment dynamics," said Sommerfield. "Data we collect on sediment transport, deposition, and erosion help determine how marshlands could respond to sea-level rise and changes in sediment delivery."

## Making coastal communities safer

The dynamic nature of Delaware's shoreline exposes communities, properties, and people to a unique set of hazards. As the coastal population grows, residents and structures become more vulnerable to storms and their associated wind, waves, erosion, and flooding.



*Delaware Sea Grant's research and education efforts are helping coastal residents stay safe in a dynamic coastal environment.*

Sea Grant scientists Jim Kirby and Fengyan Shi are working to refine a model that will help state officials predict storm surge and flooding, with the goal of saving lives and reducing storm damage. They are evaluating their model's performance by assessing its ability to correctly forecast events at the mouth of Delaware Bay.

In addition, Sea Grant's Wendy Carey and partners are helping coastal communities to identify and assess the risks associated with living, working, and doing business along the coast. To date, nearly 15 communities have benefited from workshops designed to improve their resiliency and minimize future impacts to property, infrastructure, and economies due to coastal storms and flooding.



*Chris Sommerfield (far right) and colleagues take a sediment sample in a marsh along the Murderkill River. Marshes help to reduce upland flooding during storms, absorb pollutants, and serve as important habitats for wildlife. Sommerfield's research is enhancing our understanding of coastal marshes and how they could respond to changing sea levels.*



# Coastal Water Quality and Fisheries

From Brandywine Creek's lush banks to Fenwick Island's quiet beaches, Delaware has an abundance of coastal treasures. With increasing human pressures on our coastal resources, however, it is critical to understand how we can better conserve, manage, and benefit from them.

Several Delaware Sea Grant projects are helping to ensure that the state's valuable natural resources — such as clean water and stable fisheries — can be enjoyed by our children and grandchildren.

## Using algae to monitor water quality

Scientist Kathy Coyne addresses the effects of pollution from sources such as residential or agricultural

runoff on Indian River, Little Assawoman, and Rehoboth bays, the waterways collectively known as Delaware's Inland Bays.

Coyne (at left) is working to identify specific types

of microscopic algae called diatoms that can serve as indicators of water quality. Certain diatom species do better than others in polluted waterways; therefore, the species found in a particular area can tell scientists a lot about environmental conditions there.

Once armed with the new information, Coyne plans to provide the Delaware Department of Natural Resources and Environmental

Control and monitoring groups such as the UD Citizen Monitoring Program with training on how to incorporate diatom indicators into their monitoring efforts.

"It's really important for us to involve citizens. They are our eyes on the bays," she said.

Water quality monitoring, she added, benefits not only the ecosystem, but it also helps to protect the health of people using the waterways.

## Maintaining fish populations

Several local fish species are the subject of a project led by Delaware Sea Grant researcher Tim Targett and Sea Grant collaborators from Virginia and Maryland. That team is working to understand how changes in environmental conditions and climate influence the movement of water and the ingress, or entrance, of fish larvae from the open ocean into the fertile estuarine waters of the Delaware and Chesapeake bays.

