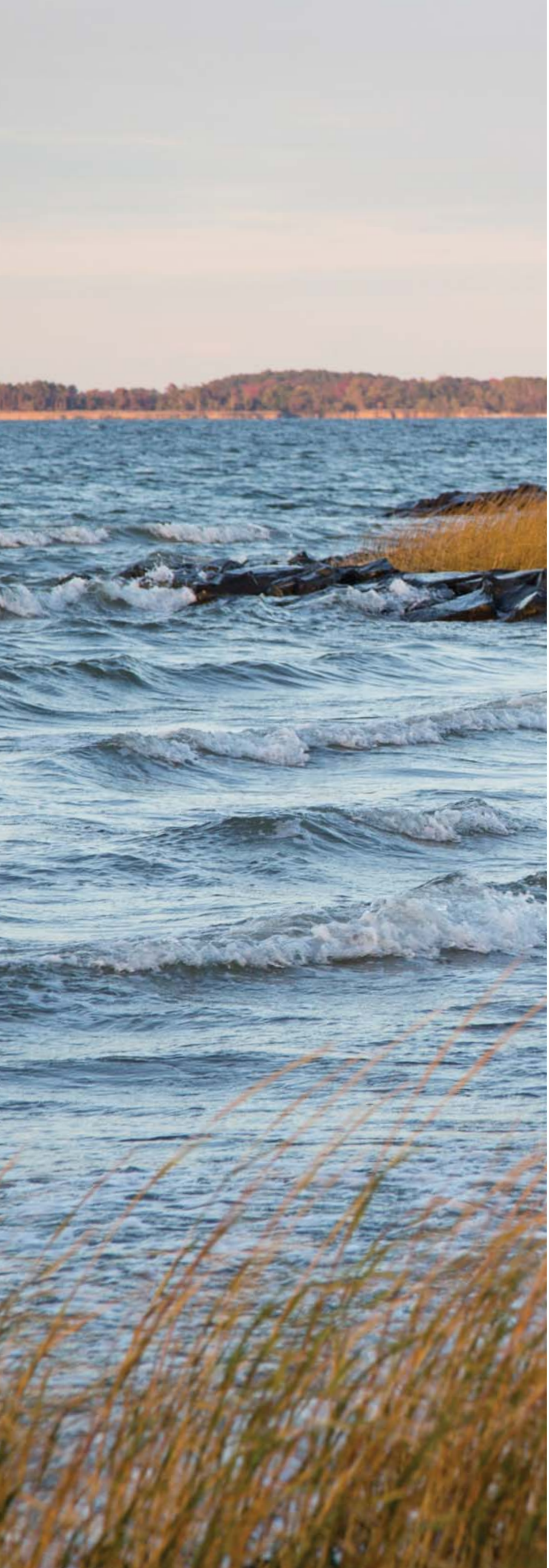
Review of the
Maryland Sea Grant College Program

BRIEFING BOOK

National Site Visit • January 21-22, 2015



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PHOTOGRAPHS: SKIP BROWN, COVER (LARGE PHOTO AND SMALL PHOTOS, FAR LEFT AND FAR RIGHT), THIS PAGE, AND PAGES 5 AND 9; DANIEL STRAIN, COVER (SECOND FROM LEFT); DON WEBSTER, COVER (SECOND FROM RIGHT); NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, PAGE 19

Program Management and Organization

The Maryland Sea Grant Program

Since it was founded in 1977, Maryland Sea Grant (MDSG) has effectively and responsibly administered the public funds and programs entrusted to our care, and has worked collaboratively with a variety of partners, to help meet the needs of our stakeholders. MDSG has supported research, education, and outreach that helped to provide Maryland's leaders and citizens the science-based information and analyses they need to make decisions that can promote a more sustainable and resilient future for the state's coastal natural resources and economy.

Much of our work is focused on the continuing effort to restore and preserve the Chesapeake Bay. The size and diversity of this estuary, America's largest, are reflected by the number and variety of organizations working to restore and preserve it — a network in which Maryland Sea Grant plays an important part. The need for a reliable scientific basis for effective management of this environmentally and economically important natural resource has grown since 2010, when regulators established the Chesapeake Bay Total Maximum Daily Load (TMDL), which set mandatory limits on nutrients and sediment inputs to the Bay to improve water quality. The advent of the TMDL has increased the need for scientific support for adaptive management and for collaborations among a variety of local organizations to implement management strategies. MDSG's university base and dedication to delivering credible, translational research findings is particularly relevant to these restoration efforts.

Management and Administration

Management Team: Composition and Responsibilities

Maryland Sea Grant is successful at its missions to promote research, education, and public outreach because its leadership team consists of staff members highly qualified in all of these areas who collaborate closely and communicate well and often. Our management approach and practices are designed to keep our program innovative and relevant.

The senior staff meets at least monthly to discuss opportunities, plan activities, highlight critical administrative and planning issues, and evaluate results. The entire staff meets monthly for similar discussions. In addition, the MDSG Director attends meetings of the University of Maryland Extension's administrative leadership to pursue collaborations. MDSG Extension staff interacts routinely with the MDSG Director. Both the MDSG Director and the MDSG Extension Leader discuss strategies, work plans, and program evaluation frequently between our monthly management team meetings.

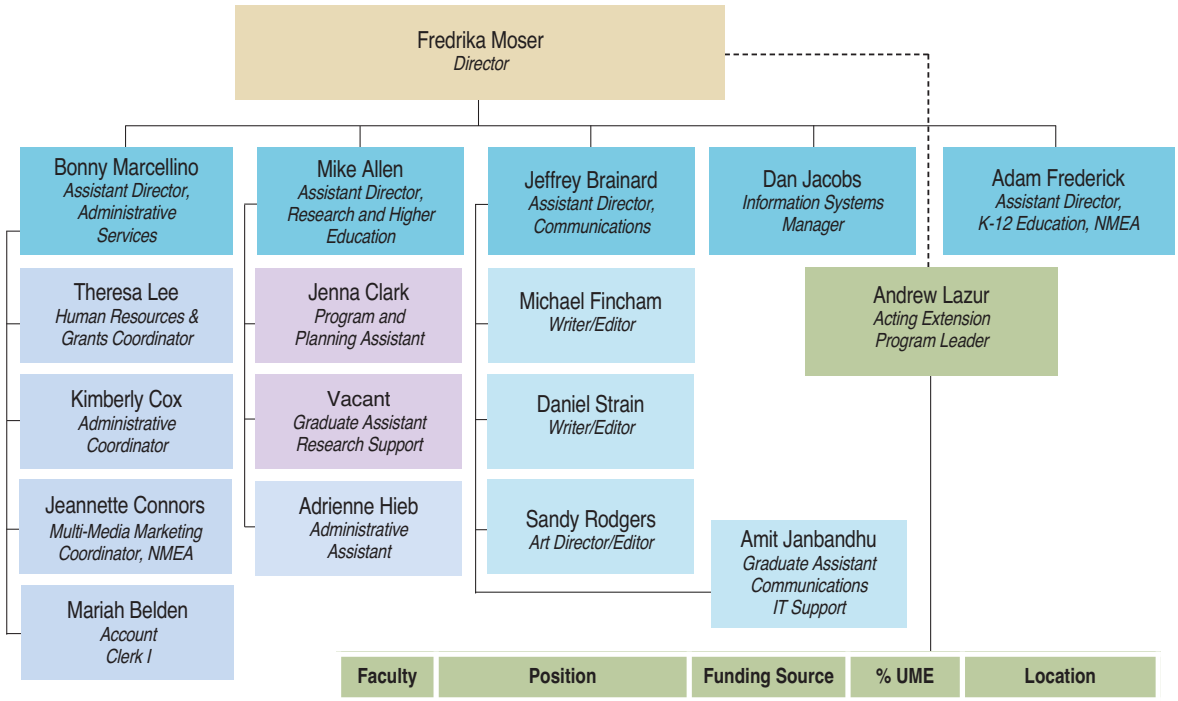
During the past four years, MDSG's leadership team experienced considerable turnover, resulting in new faces and new directions for the program. These changes included: the retirement of our Assistant Director for Communications, Jack Greer (2010); the resignation of our previous director, Jon Kramer (2011), who joined a new initiative at the University of Maryland, the National Socio-Environmental Synthesis Center (SESYNC); the retirement of the MDSG Extension Program Leader, Doug Lipton (2012); the creation of a new Assistant Director for Education position (2012); and the transition of the Assistant Director for Research, Fredrika Moser, to become interim Director (2011) and ultimately Director (2012). Throughout these transitions, the leadership team never skipped a beat, successfully leading the program to complete, among other things, a new 2014-2017 strategic plan, a NOAA performance review process, a special graduate fellowship program, and two competitions for MDSG research grants funded from Omnibus appropriations. Our leadership team and their duties include:

■ **Fredrika Moser,** Ph.D., the Director, provides overall leadership, staff management, coordination, and direction setting. Dr. Moser leads the program's interactions with the governing council and boards, the University of Maryland at College Park, the University of Maryland Extension, and our state, regional, and federal partners and collaborators. Dr. Moser reports directly to the President of the University of Maryland Center for Environmental Sciences, which is MDSG's administrative home.

