THE UNIVERSITY OF MAINE

2018-2028

DARLING MARINE CENTER STRATEGIC PLAN

Connecting People to the Ocean

RESEARCH
EDUCATION
ENGAGEMENT

Impacts of Research, Education, & Engagement at the Darling Marine Center

Enabling university-industry partnerships and business incubation

Building capacity for coastal stewardship and citizen science

Connecting people to the ocean

TABLE OF CONTENTS

Graphic design courtesy of Winsor Design Studio and photos courtesy of K. Coupland, L. Healy, H. Leslie, J. Thompson, J. Waller, and UMaine Marketing & Communications.

Executive Summary

The Darling Marine Center is a proud part of the University of Maine, the state's Land and Sea Grant University. Since its founding in 1965, the Darling Marine Center has been an active center of marine research, education, community engagement, and outreach.

The mission of University of Maine's Darling Marine Center is to connect people to the ocean by generating and sharing knowledge of coastal and marine ecosystems and the human communities that are part of them.

The Darling Marine Center brings unique strengths and opportunities to University of Maine by virtue of its waterfront facilities, resident expertise, and partnerships with marine businesses and local communities. As the university's marine laboratory, the DMC welcomes scientists and students from UMaine and around the world throughout the year.

In addition to supporting university research and education, the DMC also actively engages with fishermen, aquaculture entrepreneurs, citizen scientists, and other community members through collaborative research, education, workforce development, and business incubation programs.

As we look ahead to our next 50 years, we envision that the Darling Marine Center will continue to be an internationally recognized center for marine research, education, and engagement. The DMC will enable scientific discovery and help sustain coastal communities, ecosystems, and economies in Maine and beyond.

Through strategic investments in infrastructure, programs, and people over the next 10 years, the DMC will expand its impacts on the scientists, students, and communities that we serve. Our highest priorities include modernization and expansion of key waterfront infrastructure, especially the pier and flowing seawater system. We also will renovate and construct other facilities to enable us to achieve our strategic research, education, and engagement goals. We will invest in the people and programs that make UMaine and the DMC renowned centers of excellence in the marine realm. Building pathways that enable our diverse constituents—students, researchers, community members, and industry—to access the science and education resources available through the DMC and UMaine will be a particular focus.

We invite you to give this strategic plan a close read, and welcome your engagement in this work. Together, we can deepen the DMC's contributions to knowledge of how our oceans work and to the health of coastal ecosystems and economies in Maine and beyond.

To learn more about how you can contribute, please visit dmc.umaine.edu and contact the DMC Director at heather.leslie@maine.edu or (207) 563-3146.

Guiding Principles

These principles guide everything we do and are central to the development and implementation of this strategic plan.

ACCESS: We are committed to connecting people of all ages and abilities to the ocean.

COMMUNITY: We cherish community and the connections that create it.

COMMUNICATION: We are committed to sharing our findings and knowledge to benefit society.

DIVERSITY: We encourage a diversity of perspectives and backgrounds and recognize that diversity is vital to discovery, learning, and innovation.

EXCELLENCE: We strive for excellence, and promote scientific rigor, honesty and curiosity in all our endeavors.

RESPECT: We recognize and celebrate the important work of every member of our community.

SUSTAINABILITY: Sustainability in all its dimensions—including environmental, financial, and institutional—is a keystone of our work.

Introduction

Healthy ocean and coastal ecosystems are the foundation of thriving coastal communities in Maine and beyond. They contribute vital jobs, shape cultures, and provide many other benefits to the people who are part of them. Yet, our oceans are changing, and coastal communities and economies are changing, too. These changes present both challenges and opportunities.

The DMC, as the University of Maine's marine laboratory, provides a physical and intellectual place for people to connect with the ocean: to gain understanding, to appreciate its wonders, and to create new and sustainable ways to interact with it. Scientists and students, fishermen and aquaculture entrepreneurs, and community members with diverse interests come to the DMC for research, education, and engagement activities. They have done so for the past 53 years as a result of the generous gift of Mr. Ira C. Darling.

Today, buildings and facilities on the campus are a mixture of old and new, many dating to before the lab's founding. A Facilities Inventory completed in August 2016 by the architectural and engineering firm Harriman noted this, saying "While there are several buildings constructed in the last 20 years that are in good condition, much of the physical infrastructure is in fair to poor condition." The report concluded that significant investment will be required in the near future to correct for this. In addition, science and education have evolved and require very different facilities than in the past. Thus, significant renewal is called for to maintain and advance the DMC's mission.

With the arrival of a new DMC director, rising undergraduate enrollment, and recruitment of at least 12 additional tenure-stream marine and environmental faculty to UMaine in the last three years, now is an excellent time to reflect on how we can best leverage the assets of the DMC to benefit the many scientists, students, and community partners who use the facility.

In February 2016, the DMC initiated a joint Strategic Planning and Master Planning effort in close coordination with the College of Natural Sciences, Forestry and Agriculture (NSFA), School of Marine Sciences (SMS), and Facilities Management. The architectural and engineering firm Harriman provided additional expertise. This Strategic Plan, together with the Master Plan, are the products of our work. They reflect more than 1500 hours of collective time that faculty, staff, students, and other constituents have devoted to envisioning our future over the last two years. We held numerous meetings and public events on the coast and in Orono, and reached out to colleagues and neighbors from Portland to Machias, as well as nationally, to solicit input on our priorities and plans for the future.

As we look to the future, we have the opportunity and obligation to envision how best to build upon Mr. Darling's great gift. We want to create and sustain the physical and intellectual spaces needed to enable scientific discovery and solutions-oriented research that benefit all people. We aspire to a Center that serves the needs of our university community; welcomes and engages our many partners and visitors; and inspires all.