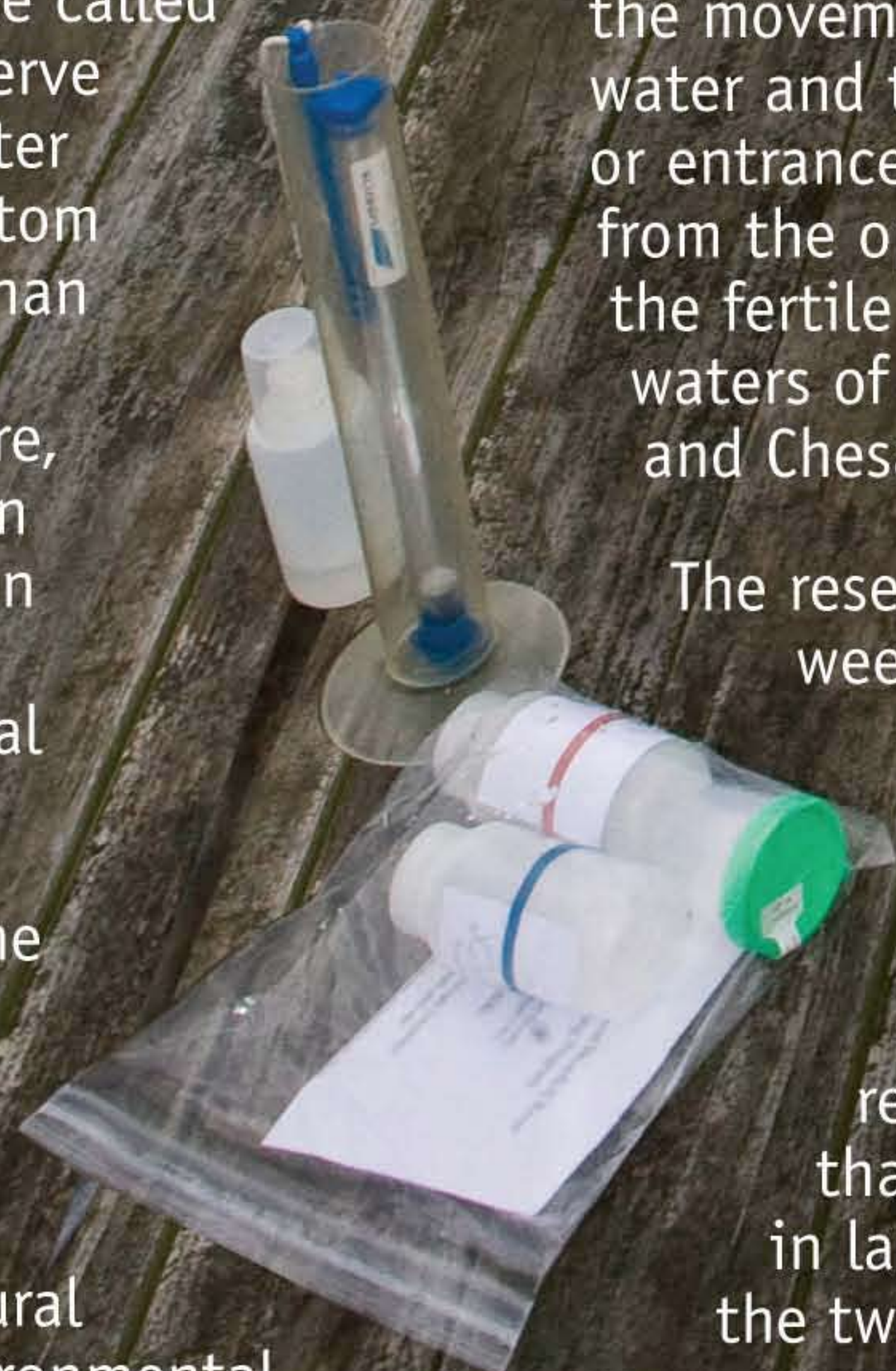
The researchers sample weekly in both estuaries, looking particularly for larvae of Atlantic croaker, Atlantic menhaden, and American eel. Their results to date suggest that there are differences in larval ingress between the two estuaries.

Diatoms could soon be added to the suite of tools used to monitor water quality in Delaware. Here, a volunteer uses a device that measures water clarity.

Derek Parks



Bobb Bowden



Targett explained that because larval fish are transported into estuaries by tides, wind, or a combination of weather-related factors that vary from year to year and estuary to estuary, results of the team's work will help fisheries managers understand causes for natural variability in fish numbers. This will help them maintain healthy fish populations and sustainable fisheries.

Sea Grant researchers collect fish larvae from Delaware Bay. The research is essential to understanding factors contributing to variability in fish populations.



Tammy Beeson



# Alternative Energy on the Horizon

Renewable energy sources have been in the spotlight recently. While there is a vast portfolio of alternative energy options worldwide, coastal-based energy sources offer particular appeal to Delaware and the mid-Atlantic region. As a coastal state, Delaware is primed to lead the way in the next generation of marine energy production.