■ **Michael Allen,** Ph.D., Assistant Director for Research, oversees the research portfolio for the program. This work includes managing our requests for proposals. He also runs our extensive undergraduate and graduate fellowship programs.

■ **Jeffrey Brainard,** M.S., Assistant Director for Communications, leads our communications team that includes an art director, a science writer, and a writer/film producer. Together they produce our magazine, website stories, and videos.

Figure 1. Maryland Sea Grant Organizational Chart, December 2014.



Faculty	Position	Funding Source	% UME	Location
Lazur	Acting Extension Program Leader	UMCP	100% (Tenured)	UMCP
Vacant	Administrative Assistant	Omnibus[1]	100%	UMCP
McIntee	Administrative Assistant	Omnibus[1]	100%	Horn Point (UMCES)
Holzer	Fisheries Economics	UMCP	100% (Tenured)	UMCP
Parker	Aquaculture Business	Sea Grant Award[2]	100%	Anne Arundel Co.
Liu	Seafood Technology Specialist	UMCP, UMES & Omnibus[1]	100%	UMES
Vacant	Hydrologist-Watershed Specialist	UMCP	65%[3]	Horn Point (UMCES)
Meritt	Shellfish Aquaculture & Restoration Specialist	Omnibus[1]	32%[3]	Horn Point (UMCES)
Webster	Aquaculture & Restoration Agent	UMCP	100% (Tenured)	Eastern Shore (Wye Res. & Educa. Center)
Vacant	Water Quality Specialist	UMCP	100% (Tenured)	IMET[4]
Carrasco	Coastal Communities Specialist	Omnibus[5]	100%	UMCP
Takacs	Regional Watershed Restoration Specialist	UMCP	100% (Tenured)	Southern MD (Jefferson Patterson Park[6])
Vacant	Chesapeake Bay Sentinel Site Coordinator	DNR[7] & Omnibus	100%	UMCP
Dindinger	Regional Watershed Restoration Specialist	UMCP	100% (Tenured)	Lower Eastern Shore
Rockler	Regional Watershed Restoration Specialist	UMCP	100% (Tenured)	Central Maryland
Buehl	Regional Watershed Restoration Specialist	DNR[7] & Omnibus	100%	Mid & Upper Eastern Shore
Varsa	Regional Watershed Restoration Specialist	DNR[7] & Omnibus	100%	Northern Maryland
Strain	Communications	Omnibus[1]	25%	Sea Grant

Extension Personnel & Funding

[1] Funded by MDSG Omnibus Award

[2] Funded by Sea Grant Aquaculture Extension grant

[3] Remaining Funds provided by Horn Point Laboratory

[4] Institute of Marine and Environmental Technology

[5] Funded by Sea Grant Coastal Communities and Climate Change grants

[6] Jefferson Patterson Park is a Maryland Department of Planning facility; Takacs also has a second office at St. Mary's College of Maryland

[7] DNR is the Maryland Department of Natural Resources

■ **J. Adam Frederick,** M.S., Assistant Director for Education, manages our programs in K-12 and free-choice learning and oversees the National Marine Educators Association office. He is responsible for coordinating with education leaders in state and local government, schools, and free-choice learning venues.

■ **Andy Lazur,** Ph.D., acting Maryland Sea Grant Extension Program Leader, oversees personnel and program priorities for 14 Extension specialists and agents who work in diverse fields, including the restoration of Maryland watersheds and fisheries. In 2013, the University of Maryland Extension (UME) merged the administrative responsibilities of the Sea Grant Extension Program Leader with those of the UME Natural Resources leader.

■ **Bonny Marcellino,** former Assistant Director for Administration, oversees the program's budgets, grants management, and assures compliance with all federal and state regulations and auditing. She is responsible for coordinating with the University System of Maryland's administration, including the University of Maryland Extension and the UMCES administrative council. Marcellino served MDSG as Assistant Director for Administration for more than 15 years before formally retiring in 2013; she has stayed on in a part-time position to transition the administrative team to new leadership and responsibilities.

Our management team positions are 100 percent state funded and have 100 percent time commitments to MDSG, with the exception of our Assistant Director for Education's position, which is funded at 25 percent by NOAA.

Extension Program: Organization and Integration

The Sea Grant Extension Program (SGEP) is a programmatic unit within the College of Agriculture and Natural Resources, University of Maryland Extension (UME), University of Maryland at College Park. Responsibility for managing the Extension program rests with the Sea Grant Extension Program Leader. Guidance and approval of programmatic decisions are coordinated with the Sea Grant Director and the Dean of the College of Agriculture and Natural Resources (AGNR), Dr. Cheng-i Wei, who is also Director of the UME and the Agricultural Experiment Station.

Maryland Sea Grant, the University of Maryland Center for Environmental Science, and UME operate through an agreement codified in our Memorandum of Understanding signed July 2013. Dr. Stephen Wright is the Associate Dean for Cooperative Extension, to whom the Sea Grant Extension Program (SGEP) Leader reports.

There is close integration across the different UME and MDSG program elements at the staff level. The Sea Grant Extension Program Leader attends regular staff and management team meetings at MDSG and is part of the UME administrative team. Sea Grant Extension faculty members carry out long-range planning by preparing annual Individual Extension Plans. These are well coordinated with MDSG's program planning. MDSG leadership meets routinely with SGEP personnel, and MDSG provides communications and reporting support to SGEP. Our Research staff works with SGEP to jointly prepare grant proposals and develop creative programs to integrate research and extension. Our Extension agents also interact with members of our advisory boards. Conversely, MDSG's association with UME allows Sea Grant to leverage UME's extensive network of agents and specialists in the related program areas of Agriculture and Natural Resources, Family and Consumer Sciences, and 4-H. The availability and sharing of resources strengthens both Sea Grant and other Extension programs. This relationship was more fully realized in 2013 when the Sea Grant Extension Leader position was merged with that of the Natural Resources group of UME.

Significantly, MDSG and UME have collaborated successfully to secure funding to establish and expand a Regional Watershed Restoration Specialists cluster within UME. The five staff members in this group work

Distinctive Approaches – Databases for Management

MDSG designed new databases to support and enhance management approaches and program effectiveness. We consider these efforts to be best management practices.

- **Publications.** This new database will modernize our tracking of scholarly publications and ease the reporting burden on funded researchers. This system automatically mines the broadly used Web of Science database of scholarly publications to collect citation information by using the unique IDs of MDSG-funded PIs.
- **Strategic Planning.** Another database allows us to track our progress in meeting the goals and objectives of our strategic plan more efficiently than is possible using NOAA's PIER system.
- **Mailing Lists.** We merged mailing lists that we had separately maintained for several purposes. This will allow us to better target and coordinate our outreach efforts to reach key stakeholders.

with local organizations to plan and carry out projects that help communities manage stormwater in order to improve water quality in the Chesapeake Bay and its tributaries. (See details about their work in the box on page 14.) This collaboration began with support in 2009 from the Maryland Department of Natural Resources (DNR) for two such staff positions. The success of these two positions demonstrated the need for expanded public engagement in this area, and as a result, UME created two new, University of Maryland funded, tenure-track positions for Regional Watershed Restoration Specialists in 2011.

A second partnership with DNR Fisheries created a Fisheries Economist postdoctoral position in 2010 that continues to support a researcher working between AGNR and DNR (at a value over the last four years of approximately $360,000) under the supervision of the SGEP fisheries economist. This position, designed jointly between SGEP and DNR, is a long-term partnership to support focused scientific analyses on issues critical for informing and advising fisheries management in the Chesapeake Bay.

Staff Structure

MDSG headquarters uses federal and state funding to employ 14 permanent staff members (Figure 1) to provide programmatic and administrative support for MDSG activities. Graduate and undergraduate students also work as part-time assistants in both the communications and research programs, while special projects and grants may also allow us to hire additional assistants. Thus, our office is often filled with up to 17 people. MDSG's office space in College Park includes videoconferencing capability and a video production facility to support our staff-produced documentaries.

In the Extension program UME provides partial or full funding ($594,602) for nine faculty positions (8.96 full-time-equivalent [FTE]), which overlap with MDSG's Omnibus appropriations funding ($315,225) to partially or fully support seven faculty positions (3.50 FTEs) with additional funds from the Maryland DNR and two part-time administrative assistants (0.85 FTE). The Omnibus funding support includes a three-year grant for the Aquaculture Business Specialist. All told there are 17 SGEP personnel and they are housed statewide, primarily in academic or research facilities of the University System of Maryland.

Institutional Setting, Governance, and Advisory Boards

The program's institutional setting is consistent with its standing as a University System of Maryland (USM)-level program and its mission to serve all of Maryland. MDSG is overseen by a Governance Board consisting of University System of Maryland Chancellor William Kirwan, who represents the broad interests of the state; President Donald Boesch of the University of Maryland Center for Environmental Sciences, representing the institution with legislative responsibility for environmental science; and the Provost of the University of Maryland at College Park, a land-grant institution with responsibility for Sea Grant Extension. Current administrative links with the Provost are through the Dean of the College of Agriculture and Natural Resources, Dr. Cheng-i Wei, and Associate Dean for Cooperative Extension, Dr. Stephen Wright.

The Governance Board provides practical governance of the program and its director and facilitates and strengthens the partnership between the university, state, and National Sea Grant program. The University of Maryland Center for Environmental Science (UMCES) is the institution responsible for financial and personnel management and ongoing supervision of the MDSG Director, serving as the program's administrative home. The MDSG Director is a member of the UMCES leadership team and serves on the President's Executive and Administrative councils.