Researchers at Delaware Sea Grant understand the state's potential as a leader in marine renewable energy. Today, they are playing essential roles in transitioning the state — and the nation — toward energy independence.

## Harnessing the winds of public opinion

In 2005, Delaware Sea Grant researchers Jeremy Firestone and Willett Kempton surveyed residents of Cape Cod, Mass., to learn their opinions about a proposal to establish a wind farm just off their coast. The majority opposed the project.

Firestone and Kempton used the same approach in 2006 to see if Delawareans felt the same way about seeing wind turbines off their own coast.

They didn't.

In fact, more than 90 percent of Delawareans expressed overwhelming support for offshore wind power as a future source of energy for the state.

Since then, prospects for wind farm development proceeded rapidly in Delaware, with the First State emerging as a potential location for the nation's first offshore wind farm. Instead of a hypothetical situation, Delawareans are now facing the very real prospect of wind turbines spinning off the coast.

**Firestone and Kempton's findings are shaping energy policy in Delaware and the United States.**

Has increased public awareness of alternative energy resources and the greater likelihood of Delaware having an offshore wind farm in the near future changed public opinion since 2006? Firestone and Kempton are finding out. They are conducting follow-up surveys of residents in both locations to determine how public opinions have evolved over the past several years. Their findings are being used to help shape energy policy as the United States and Delaware work toward generating environmentally friendly, price-stable electricity. They also are shedding light on how and why public attitudes toward offshore wind development have changed over time.

## Planting the seeds of change



Bob Bowden

*Agricultural fields in Delaware could feature a new crop thanks to the research of Denise Seliskar and Jack Gallagher. Seashore mallow thrives in soils exposed to salt water.*



Jennifer Halchak

Along the coast, seashore mallow, a salt-tolerant plant known for its hibiscus-like blooms, may bring a whole new meaning to "flower power" thanks to work being done by Delaware Sea Grant researchers Jack Gallagher and Denise Seliskar. Along with graduate student Jen Halchak, they are examining seashore mallow's potential both as a biofuel and as a viable crop to grow on low-lying farmland that is increasingly exposed to salt water.

With further understanding of the native marsh perennial's many strengths, including its oil-rich seeds, ability to grow on non-arable land, and erosion-fighting deep-root system, Delaware farmers may soon have a new option for sustaining the ecological and economic uses of agricultural land threatened by sea-level rise.





# Advancing Coastal Technology

Prior to the microscope's invention, humans were unaware of the tiny plants and animals that swarm throughout our oceans. Today, we know that plankton form the basis of the marine food web.

Technological advances continue to greatly improve our understanding of the natural world. Delaware Sea Grant is a leader in developing the next generation of ocean research technology. From an underwater robot to an unmanned blimp, our scientists are honing new and better ways to collect data, make important discoveries, and benefit humankind.

*Thanks to the University of Delaware's unmanned airship, Sea Grant researchers will have access to detailed images of the shoreline, like the one shown here.*

*They may seem harmless when seen under a microscope, but some phytoplankton blooms can cause problems for coastal waterways.*



## New sensor analyzes microscopic plants

Delaware Sea Grant researchers George Luther and Matt Oliver are using a new type of sensor to help determine how efficiently Delaware Bay phytoplankton grow. The sensor measures how changes in sunlight and nutrients affect the growth of the microscopic plants.

When phytoplankton occur in high concentrations — events known as blooms — they can degrade water quality and harm fish and other marine life. Knowing how efficiently the plants grow will help resource managers looking to monitor the bay's health.

## Airship offers novel way to study shorelines

Closer to shore, another study is using GPS and imaging systems to learn more about the accumulation of sand around Cape Henlopen Point. Researchers Jack Puleo and Michael O'Neal are using a sophisticated GPS system to map the shape of the beach and the amount of sand present, and a camera system will take near real-time images of the shoreline.

The scientists will compare the GPS information with measurements collected by their new navigable unmanned airship. The 60-foot airship offers the opportunity to gather high-resolution images over a large land area.

Information about how sediment is transported will help state program managers assess how moving shorelines affect beaches, developed areas, and wildlife.

*Matt Oliver (left) and George Luther are using a new sensor to measure the relationship between environmental conditions and phytoplankton growth.*

## Underwater robot maps ecological hotspots

Researchers Art Trembanis and Doug Miller are using an autonomous underwater vehicle (AUV) to learn more about specific habitats on the bottom of Delaware Bay. Some of these habitats support diverse communities of organisms and are known as fishing hotspots by recreational anglers, but scientists don't know much about them.

The AUV is a torpedo-shaped robot that can swim untethered through the water to collect data. It uses sophisticated sonar sensors to take acoustic "pictures" of the seafloor and gathers water quality information and other data that will help the scientists determine the factors contributing to the areas' ecological productivity.

"The AUV can get close to the seabed without actually disturbing it," Trembanis said.



Joe Farrell

Lisa Tossey

Lisa Tossey



# COMMUNITY CONNECTION

## Sea Grant's Efforts Conserve Resources

### Good News for Oysters



Led by Delaware Sea Grant and its partners, volunteers working to restore Inland Bay oyster populations have been raising the shellfish since 2003. The program, headed by Delaware Sea Grant Aquaculture Specialist John Ewart (shown above), now has 170 gardeners at more than 100 locations. In 2008, it hit an exciting milestone: Participants found evidence of naturally occurring juvenile oysters in two Fenwick Island waterways!

### A Growing City Plans for the Future



Teaming up with the Greater Lewes Foundation, Jim Falk, director of the Delaware Sea Grant Marine Advisory Service (shown above), recently helped the historic City of Lewes envision its future. For the project, known as FutureScan, he helped solicit feedback from more than 125 stakeholders across the greater Lewes area and outlined nine action items to help Lewes begin addressing quality of life and growth issues throughout the community.

### We Help Keep Your Seafood Safe



In 2008, Seafood Technology Specialist Doris Hicks and her partners reported results of their survey that asked more than 1,200 consumers about their knowledge of seafood processing technologies. In a new survey, more than 100 nutritionists and dieticians from across the country have responded to questions about the benefits and risks of seafood consumption. The outcome? Food and nutrition educators are being provided with critical information that supports their efforts to make seafood more safe and accessible for consumers.

### Water Monitoring: Everyone Benefits

The UD Citizen Monitoring Program has trained more than 250 citizen volunteers to collect water quality data throughout coastal Delaware. Joe Farrell, the program's manager, said that not only does it help educate the public, but nonprofit and university scientists put the volunteers' data to good use in preserving clean water and protecting public health.

In addition, Delaware Department of Natural Resources and Environmental Control resource managers acknowledge that the data is extremely useful in supporting their management and regulatory efforts.

### Knowledge of Native Plants Grows with Garden

Native plants require little maintenance, are specifically adapted to the stresses common to coastal areas, and provide a natural extension of the local ecosystem. Sea Grant's Wendy Carey and partners created a native plant demonstration garden in Lewes to create awareness about these plants. The recently expanded, award-winning garden has attracted thousands of visitors who have learned how they can help protect the coastal environment by including native plants in their home landscapes.

To learn more about any of these projects, call 302-831-8083 or visit [www.deseagrants.org](http://www.deseagrants.org).



## ADVISORY GROUP MEMBERS GUIDE SEA GRANT EFFORTS

The Delaware Sea Grant Advisory Council is a diverse group — it comprises members of the Delaware General Assembly and representatives from state and local government agencies, industry, nongovernmental organizations, and the education sector. Its members provide critical input on Delaware Sea Grant's research, outreach, and education projects as well as its strategic planning efforts.

### Executive Committee

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# 2009 READERSHIP SURVEY



Complete and mail this brief survey or save a stamp and complete it online at [www.deseagrant.org/survey](http://www.deseagrant.org/survey). **Respond by July 22** and you will be entered into a drawing for our Coastal Prize Package.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Daytime telephone \_\_\_\_\_

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- ☐ I would like to subscribe to *At Sea*, Delaware Sea Grant's e-newsletter. (Provide e-mail address above.)