The Institutional Council (IC) consists of eight members representing the institutions that perform MDSG research, education, and outreach activities. The IC meets as needed to address issues pertinent to accountability and development of program mission and priorities from the perspective of the academic and research institutions in the state.

Advisory Boards

Maryland Sea Grant has two advisory bodies that provide guidance and oversight to the program at various levels: (1) the External Advisory Board, which represents a diverse group of stakeholders, and (2) the Academic Advisory Committee, which represents scientists from a diversity of institutions in Maryland and the District of Columbia.

The External Advisory Board (EAB) is a high-level link to important external clients in Maryland. Its composition includes government and non-government institutions with marine-related interests. The EAB provides guidance to reflect the concerns of relevant stakeholder groups and provides realistic assessments of needs within the state and region. It brings high value to our program and plays an important role in formulation and refinement of program mission, focus, and priority setting. We believe that managed turnover in the EAB is desirable and we keep an open door for new members to join and others to leave, recog-

Table 1. External Advisory Board, 2010-2014.

Mr. David Blazer
Maryland Port Administration

Dr. William Boicourt
UMCES Horn Point Laboratory
(alternate for AAC Liaison)

Mr. Mark Bryer
The Nature Conservancy

Dr. Jana Davis
Chesapeake Bay Trust

Mr. Martin Gary
Potomac River Fisheries Commission

Mr. William Matuszeski
U.S. EPA Chesapeake Bay Program (retired)

Dr. Beth McGee
Chesapeake Bay Foundation

Dr. Thomas Miller
UMCES Chesapeake Biological Laboratory
AAC Liaison

Mr. Adam Ortiz
Department of the Environment
Prince George's County

Ms. Ann Swanson
Chesapeake Bay Commission

Mr. Eric Schwaab
National Aquarium in Baltimore

Mr. Dave Wilson
Maryland Coastal Bays Program

Former Members

Dr. Russ Brinsfield
Center for AgroEcology and
Mayor, Vienna, Maryland

Mr. David Pittenger
Executive Director
National Aquarium in Baltimore

Mr. Ed Rhodes
Phillips Seafood, Inc.

Table 2. Academic Advisory Committee, 2010-2014.

Dr. William Boicourt
Horn Point Laboratory, UMCES (2006-present)

Dr. Marie Bundy
NOAA National Estuarine Research Reserve Program
(2010-present)

Dr. Feng Chen
Institute for Marine and Environmental Technology,
UMCES (2012-present)

Dr. Jana Davis
Chesapeake Bay Trust (2010-2012)

Dr. Patricia Delgado
Jug Bay Wetlands Sanctuary (2008-present)

Dr. Matt Fitzpatrick
Appalachian Laboratory, UMCES (2012-present)

Dr. Andrea Johnson
Living Marine Resources Cooperative, UMES
Science Center (2008-2012)

Mr. Brent McCloskey
Environmental Finance Center (2010-present)

Dr. Thomas Miller
Chesapeake Biological Laboratory, UMCES
(2006-present)

Dr. Brad Stevens
Living Marine Resources Cooperative Science Center,
UMES (2012-present)

Dr. Peter Tango
NOAA Chesapeake Bay Program Office (2010-present)

nizing the value in both new membership and long-term contributors who understand our mission (see Table 1). MDSG meets with the EAB biannually and conducts further communications between meetings as a group and individually through email, phone conversations, and in-person discussions.

The Academic Advisory Committee (AAC) provides essential input to the MDSG research program (Table 2). The AAC provides important advice regarding research programmatic issues, the integration of research and extension, our Request For Proposal process, and graduate student support and fellowships. In addition, the AAC participates in the evaluation of the scientific merit and relevance of preproposals. Members are selected based upon their scientific credentials, areas of expertise, and knowledge of issues relevant to our mission. Although some members of the AAC are affiliated with research institutions, MDSG has made a concerted effort to engage individuals from the state government and non-governmental organizations as well. We encourage turnover in the AAC to bring new ideas, while we also work to maintain needed institutional knowledge and continuity on the committee.

Programmed Team Approach: Strategic Planning

Strategic Plan 2010-2013 and Omnibus Research Cycle Alignment

Maryland Sea Grant considers strategic planning fundamental to the effective management, evaluation, and success of our program. This report reflects our accomplishments based on our 2010-2013 strategic plan. That plan, developed in consultation with our advisory boards and stakeholders, was a required realignment by the National Sea Grant Office (NSGO) so that our plan's goals and objectives more closely adhered to those of NSGO. We strove in this plan to balance national needs with our need to contribute to the overarching goal of conserving and restoring the Chesapeake Bay and its watershed. In addition, during the development of our 2010-2013 plan, Maryland Sea Grant was required to not only align our goals and strategies with the new NOAA National Sea Grant Strategic Plan but also our research cycles. Accordingly, it was necessary for Maryland Sea Grant to shift its Omnibus cycle by one year (2011 to 2012) to conform to this national policy.

The four focus areas we adopted for our 2010-2013 plan were:

- Resilient Ecosystem Processes and Responses
- Sustainable Natural Resources of Coastal Maryland
- Viable Coastal Communities and Economies
- Understanding Regional Effects of Climate Change and Sea Level Rise and their Impacts on Coastal Communities and Ecosystems

Achieving successful outcomes required MDSG to coordinate activities across all four focus areas. We worked to build our capacity to make sound decisions, to address climate change, and to implement adaptive management across our areas. MDSG used a detailed implementation plan to track our activities, measure our success at meeting our goals and objectives, and inform future strategic planning.

Strategic Plan 2014-2017

In 2011 and 2012, we developed our 2014-2017 strategic plan collaboratively and deliberatively. We surveyed more than 50 of our stakeholders, held strategic planning meetings with our advisory boards, our staff, and our Extension faculty to gain their insights on important components, and built consensus within our program to develop the strategic plan: A plan that would meet the needs of our constituents while setting reasonable and attainable goals for the program. Our new plan is forward-looking and consistent with our university's strategic plan and with those of both NOAA and the Chesapeake Bay Program. We aligned our focus areas and strategies to be consistent with those of the National Sea Grant Office's plan and used our new plan in 2013 to inform our 2014-2016 Omnibus research funding.

Recruiting Talent, Producing Results: Research Grants

MDSG has run several types of grant competitions for different purposes, through which we have helped to advance scientific knowledge about the Chesapeake Bay region and to cultivate the next generation of marine and coastal scientists. During this review period, these included our Omnibus and regional research competitions (2009-2011, 2011-2012, 2012-2014, and 2014-2016) and our graduate research fellowship competitions (2009-2011, 2011-2012, 2012-2014, and 2013-2014). All of these competitions were informed by our strategic plans. The 2011-2012 one-year cycle allowed us to align our grant cycle with the rest of the Sea Grant network.

In order to maximize participation in our grants competitions, we widely distribute our Request for Proposals announcements through an extensive email list, our web

site, Facebook, and Twitter. Although the vast majority of our research funding supports science at academic institutions, we are open to applications from a broad range of institutions, with the exception of most federal entities.

Technology support for our grants competitions is a critical component of our management system. MDSG has developed and maintains a web-based proposal submission and review system. Included is an online budget preparation module that has been adopted by many other programs. PIs submit preproposals and full proposals to us electronically. The review process works exclusively with electronic files (PDF format). Reviewers access preproposals and full proposals through a password-protected website and submit their reviews on the same site. The same system was used for National Strategic Initiatives formerly handled by MDSG. This fully electronic system saves our program labor and mailing costs and improves the accuracy of our process.

Review Process

■ **Preproposals.** Each preproposal receives external peer reviews and is discussed by two independent panels. The first panel is composed of members of the Maryland Sea Grant Extension program, who provide feedback on the proposed outreach plan and the research topic's potential for outreach. The second panel, composed of members of our Academic Advisory Council (AAC), reviews preproposals for technical soundness and relevance to our strategic priorities highlighted in the RFP. Comments from both panels are used to determine which preproposals are encouraged for further development. Additionally, we ask our External Advisory Board (EAB) to review abstracts from each proposal and provide comments on which they feel would have the highest stakeholder impact provided that the technical aspects are sound. The AAC considers the EAB input in their overall review.

■ **Full Proposals.** All full proposals are sent to experts from outside Maryland and Virginia for external electronic peer review. In addition, we convene the same SGEP outreach panel to examine the outreach plans developed by the PIs as all full proposals are required to have a complete, well-conceived outreach plan. An expert technical review panel comprised of scientists, also from outside of the region, convenes to do the final technical review. The panel is conducted using protocols consistent with both NSF and NOAA. Panelists are asked to rank proposals within given topical areas and to provide rationales in both written and oral form. The final decision for funding is based on ranking, the availability of funds, and the need to develop a balanced portfolio of research projects to meet strategic plan goals. The MDSG Director and Assistant Director for Research develop the final portfolio of projects, which are then approved by the National Sea Grant College Program.

Table 3 provides information on the funding success rate of proposals from our recent Omnibus funding, while Table 4 lists the expertise of the external technical review panels for those years.