1. After reading this issue of *Reporter*, which actions, if any, do you plan to take within the next six months?

- ☐ Read more about climate-related issues  
☐ Learn more about technologies used for marine research  
☐ Find out more about water quality monitoring  
☐ Learn more about alternative energy  
☐ Attend UD's Coast Day  
☐ Visit UD's Hugh R. Sharp Campus for a tour  
☐ Take part in a Sea Grant workshop, lecture, or seminar  
☐ Visit [www.deseagrant.org](http://www.deseagrant.org)  
☐ Visit Delaware Sea Grant on YouTube, Facebook, or Twitter  
☐ Other (Please specify): \_\_\_\_\_

2. What coastal challenges or issues would you like to learn more about?

\_\_\_\_\_  
\_\_\_\_\_

3. Do you like this report's format? ☐ No ☐ Neutral ☐ Yes

Comments or suggestions: \_\_\_\_\_

\_\_\_\_\_

4. How would you rate the readability of this report?

- ☐ Poor ☐ Good ☐ Average ☐ Very Good ☐ Excellent

Comments or suggestions: \_\_\_\_\_

\_\_\_\_\_

5. How would you rate the information contained in this report?

- ☐ Poor ☐ Good ☐ Average ☐ Very Good ☐ Excellent

Comments or suggestions: \_\_\_\_\_

\_\_\_\_\_

6. What is your age? ☐ Under 20 ☐ 20-29 ☐ 30-39 ☐ 40-49

☐ 50-59 ☐ 60-69 ☐ 70 +

7. What is your occupation?

- |   |  |
|---|--|
| <input type="checkbox"/> Business/industry    | <input type="checkbox"/> Resource manager              |
| <input type="checkbox"/> Commercial fisherman | <input type="checkbox"/> Retiree                       |
| <input type="checkbox"/> Educator             | <input type="checkbox"/> Scientist                     |
| <input type="checkbox"/> Homemaker            | <input type="checkbox"/> Student                       |
| <input type="checkbox"/> Legislator           | <input type="checkbox"/> Other (Please specify): _____ |
| <input type="checkbox"/> News media           | _____  |

8. Other comments:

\_\_\_\_\_  
\_\_\_\_\_

**MOISTEN HERE TO SEAL**

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# YOUR Chance to Win Our Coastal Prize Package



Complete our readership survey and be entered to win a package of prizes including a stay at UD's Virden Center in Lewes, our Coast Day Crab Cake Cookbook, and much more!

Lisa Tossey

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University of Delaware  
Marine Public Education Office  
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## *Lectures, Seminars, and Workshops*

Our calendar is loaded with events on topics ranging from safe seafood preparation to the health of Delaware Bay.

## *Publications That Educate, Inform, and Entertain*

Whether you're a teacher looking for classroom materials or a cook in search of new seafood recipes, we have something for you. Or, to keep up with Delaware Sea Grant news, sign up for *At Sea*, our e-mail newsletter.

# Stay Informed. *Stay Involved!*

*Reporter* is our annual newsletter, but you can follow Delaware Sea Grant happenings — and get involved yourself — throughout the year!

## *Engaging Multimedia*

You may know our *SeaTalk* announcements from the radio, but now you can also view them as video podcasts online. Topics range from hurricane research to alternative energies (and we're adding more each month)!

## *Free Tours*

Docent-guided walking tours of UD's Hugh R. Sharp Campus in Lewes and self-guided tours of the campus' native plant garden provide an up-close view of our research and the coastal environment.

*Also look  
for us on:*



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For more information, call 302-831-8083 or visit [www.deseagrants.org](http://www.deseagrants.org).



# CLIMATE CHANGE *and Our Coast*



**SUNDAY, OCTOBER 4 • 11 A.M. TO 5 P.M.**

Our annual celebration of the sea includes a crab cake cook-off, children's activities, research demonstrations, lectures, and much more!

[www.decoastday.org](http://www.decoastday.org)

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