■ **Quality of Feedback to and from Principal Investigators.** Lead Principal Investigators (PIs) who submitted preproposals and final proposals receive blinded external peer reviews, outreach panel comments, and technical panel comments as PDFs. We invite PIs to provide feedback regularly to Maryland Sea Grant on the RFP process. In addition, all reviewers and panel members receive an email describing the outcome of the competition.

Table 3. Funding success rate of proposals.*

Indicators	2009-2011	2011-2012	2012-2014	2014-2016
Preproposals	47	29	27	29
Preproposals from home institution (UMCES)	30	19	12	13
Institutions (including departments)	26	23	23	30
Multi-institution preproposals	20	11	12	16
Full Proposals	22	12	15	17
Proposals Funded	8	8	8	7
Proposals Funded (% success)	36%	67%	53%	41%

** Summary of the number of preproposals, full proposals, and institutions represented for each competition in the period from 2009-2016. There are 45 institutions and over 100 different departments in the state of Maryland and in Washington, D.C., that receive the Request for Proposal announcement.*

■ **Analysis of Research Proposals.** Table 5 summarizes our ratings and scoring analyses for our grants competitions funded through our Omnibus appropriations. Table 6 provides summary data on new versus continuing projects, new PIs, recruitment of PIs/institutions, and regional/multi-program projects. This table is based on final outcomes from the funded full proposals for each time period.

Program Development Funds

MDSG uses program development funds to catalyze new research areas, complete projects, and support meetings and specific outreach efforts. While small, these funds have proven extremely useful in engaging a diverse cross-section of the research, outreach, and education communities in Maryland and beyond. These funds also give MDSG entree to new stakeholders in academic, government, and non-governmental organizations. Table 7 lists a sample of the institutions and programs funded in this manner over the past five years. MDSG augments Omnibus funding for program development activities with state appropriations and funds derived from recovery of indirect costs.

Sources and Expenditures of Revenues

Maryland Sea Grant's portfolio of resources includes generous support from the state of Maryland for core administration. Though the budget climate in Maryland remains challenging, state appropriations funding for MDSG through UMCES support has grown from $1.01 million in 2010 to $1.05 in 2014. Additional support (2014: $0.75M) for positions in Sea Grant Extension is provided through the University of Maryland Extension. We use a diversity of funding sources to meet our 50 percent matching fund requirements. First, through an UMCES granted waiver of indirect costs on the administrative, communications, extension, education, and program development portions of our Omnibus award and second, through subcontracted research awards that are required to provide a 50 percent match on their indirect and direct costs. UMCES does not charge subcontracting fees on MDSG awards to other institutions. MDSG competes, when appropriate, for external grants and contracts to support projects that are consistent with our mission and goals. Table 8 summarizes Maryland Sea Grant's funding from the state of Maryland, the National Sea Grant College Program (NSGCP), and other funding including pass-through and external grants awarded for the period 2010-2014.

Distribution of Omnibus Funding, NSI, and External Competitive Funding

Table 9 provides data on how NSGCP and matching funds were distributed among Omnibus program elements during the review cycle. For example, the MDSG Education component (R/E-1) funds the graduate fellows program

Table 4. Expertise of external review panels.*

Omnibus External Panel 2011-2012
Systems Ecology – *Systems Ecology and Ecoinformatics Laboratory, Department of Biology and Marine Biology, University of North Carolina at Wilmington*
Shellfish Ecology/Disease – *Institute of Marine and Coastal Science, Rutgers University*
Estuarine Ecology – *The Piehler Laboratory, Institute of Marine Sciences, University of North Carolina at Chapel Hill*
Restoration Ecology – *Smith Science Center, Department of Marine Science, Coastal Carolina University*
Dorn Carlson – *National Sea Grant Office*
Omnibus External Panel 2012-2014
Water Resources and Environmental Chemistry – *School of Forestry and Environmental Studies, Yale University*
Fisheries and Aquatic Ecosystems – *Institute of Marine and Coastal Science, Rutgers University*
Coastal Geology and Geomophology – *Geological, Environmental, and Marine Sciences Department, Rider University*
Nutrient Chemistry – *Marine Sciences Program, University of Connecticut*
Sami Grimes – *National Sea Grant Office*
Omnibus External Panel 2014-2016
Community Ecology and Marshes – *Department of Rangeland Ecology and Management, Texas A&M University at Galveston*
Chemical Oceanography and Biogeochemistry – *Gulf Coast Research Laboratory, University of Southern Mississippi*
Fisheries and Fish Ecology – *Department of Biology, East Carolina University*
Social Bases of Environmental Attitudes and Beliefs – *Department of Sociology, University of New Hampshire*
Chelsea Berg – *National Sea Grant Office*

** Composition by expertise and institution of the external technical review panels for the Omnibus proposal cycles during the period 2010-2014.*

Table 5. Average proposal scores.*

Indicators	2009-2011	2011-2012	2012-2014	2014-2016
External peer review average score — funded	1.75	1.73	1.52	1.40
External peer review average score — unfunded	2.19	1.96	1.77	1.90
Technical panel average score — funded	2.07	1.60	1.10	1.68
Technical panel average score — unfunded	2.55	2.88	2.50	2.33

** Summary of the average scores for full proposals received from the external peer reviews and the technical panel for all full proposals submitted for each competition during the period from 2009-2016. Average scores are shown for proposals selected for funding and proposals that were unfunded. A standard scoring scale was used: 1.0 = excellent; 2.0 = very good; 3.0 = good; 4.0 = fair; 5.0 = poor.*

Table 6. Recruiting new investigators.[1]

Indicators	2009-2011	2011-2012	2012-2014	2014-2016
New projects	7	8	6	7
Continuing projects	1	0	0	0
New PIs (includes Co-PIs)[2]	13	9	12	8
New institutions[2]	0	4	6	4
Multi-investigator projects	5	3	5	5
Regional and multi-program projects (leveraged funding)	1	n/a[3]	1	0

[1] *Summary data on new vs. continuing projects and new PIs, recruitment of PIs/institutions, and regional/multi-program projects. This table is based on final outcomes from the funded full proposals for each time period.*

[2] *PI new to MDSG or not funded for two cycles.*

[3] *There was no regional competition in 2011-2012.*

Table 7. Institutions supported by Program Development funds, 2010-2014.

Atlantic Estuarine Research Society
Chesapeake Research Consortium
Florida Atlantic University
Gallaudet University
Hampton University
Jefferson Patterson Park & Museum, Maryland Department of Planning
Johns Hopkins University
Mid-Atlantic Marine Education Association
Maryland Department of Natural Resources
National Aquarium in Baltimore
Old Dominion University, Research Foundation
Richard Stockton College of New Jersey
Salisbury University
Smithsonian Environmental Research Center
Society for Advancement of Hispanics/Chicanos and Native Americans in Science
South Carolina Sea Grant Consortium
Smithsonian Environmental Research Center
Tidewater Chapter, American Fisheries Society
Towson University
University of Maryland, Baltimore County
University of Maryland Center for Environmental Science
University of Maryland, College Park
University of Maryland Eastern Shore
University of Florida
Virginia Sea Grant
Washington College

associated with research projects. Using this approach (i.e., fellows are competitively selected and then funded as employees of MDSG) provides distinct programmatic and financial advantages — no indirect costs are charged to this portion of the Omnibus award. We consider our allocation to the research portion of the Omnibus award to include direct grant support, funds for these fellowships, and PD. Since becoming the headquarters office for the National Marine Educators Association, we have leveraged some funding from this partnership with our own education program. We have leveraged our education investment further with ongoing teacher professional development and K-12 efforts in other UME program areas.

Table 10 lists additional funding from the NSGCP and other NOAA programs that have been added to MDSG's funding portfolio for the period 2010-2014.

Maryland Sea Grant seeks funding from a variety of external sources to support activities consistent with our mission. Grantors have included the Department of the Interior, EPA, NSF, NOAA, and Maryland state agencies. Since 2010, we have received ~$1.0M in external grants and contracts for specific activities. Table 10 summarizes data on these for 2010-2014. Project names, award amounts, funding sources, and annual totals are shown.

Table 8. Distribution of all funds supporting Maryland Sea Grant efforts, 2010-2014.

	Annual period of February 1 through January 31					
	2010	2011	2012	2013	2014	Total
State (MDSG)	1,012,143	1,015,524	1,015,938	1,029,963	1,054,787	5,128,355
% of Total Year	26%	33%	35%	33%	31%	
NSGCP – Core*	1,420,000	1,421,760	1,420,000	1,402,744	1,630,193	7,294,697
% of Total Year	36%	46%	49%	45%	48%	
Other Funding	1,491,600	638,020	446,985	717,673	704,800	3,999,078
% of Total Year	38%	21%	16%	23%	21%	
Total MDSG Funds	3,923,743	3,075,304	2,882,923	3,150,380	3,389,780	16,422,130
State (MDSG Extension)	567,160	539,667	635,407	657,619	750,269	3,150,122
Other Funding (MDSG Extension)	340,020	910,719	417,132	393,529	126,830	2,188,230
Total MDSG Extension Funds	907,180	1,450,386	1,052,539	1,051,148	877,099	5,338,352
Total MDSG & MDSG Extension	4,830,923	4,525,690	3,935,462	4,201,528	4,266,879	21,760,482

** (Core) Coastal Communities funds were counted in 2010-2014; (Core) Climate money was not included in 2010-2013. Percentages are rounded.*

Table 9. Maryland Sea Grant Core NOAA funding, 2010-2014.

Omnibus Year and Award Number	Program Administration, M-1	Communication C-1	Program Development P-1	Education R/E-1	Research R/	Extension A/EX-1	R/, P-1, and R/E-1[1]	TOTAL
2010 NA10OAR4170072	80,600	263,415	56,994	150,000	547,991	321,000	53%	1,420,000
2011 NA10OAR4170072	101,760	263,448	57,599	160,000	517,953	321,000	52%	1,421,760
2012 NA10OAR4170072	100,000	263,448	28,495	150,000	557,057	321,000	52%	1,420,000
2013 NA10OAR4170072	110,000	263,448	26,598	137,000	544,698	321,000	50%	1,402,744
2014 NA14OAR4170090	171,000[2]	234,000	136,792	310,000[2]	477,401	301,000[3]	57%	1,630,193
Total funds per area	563,360	1,287,759	306,478	907,000	2,645,100	1,585,000		7,294,697
Percentage funds per area[4]	8%	18%	4%	12%	40%	22%		

[1] *Percentage of total Omnibus funding allocated to research.*
[2] *This includes Minibus funding to P-1 and R/E-1.*
[3] *This includes A/CL-1 coastal communities and climate change.*
[4] *Values are based on totals for 2010-2014.*

Table 10. Other funding, including National Strategic Initiatives (NSIs), pass-through, enhancement funds, and external awards, 2010-2014.*

2010			
A/CL-1	30,000	Enhancing Sea Grant's Ability to Help Coastal Communities Adapt to Climate Change	NOAA
M/INV-1	400,000	Preventing Aquatic Invasive Species through Vector Management: Live Bait	NOAA
A/AQ-2	91,100	Evaluation of Innovative Practices for Aquaculture Development	NOAA
R/AQ-5	228,461	Predicting Spatial Impacts of Bivalve Aquaculture on Nutrient Cycling and Benthic Habitat Quality	NOAA
R/AQ-4	200,561	Developing Sustainable Year-round Captive Spawning Technologies for a New Aquaculture Species, *Seriola dumerili*	NOAA
R/EC/FISH-1	291,608	Socioeconomic Research in Support of Ecosystem Based Fisheries	NOAA
A/EX-1f	4,900	Fisheries Anthropology Project	NOAA
E/E-16	44,000	Knauss Fellowship / Murray	NOAA
E/EC-6	64,166	National Marine Fisheries Service Fellowship / DePiper	NOAA
E/E-18	119,800	Undergraduate Research Experiences in Estuarine Processes	NSF
O/WS-1	17,004	Reducing Stormwater Impact by Reaching Homeowners and Service Providers at Behavior "Choice Points"	CBT
	1,491,600		
2011			
A/AQ-2	92,725	Evaluation of Innovative Practices for Aquaculture Development	NOAA
R/AQ-4	199,406	Developing Sustainable Year-round Captive Spawning Technologies for a New Aquaculture Species, *Seriola dumerili*	NOAA
R/AQ-5	169,864	Predicting Spatial Impacts of Bivalve Aquaculture on Nutrient Cycling and Benthic Habitat Quality	NOAA
E/E-16	46,000	Knauss Fellowship / Mueller	NOAA
E/E-18	122,100	Undergraduate Research Experiences in Estuarine Processes	NSF
R/EH-13	7,925	Universidad Metropolitana and UMD: Partnership to Build Diversity in Estuarine Undergraduate Research	NSF
	638,020		
2012			
A/CL-1	30,000	Enhancing Sea Grant's Ability to Help Coastal Communities Adapt to Climate Change	NOAA
A/AQ-2	97,968	Evaluation of Innovative Practices for Aquaculture Development	NOAA
R/AQ-6	114,471	Development and Evaluation of Eco-engineered Macroalgae and Shellfish Multi-trophic Aquaculture Systems in the Chesapeake Bay	NOAA
E/E-18	122,650	Undergraduate Research Experiences in Estuarine Processes	NSF
R/EH-13	31,896	Universidad Metropolitana and UMD: Partnership to Build Diversity in Estuarine Undergraduate Research	NSF
M/INV-3	50,000	Mid-Atlantic Panel on Aquatic Invasive Species Research Funding	DOI/FWS
	446,985		
2013			
A/CL-1	30,000	Enhancing Sea Grant's Ability to Help Coastal Communities Adapt to Climate Change	NOAA
R/AQ-6	114,471	Development and Evaluation of Eco-engineered Macroalgae and Shellfish Multi-trophic Aquaculture Systems in the Chesapeake Bay	NOAA
Op/EH-277	16,000	Workshop on Harmful Algal Blooms	NOAA
E/E-16	52,500	Knauss Fellowship / Boesch	NOAA
E/E-16	52,500	Knauss Fellowship / Bransome	NOAA
E/E-16	52,500	Knauss Fellowship / Soltanoff	NOAA
E/E-16	52,500	Knauss Fellowship / Yepsen	NOAA
A/AQ-3	83,826	Evaluation of Innovative Practices for Sustainable Aquaculture Development in Chesapeake Bay	NOAA
E/E-18	183,506	Undergraduate Research Experiences in Estuarine Processes	NSF
R/EH-14	55,870	Universidad Metropolitana and UMD: Partnership to Build Diversity in Estuarine Undergraduate Research	NSF
M/INV-3	40,000	Mid-Atlantic Panel on Aquatic Invasive Species Research Funding	DOI/FWS
	733,673		
2014			
A/CL-2	40,000	Enhancing Coordination of the Chesapeake Bay Sentinel Site Cooperative	NOAA
A/AQ-3	151,876	Evaluation of Innovative Practices for Sustainable Aquaculture Development in Chesapeake Bay	NOAA
E/E-16	56,500	Knauss Fellowship / Newcomer-Johnson	NOAA
E/E-16	56,500	Knauss Fellowship / Sykora-Bodie	NOAA
E/E-16	56,500	Knauss Fellowship / Tewes	NOAA
E/E-18	280,424	Undergraduate Research Experiences in Estuarine Processes	NSF
M/INV-3	40,000	Mid-Atlantic Panel on Aquatic Invasive Species Research Funding	DOI/FWS
E/M-1	23,000	NMEA: A New Home for the National Marine Educators Association Office	NMEA
	704,800		
TOTAL	**4,015,078**		

** Funding sources include the following: CBT, Chesapeake Bay Trust; DOI/FWS, Department of the Interior, Fish and Wildlife Service; NMEA, National Marine Educators Association; NOAA, National Oceanic and Atmospheric Administration; NSF, National Science Foundation.*

Stakeholder Engagement

A fundamental part of the Maryland Sea Grant program is our close collaboration with key stakeholders to meet their needs and those of communities throughout Maryland and the region. Our collaborative efforts are philosophically grounded in our commitment to integrate science and outreach to help inform our stakeholders and so improve the preservation and wise use of Maryland's coastal natural resources. By continually working with our stakeholders to discern and meet their needs, we have shown that MDSG generates value for the investment made in our program by the state of Maryland and the NOAA National Sea Grant College Program.

Our partnerships with our constituents have been shaped by the ongoing effort to restore and sustain the Chesapeake and coastal bays and their watersheds, an effort of paramount importance to our stakeholders. In Maryland, leaders and communities are paying more attention in particular to the alteration of the region's ecosystems by climate change, and so our future efforts are likely to more tightly couple adaptation to climate change with restoration and sustainability of our waterways.

Our stakeholders are a diverse group: decision-makers at all levels of local, state, and federal government; nonprofit organizations; students and teachers; and watermen (the Maryland term for fishermen), shellfish aquaculturists, and seafood processors, to name some. We see MDSG's role as a bridge and "honest broker" between the knowledge base of our academic partners and this community of users.

MDSG has established and extended this bridge in several ways. We involved stakeholders in writing and implementing our strategic plans, and we worked with stakeholders to carry out those plans. We strongly encourage and support MDSG staff, especially our Extension faculty members and leadership team, to pursue engagement with stakeholders as part of their professional development. (See Leadership of Staff on page 13.)

We have also worked to provide an unbiased forum to facilitate public discussion, understanding, and consensus-building about Chesapeake Bay restoration — and we have synthesized scientific findings to inform such discussions. These interactions inform our actions and help drive innovation and creativity in our program.

Highlights of our key public-engagement efforts follow.

Facilitation and Synthesis

■ **Ecosystem-Based Fisheries Management.** MDSG and our partners led an extensive process engaging over 80 scientists in Maryland to develop a scientific knowledge base for Ecosystem-Based Fisheries Management (EBFM) in the Chesapeake Bay region. This informed a new management structure in the Chesapeake Bay Program Office's Fisheries Goal Implementation Team that is now incorporating the concepts of EBFM into their discussions concerning fisheries management in the region. The stakeholders who benefitted by this work include fisheries managers and the Chesapeake's fishing industry.

■ **Aquatic Invasive Species.** Preventing the introduction of aquatic invasive species (AIS) through vector management is recognized as an optimum management practice for reducing the spread of AIS. MDSG has led a multi-disciplinary group of researchers and Extension agents from the Mid-Atlantic region and beyond to identify the risks of AIS invasions and to define behavior changes necessary to effectively manage one particular vector, the live bait trade in marine bloodworms from Maine. One such change is to educate the public to throw out unused bait and the algal material used to pack it, which can carry the AIS species. We did this through a pilot study with bait shop owners (see brochure cover, above). Additionally, MDSG researchers worked with bloodworm wholesalers in Maine to develop algal cleaning procedures and alternative packing materials that can be use to reduce the risk of an AIS introduction. The stakeholders served by this project include state natural-resource managers and recreational fishers.

■ **Harmful Algal Blooms.** Harmful algal blooms (HAB) are a serious threat to our nation's waterways and a potentially growing one because of changing climate conditions. Maryland Sea Grant led a workshop in 2014 to proactively engage the Chesapeake Bay HAB Task Force and collabo-

Leadership of Staff on Boards and Committees, 2010-2014

Fredrika Moser, *Director*

- Mid-Atlantic Regional Association for Coastal Observing Systems, Board of Directors
- Chesapeake Bay Observing Systems, Board of Directors Member
- Mid-Atlantic Panel on Aquatic Invasive Species, Chair, Executive Committee
- NSF-funded "Institute for Broadening Participation's Pathways to Ocean Sciences" Project, Member, Advisory Board
- Sea Grant Association Research Coordinators, past Chair
- USDA Northeastern Regional Aquaculture Center, Board of Directors Member
- UMCES Self-Study Design as part of UMCES accreditation process through the Middle States Commission on Higher Education, Steering Committee

Michael Allen, *Assistant Director for Research*

- Sea Grant Research Coordinators Network
- Mid-Atlantic Panel on Aquatic Invasive Species, Executive Committee

J. Adam Frederick, *Assistant Director for Education*

- National Marine Educators Association, National Office Coordinator, past President, past Executive Committee
- Sea Grant Educators Network, Website Committee Chair
- Stevenson University Biology Department Advisory Board
- Journal of Science Activities, Editorial Board

Andrew Lazur, *Principal Agent and Acting Assistant Director, Natural Resources and Sea Grant Extension Program*

- Maryland Aquaculture Coordinating Council
- Maryland Fisheries Habitat Workgroup

Virginia (Vicky) Carrasco, *Coastal Communities Specialist*

- Sea Grant National Adaptation Forum Organizing Committee
- Maryland Climate Forum Steering Committee, Leader
- Maryland Working Waterfront Advisory Committee
- American Planning Association (MD State Chapter)
- UME Natural Resources Conservation/Sustainability Impact Team Leader
- Latinas Leading Tomorrow, Board of Directors
- Montgomery Housing Partnership, Board of Directors
- Western Maryland Local Government Exchange: Alleghany, Carrol, Cecil, Frederick, Garrett, Steering Committee
- National Sea Grant, Sustainable Coastal Community Development Network, past Chair

Jennifer Dindinger, *Lower Eastern Shore Regional Watershed Restoration Specialist*

- Dorchester County Watershed Implementation Plan Team
- Maryland Watershed Implementation Plan Stakeholder Advisory Committee
- Choptank Tributary Strategy Team, past Chair
- Environmental Leadership Program, Senior Fellow
- Association of Natural Resources Extension Professionals, Finance Committee
- Wicomico County Watershed Implementation Plan Committee

Jorge Holzer, *Fisheries Economics Specialist*

- Maryland DNR Fisheries Service, Striped Bass Fisheries Management Task Force
- Mid-Atlantic Fishery Management Council, Expert Panel Review
- DNR Chesapeake & Coastal Service's Working Waterfronts Advisory Committee
- Chesapeake Bay Program Sustainable Fisheries Goal Implementation Team
- Atlantic States Marine Fisheries Commission's Committee on Economics and Social Sciences

Chengchu (Cathy) Liu, *Seafood Technology Specialist*

- National Seafood HACCP Alliance, Steering Committee
- Institute of Food Technologists (IFT) Aquatic Food Product Division Community Team Leader
- UNESCO/IOC/WESTPAC Project on Toxic Marine Animals and their Toxins, Steering Committee

Donald Meritt, *Shellfish Aquaculture Specialist*

- Maryland Oyster Advisory Commission, Substrate Subcommittee, Enforcement Subcommittee
- Horn Point Laboratory Boat Services Committee
- Horn Point Laboratory Dive Committee, past Chair
- UMCES Diving Safety Board
- Advisory Committee to New York Harbor School Aquaculture Program of Study

Matthew Parker, *Aquaculture Business Specialist*

- USDA/NOAA Sea Grant National Aquaculture Extension Steering Committee, Sea Grant Representative

Amanda Rockler, *Central Maryland Regional Watershed Restoration Specialist*

- Chesapeake Conservation Landscaping Council Board
- Chesapeake Conservation Corps Advisory Board

Jackie Takacs, *Southern Maryland Regional Watershed Restoration Specialist*

- Mid-Atlantic Marine Education Association, Treasurer
- Watershed Assistance Collaborative
- The Association of Watershed and Stormwater Professionals
- St. Mary's Arboretum Association, Committee Chair
- Patuxent River Commission (Appointed by Governor O'Malley)
- St. Mary's County Watershed Implementation Team, Executive Board Member
- National Marine Educators Association, Planning Committee and Treasurer

Krisztian Varsa, *Northern Maryland Regional Watershed Restoration Specialist*

- Bird River Small Watershed Action Plan (SWAP) Steering Committee
- Loch Raven East SWAP Steering Committee
- Upper Jones Falls SWAP Steering Committee
- Reservoir Watershed Coalition
- University of Maryland Faculty-Staff Advisory Committee
- Baltimore County Extension Marketing Committee

Donald Webster, *Eastern Shore Area Agent*

- Maryland Oyster Advisory Commission
- Maryland Aquaculture Coordinating Council, Chair
- Northeastern Regional Aquaculture Center, Maryland Representative, Technical Advisory Council
- University of Maryland Diving Control Board, past Secretary
- University of Maryland Extension Conference Planning Committee
- University of Maryland, College Park, Faculty Senate, Chair

Distinctive Approaches – Watershed Restoration Specialists

Many Maryland communities are looking for help to meet new federal and state limits on input of nutrients and sediment into the Chesapeake Bay in order to comply with a new Total Maximum Daily Load (TMDL) established by the federal and state governments in 2010. MDSG Extension now has five staff members who are collaborating with multiple stakeholders and communities in the Chesapeake's watershed to reduce stormwater runoff and limit the input of nutrients and sediment into the Chesapeake Bay.

- **Watershed Assistance Collaborative.** This innovative partnership among MDSG, the Maryland Chesapeake and Coastal Program, and other groups directly serves the needs of communities as they work to comply with the TMDL. In this partnership, Sea Grant Extension specialists provide services and technical assistance to help communities plan and secure funding for watershed restoration activities and projects. By leveraging resources of existing programs, the collaborative provides coordinated capacity-building opportunities to local implementers.

- **SMART Tool.** Working with academic partners and county governments, watershed specialists developed a Stormwater Management and Restoration Tool (SMART) to track reductions in nutrients and sediment runoff from residential and small commercial properties. The EPA Chesapeake Bay Program Office recently approved the use of this tool as a valid method for measuring reductions in nutrients and sediment required for towns to meet their TMDL requirements.

- **Watershed Stewards Academies.** The watershed specialists, working in partnership with four Maryland counties, helped to establish three Watershed Stewards Academies. These work to teach homeowners and municipalities to plan and carry out small-scale stormwater management practices, including rain gardens and rain barrels.

- **Landscaping Certification Program.** Watershed specialists have also helped to develop a program that certifies landscapers who have received training in best practices for installing measures that can minimize stormwater runoff from homeowner properties and small municipal facilities. These features include rain gardens, permeable pavements, rain barrels, green roofs, and other design features.

rate with NOAA to develop new public outreach tools to improve HAB monitoring and early response in the Chesapeake and coastal bays. The workshop participants developed concepts for new communication strategies to coordinate responses by stakeholders in public health and environmental regulatory agencies and by Chesapeake aquaculture businesses whose operations could be harmed by HABs. This successful workshop led to the submission of a funding proposal to support implementing the workshop recommendations.

Extension

■ **Aquaculture Industry Expansion.** Maryland's developing shellfish aquaculture businesses got a considerable boost from the engagement of MDSG Extension staff members Doug Lipton, Donald Webster, and Matt Parker. They played an integral role in the development of new state policies, regulatory changes, and funding opportunities that have helped this industry grow. Key in this regard is these staff members' participation on the Maryland Oyster Advisory Commission. In addition, their efforts to provide watermen and other entrepreneurs business advice and help to access financing has spurred the creation of new Maryland oyster aquaculture facilities. In collaboration with Extension specialist Dr. Donald Meritt, the staff obtained external funding to provide workshops for their industry partners in oyster remote sensing and hatchery training.

■ **Seafood Safety and Processing.** Extension seafood specialist Tom Rippen (retired) and his successor, Chengchu (Cathy) Liu, helped Maryland's seafood industry improve their production techniques and the safety and reliability of their products. Improvements included advances in packaging, processing, and marketing of new blue crab products. Extension specialists also continued an innovative quality assurance program for Maryland crab processors. Their work helps seafood processors develop new ways to market and package products. In addition, MDSG's seafood specialists have run Hazard Analysis and Critical Control Point (HAACP) training programs, which educate seafood industry personnel regarding safe handling and processing of blue crabs and oysters to prevent food-borne illnesses. This training is run successfully in partnership with supportive industry and academic collaborators within and outside Maryland.

■ **Watershed Restoration Specialists.** Extension staff members are collaborating with multiple stakeholders to help coastal communities manage stormwater runoff and reduce the input of nutrients and sediment into the Chesapeake Bay (see box at left).

■ **Economic Support for Fisheries Management.** Maryland Sea Grant has played an important role in state and regional management of fisheries by providing economic analyses and advice. This work by Extension economists Doug Lipton (retired) and Jorge Holzer significantly influenced the design of a Maryland program to buy back commercial blue crab fishing licenses. Other analyses provided valuable, novel insights about the value of recreational fishing in Maryland and about proposed new rules regarding Maryland's commercial fisheries, with a focus on the striped bass fishery.

■ **International Engagement.** MDSG specialists have provided expertise in the international arena in several projects. Douglas Lipton (retired) worked in Korea on an offshore aquaculture assessment and in Egypt and Israel on the economics of polyculture. Thomas Rippen (retired) had a long-standing effort focused on promoting good aquaculture practices in Vietnam and China. Matt Parker is currently working in Myanmar to help fishermen improve their aquaculture practices. Chengchu Liu is building a network in Southeast Asia, where she consults on seafood safety practices.

Recruiting Talent, Producing Results: Education and Training

K-12 and Free-Choice Learning

Helping to educate multiple types of learners about coastal and marine science is an important aspect of our program. We have developed innovative approaches to teacher professional development working with partners from state and federal agencies, academia, non-profits, school administrations, and teachers — efforts that have led to successes in the classroom. For example, we developed a new teacher-training program in aquaponics in collaboration with Johns Hopkins University for teachers who are utilizing it in a variety of Maryland schools.

Most recently, MDSG became the headquarters for the National Marine Educators Association (NMEA); our staff oversees this group's membership services and provides a central office for its executive committee. This important partnership strengthens our education role at the national level and provides further opportunities to engage with the membership of NMEA.

Other successful stakeholder programing relationships in education include working with the Maryland Science Center and the National Aquarium, both located in Baltimore, to help develop exhibits to support free-choice learning opportunities for life-long learners. Another continuing partnership is our work with teachers and administrators in several public school jurisdictions through our Aquaculture in Action program, which uses aquaculture as a tool for instruction about the scientific method and other general concepts in science. Importantly, these programs receive strong support from the state of Maryland Department of Education as they effectively develop classroom lesson plans (see our website) that address instructional strategies, state environmental literacy standards, and STEM education approaches embodied in the Next Generation Science Standards recently adopted by Maryland and other states. Internationally, our Biofilms and Biodiversity educational lessons are part of a collaborative effort with Gothenburg University's Virtue Project.

Graduate Fellows: Focusing on Outreach

Since 1977, MDSG has supported more than 200 undergraduate and graduate students at institutions across the state of Maryland. Our core graduate fellowship program, the Maryland Sea Grant Research Fellows, gives qualified graduate students the opportunity to work with established marine scientists in the design and conduct of university-based research as well as outreach in academic and non-academic venues. These students are selected through a competitive process and work on projects associated with our Omnibus-funded research grants.

In 2012, MDSG held a special, one-time fellowship competition that funded an additional five graduate students on student-proposed projects spanning our focus areas. The fellowship provided a stipend and tuition remission to students pursuing graduate degrees in the natural or social sciences pursuing watershed, coastal or marine research that is relevant to Maryland and MDSG's strategic goals.

As part of our management efforts to integrate research and extension, we designed these fellowships to train young scientists in the effective translation of their research to a broader audience. The program was a collaboration between MDSG's research program and outreach partners as each fellow was required to identify an "end-user mentor" to meet regularly with the fellow and advise him or her on appropriate outreach mechanisms for disseminating and applying research findings. These mentors were outside the academic sphere, e.g., resource managers and educators. Fellows also participated in a workshop with Sea Grant Extension Program staff members designed to strengthen the outreach components of their research projects. MDSG is currently developing a new, ongoing fellowship program in coastal sustainability and resilience that will be based on this successful special fellowship.

Engaging Underrepresented Students

With funding primarily from the National Science Foundation, state appropriations, and program development funds, Maryland Sea Grant led a workshop in Puerto Rico to help build capacity for training underrepresented and underserved students to compete effectively for undergraduate research fellowships in the continental United States while building similar research capacity in Puerto Rico. This workshop led to the successful funding of Maryland Sea Grant and UMCES to work with our partners in Puerto Rico to run two years of pilot research experiences for undergraduate students in Puerto Rico.

Communicating with Stakeholders

MDSG's communication team is highly effective at integrating research and outreach for numerous stakeholders interested in understanding the science and policies driving restoration and sustainability of the Chesapeake and coastal bays.

A distinctive aspect of our communications work is our focus on long-form, narrative-driven articles and video documentaries to describe these themes in a way that is scientifically accurate and informative while also engaging the interest of non-scientists, particularly in the Chesapeake Bay region. This approach is showcased in MDSG's magazine, *Chesapeake Quarterly* (see box at right), and documentaries by our staff filmmaker, Michael Fincham, such as *Who Killed Crassostrea virginica? The Fall and Rise of Chesapeake Bay Oysters*, which was rebroadcast on public television stations nationwide in 2014. The magazine, which is free, has attracted nearly 5,000 subscribers from diverse backgrounds including local and state officials, scientists, K-12 educators, and other citizens interested in the Chesapeake and coastal bays.

■ **A More User-Friendly Website.** In 2013, the communications team completed an ambitious project to improve MDSG's service to stakeholders: the redesign of MDSG's website (www.mdsg.umd.edu). The improved website's navigation and structure make it much easier for stakeholders to quickly find and access information – such as our searchable archive of MDSG-funded research projects and the outreach services of the Sea Grant Extension Program. The advanced function of the Drupal-driven software platform, and the website's clean, modern appearance, showcase effective website design.

■ **Use of Social Media for Engagement.** The communications team has greatly expanded MDSG's presence on social media, which has become an important tool for MDSG to reach stakeholders. We started a Twitter account in 2012; the number of followers has more than doubled in the past year alone, to nearly 1,000. The videos on our YouTube channel have attracted more than 140,000 views, making this collection among the most watched within the Sea Grant network. The communications team uses social media both to promote MDSG-sponsored events and activities and to point users to MDSG-generated educational content on a variety of topics of current interest in coastal and environmental policy.

The communications team, in collaboration with MDSG's leadership, supports MDSG's interactions with stakeholders through a variety of other products. These include workshop reports, fact sheets, an annual report, reports to NOAA, and correspondence with Congress. All efforts contribute to improved outreach to our stakeholders and to strengthening our partnerships and network engagement.

Distinctive Approaches – Comprehensive Report about Sea Level Rise

MDSG's communications team works to effectively inform and engage our stakeholders through innovative use of electronic media to help disseminate our articles, videos, and other content. In 2014, the communicators produced a particularly ambitious example of this — a major package in our magazine, *Chesapeake Quarterly*, about rising sea level and its effects on the people and environment of the Chesapeake Bay region.

This project can be a model for the Sea Grant network both for the modern, sophisticated design of the project's website and because the editorial content was produced through an effective partnership: We jointly created this material in collaboration with *Bay Journal*, a newspaper that covers the Chesapeake Bay region. This partnership enabled both publications to pool our staff resources to produce a better, more in-depth report than either of us would have created otherwise.

On *Chesapeake Quarterly*'s website, MDSG published 15 articles as well as photos, videos, and Climate Central's interactive sea level rise viewer (www.chesapeakequarterly.net/sealevel). Excerpts appeared in the print version of the magazine. Website traffic indicates that this report has been one of our most popular magazine issues ever.

Partnerships

Maryland Sea Grant places very high value on partnerships in all aspects of the program — through funded research efforts, outreach programs, and direct engagement of the program leadership team. Many of our partnerships have been sustained over several years, helping to build trust and capacity. MDSG maintains and seeks new, active collaborations with other Sea Grant Programs and NOAA entities in Maryland, the region, and nationally.

We have emphasized working with our state-level partners, who have been particularly effective in working with us to meet stakeholder needs. In addition, many of our partnerships cross boundaries among federal, state, and academic entities. Examples include the NOAA-funded Climate Forum I; the NOAA-funded Harmful Algal Blooms workshop; and the aquatic invasive species work funded by the National Sea Grant College Program. Regional partnerships — especially with Sea Grant programs in the Mid-Atlantic — are also very important and long-lived. In total, our partnerships now number more than 300.

Our academic ties are strong statewide and have been expanding outside the continental United States as well. The MDSG Research Experiences for Undergraduates (REU) program is very important in this regard and has made substantive progress in bringing underrepresented groups of students to the marine sciences, in part through partnerships with the academic community in Puerto Rico.

Analysis of the sectors represented shows that local and state entities, the academic community, and non-governmental organizations account for the majority of our partners over the past five years.

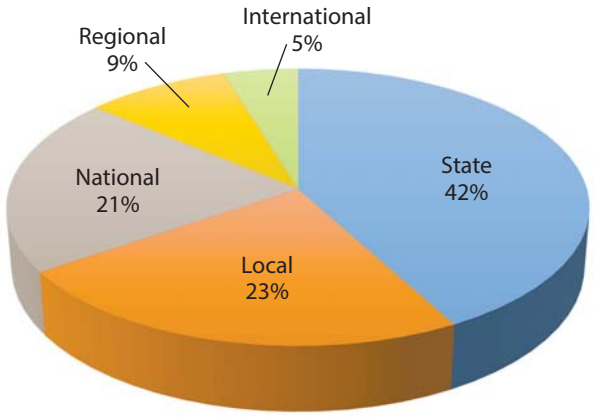
Several of our most important Sea Grant collaborations are highlighted below:

■ **Virginia Sea Grant.** VASG has been a prime and highly valued collaborator with our program for many years. Historically, we have enjoyed a very close relationship and have coordinated review of research proposals, shared funding on joint efforts, and coordinated outreach programs. Our collaborative efforts reflect a commitment of our programs to address, when possible, Chesapeake Bay issues in a regional fashion. Many of these collaborations are highlighted elsewhere in this report.

■ **Delmarva Water Quality Model.** We collaborated with the Virginia and Delaware Sea Grant programs to present a series of workshops with stakeholders about a water quality model for the Delmarva Peninsula that our programs helped to develop. The model allows users to access and manipulate an integrated water-quality and seagrass-bed model developed by scientists funded by the three Sea Grant programs. The model provides decision-makers with a tool to evaluate how land-use decisions may affect regional water quality. In the workshops, we invited stakeholders to offer refinements to the model and learn about its application to land-use planning.

■ **Mathias Medal.** MDSG and Virginia Sea Grant, in conjunction with the Chesapeake Research Consortium, jointly administer and award the Mathias Medal, a highly prestigious accolade given to senior scientists whose work and engagement have made major contributions to informing Chesapeake Bay policy. The next award will be made in 2015.

Figure 2. Partnerships by geographic area, 2010-2014.



A majority of MDSG's partners were at the state, local, or regional level. See examples of our partners in Table 7 on page 9.

Regional Collaborations

■ **Regional Research Competition.** MDSG initiated efforts to develop and run a regional research competition. This effort initially included only the Maryland, Delaware, and Virginia Sea Grant programs, which agreed to allocate a portion of their Omnibus research allocation to a coordinated regional project including researchers from all three states. The program expanded to include all seven programs from North Carolina to New York for the 2014-2016 funding cycle.

We have funded four regional efforts. Two have examined broad-scale issues pertaining to biophysical coupling that controls the ingress of blue crab and fish larvae to the Chesapeake and Delaware Bays. The third focused on nutrient dynamics in the Delmarva Peninsula's coastal bays. The fourth project was a smaller regional project with New Jersey Sea Grant to improve stormwater management technologies. These coordinated efforts leveraged resources from Sea Grant and NOAA, and we feel that this is an important model for bottom-up regional programming. We are currently planning for our 2016-2018 regional competition with Sea Grant partners from Delaware, New Jersey, and Virginia.

■ **Invasive Species.** MDSG Director Fredrika Moser and Assistant Director for Research Michael Allen are both active with the Mid-Atlantic Panel on Aquatic Invasive Species (MAPAIS) and members of the executive committee. MDSG currently partners with the panel and the U.S. Fish and Wildlife Service to administer small grants awarded by the panel. The panel consists of state and federal decision-makers from the region with whom MDSG works closely on issues concerning communication and integration of science and outreach on invasive species issues. In particular, the panel provides a forum for discussing with government managers our project about managing the invasive species live bait vector. The managers provide input on the project's design and will be fundamental to implementing its findings. Other Mid-Atlantic Sea Grant programs intermittently participate in the panel, with Pennsylvania currently holding the MAPAIS chairmanship. (See more details about MDSG's work on live bait under Stakeholder Engagement, Facilitation and Synthesis on page 12.)

■ **East Coast Commercial Watermen's and Aquaculture Exposition.** MDSG coordinates with the Mid-Atlantic Sea Grant Extension Programs to organize and conduct numerous sessions at this long-standing annual trade event held in Ocean City, Maryland.

■ **CERF Special Session.** MDSG Assistant Director Michael Allen, along with two Sea Grant Extension Program faculty, organized and chaired both oral and poster sessions for a special session at the 2013 CERF Annual Meeting in San Diego, California. The session, "Translational Science: The Complexities of Watershed and Estuarine Restoration Efforts," had strong attendance.

■ **SGA Activities.** MDSG staff have participated at several levels of the Sea Grant Association. These include chair of the Research Coordinators Network (Moser), participant in the External Relations Committee (Moser), and member and chair of the Sustainable Coast Communities Development Network (Carrasco). In addition, MDSG Extension participates in the annual Mid-Atlantic Extension coordinating meetings as often do members of the MDSG leadership.

Collaborations with NOAA Programs

■ **Watershed Restoration.** MDSG has worked with NOAA programs and others in an innovative inter-agency effort to assist local governments with coordination and resources needed for advancing watershed implementation projects. (See more details in the box on page 14.) Key in this effort is the collaboration between MDSG and the Chesapeake and Coastal Program in the Maryland Department of Natural Resources, which is funded through NOAA's Coastal Zone Management program. We feel that this sharing of capacity is a model with national implications.

■ **Ecosystem Based Fisheries Management.** MDSG was funded by the U.S. EPA Chesapeake Bay Program to develop the scientific infrastructure for EBFM in the Bay. We engaged with more than 80 participants in the process. NOAA NMFS, Silver Spring, also contributed approximately, $290,000 in direct support of socioeconomic research pertinent to the development of EBFM in the Chesapeake Bay. MDSG continues to collaborate on this project with both the state of Maryland's fisheries program and NOAA's Chesapeake Bay Program Office.

■ **Climate Change Programming.** MDSG Extension is collaborating with the NOAA Coastal Training Program for the Chesapeake Bay National Estuarine Research Reserve and the NOAA-funded Chesapeake and Coastal Program of the Maryland Department of Natural Resources to deliver coordinated programming around climate change and adaptation. The efforts of all three programs leverage staff and funding in new ways that will be critical in Maryland where almost all counties are considered "coastal.

■ **Coastal Observing Networks.** MDSG has been an active participant in the Mid-Atlantic Regional Association Coastal Ocean Observing System — a partnership of universities, private companies, non-governmental institutions, and state/federal government agencies that coordinates and facilitates observations of the ocean and estuaries between Cape Hatteras and Cape Cod. NOAA participants (NOAA Chesapeake Bay Office and NOAA Coastwatch) are key in this effort as well as in the Chesapeake Bay Observing System (CBOS), a sub-regional effort with which MDSG also works.

■ **NOAA's Office of Ocean Exploration and Research.** In collaboration with NOAA's *Okeanos Explorer* research vessel, MDSG and Virginia Sea Grant provided facilitation and synthesis at a workshop we organized with the Mid Atlantic Regional Council on the Ocean (MARCO). The event brought stakeholders, academics, and government managers together to identify research priorities for mapping and data collection in the U.S. waters of the continental shelf and slope in the North Atlantic. This was the first such workshop for MARCO and its stakeholders and a rare engagement by MARCO with a broad sector of academic scientists and federal partners. MDSG and NOAA also jointly supported a summer undergraduate intern from the University of Maryland to conduct research on the *Okeanos Explorer* (photo, above) to map seamounts in the deep ocean.

Program Changes Resulting from Previous Site Review

The 2011 site review of Maryland Sea Grant made one recommendation requiring a response and offered six suggestions.

Recommendation	Response
Take advantage of good working relationship between the Director and Extension Leader to formalize the institutional relationship between extension and the rest of the program.	Maryland Sea Grant, the University of Maryland Center for Environmental Science (MDSG's administrative home), and the University of Maryland Extension signed a Memorandum of Understanding in July 2012 that formalized our institutional relationship.
Suggestions	**Responses**
Think about how better to capture MDSG's synthesis and facilitation role in the strategic planning process.	The MDSG synthesis and facilitation role is highlighted (pages 9 and 13) in our 2014-2017 strategic plan and as a strategy for enhancing community engagement and planning.
Think about using expertise with regional research planning and agency partnerships to tackle integrated larger-scale projects.	We have continued to apply our expertise in regional planning and agency partnerships through our EBFM and regional research work as well as our work on invasive species, HABs, and with MARCO.
This may be a good time to reach out to new UMD Provost.	We recognize the importance of maintaining sound relationships with our leadership. The Director has met Provost Mary Ann Rankin and feels well positioned to seek her support if there were a need.
Consider expanding the research-extension integration efforts to before and after specific projects ("life cycle planning").	We agree whole-heartedly with this suggestion and are actively pursuing ways to strengthen this integration. We presented a workshop about this issue at Sea Grant Week 2014 and are continuing our efforts in project "life cycle planning."
Think about ways to engage and energize the excellent advisory board membership between periodic meetings.	We have greatly expanded our engagement with our external advisory board since the last review and now have set biannual meetings and other types of engagement between meetings.
Make sure there is a go-to person designated in the event of the Director's absence.	There is a clear line of command established with the Assistant Director for Research and the Assistant Director for Administration as the designated go-to persons in the event of the Director's absence.

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Publication Number
UM-SG-PI-2015-01