Strengths and Assets

The Darling Marine Center is located in South Bristol, Maine, in the village of Walpole. The campus is approximately an hour northeast of Portland and two hours south of the UMaine campus in Orono. It includes more than a mile of shoreline on the Damariscotta River estuary and more than three miles of wooded trails in the associated watershed. As it is only six miles from the Atlantic Ocean, researchers can easily access both coastal environments and the open ocean of the Gulf of Maine.

Depending on the time of year, 50 to 150 individuals are at the DMC each day. In 2017 alone, more than 2,750 people visited the DMC, for events ranging from university and professional courses to K-12 programs.

A strong core of resident researchers and students contributes to intellectual and community life, and is vital for enabling the diverse array of research, education and engagement programs the DMC provides. Faculty and students from throughout UMaine, particularly from the School of Marine Sciences, use the DMC. DMC-based researchers collaborate with colleagues from across the University of Maine System, as well as with faculty and students from other institutions. The DMC community also includes marine industry professionals and graduate students. In the summer and fall, 25 to 35 undergraduates join the community.

Enabling university-industry partnerships and business incubation

An innovative program developed by the University of Maine and University of Maine at Machias introduces Maine undergraduate students to applied marine science. The SEA (Science for Economic Impact & Application) Fellows program enables students to develop marketable skills in marine research that can be applied to problems that matter to Maine communities and businesses. SEA Fellows hail from multiple Maine communities, as well as from out-of-state. Early in the summer, students meet with professionals at marine businesses and research institutions throughout the state. The summer-long program concludes with a science symposium, where industry leaders, researchers, and members of the public gather at the DMC to learn about the students' work and ongoing opportunities for applied research and development.

CORE FACILITIES

Waterfront facilities are vital to our mission. The DMC owns and operates a commercial grade pier with vehicular access and a 1-ton crane. The pier enables vessels up to 65' to dock for field-based research and education activities. In addition to a 42' oceanographic research vessel, the DMC owns and operates several small boats suitable for sea sampling, SCUBA-based underwater research, and estuarine oceanography. The DMC's flowing seawater system and shellfish hatchery allow researchers to conduct controlled laboratory experiments in close proximity to field sites, and to culture and maintain organisms of economic and ecological interest.

Additional core campus facilities include:

- Laboratory space for resident and visiting investigators;
- A 18-room year-round dormitory and dining facility, with meeting space;
- Additional seasonal housing and a self-catering kitchen;
- An on-campus library with significant holdings and excellent electronic access to off-campus collections;
- Classrooms with microscopes, flowing seawater, and teleconferencing and video conferencing capabilities; and
- A dive locker, equipped with a breathing air compressor and gear to support scientific diving research and education.

The DMC hosts the only scientific diving program in the University of Maine System. This program is certified through the American Association of Underwater Scientists (AAUS) and is the oldest of three such programs in the state of Maine. The scientific diving program supports SCUBA-based research, and also enables students to take for-credit courses in scientific diving.

The full campus map is shown in the Appendix.

RESEARCH

Researchers at the DMC study coastal and marine ecosystems and the human communities that are part of them, in Maine and in many other parts of the world. Research at the DMC encompasses a range of marine science topics, including but not limited to:

- aquaculture and marine fisheries,
- biodiversity and invertebrate biology,
- biogeochemistry and microbial ecology,
- biological oceanography,
- ecology and conservation science,
- marine geology and chemistry,
- marine policy and archaeology,
- ocean engineering and optics, and
- physical oceanography.

The research community includes not only the faculty in residence, but also a vibrant community of scientists from UMaine and more than 50 other universities and colleges that visit throughout the year. Resident researchers are deeply knowledgeable about the marine organisms and environments surrounding the DMC. Importantly, they also bring knowledge from their work in environments around the world back to Maine. They contribute this knowledge to local and regional decision-making processes, including citizen science, fisheries management, and environmental planning efforts led by state and federal governments. Their research activities engage both graduate and undergraduate students.

Resident researchers are deeply knowledgeable about the marine organisms and environments surrounding the DMC. Importantly, they also bring knowledge from their work in environments around the world back to Maine.

RESEARCH-INDUSTRY PARTNERSHIPS

Research-industry partnerships have had a vital place at the DMC since its founding. Shellfish aquaculture in Maine essentially began at the DMC. Growers with ties to the DMC established seven of the nine shellfish farms on the Damariscotta River. Fisheries research-industry collaborations—particularly those related to Maine's highly valuable lobster industry—have yielded vital information about the biology of economically important species and the responses of these species to changing environmental conditions.

Maine Sea Grant and Maine Aquaculture Innovation Center are co-located at the DMC and facilitate these research-industry partnerships through courses, workforce development, commercialization, and other business development and support activities. DMC researchers include experts in the biology of both farmed and fished species. In addition, the DMC has designated business incubation spaces that provide laboratory, office, and operational support for marine aquaculture and biotechnology start-ups.

COMMUNITY ENGAGEMENT AND OUTREACH

The DMC is a gateway to the University of Maine for midcoast Maine. Faculty and staff in residence connect Maine citizens and visitors to a wide array of UMaine researchers and resources, particularly in the marine and environmental sciences.

The DMC connects people to the ocean through informal education programs for all ages. In the summer, the DMC offers campus tours and science seminars to the public. Our K-12 programs enable students from both near and far to connect with the ocean through hands-on learning and authentic research projects conducted in collaboration with DMC scientists. Local educational, conservation, and youth development organizations are strong partners, and use the DMC as a platform for nature-based education programs on a wide array of marine and environmental themes.

Shellfish aquaculture in Maine essentially began at the DMC. Growers with ties to the DMC established seven of the nine shellfish farms on the Damariscotta River.

EDUCATION

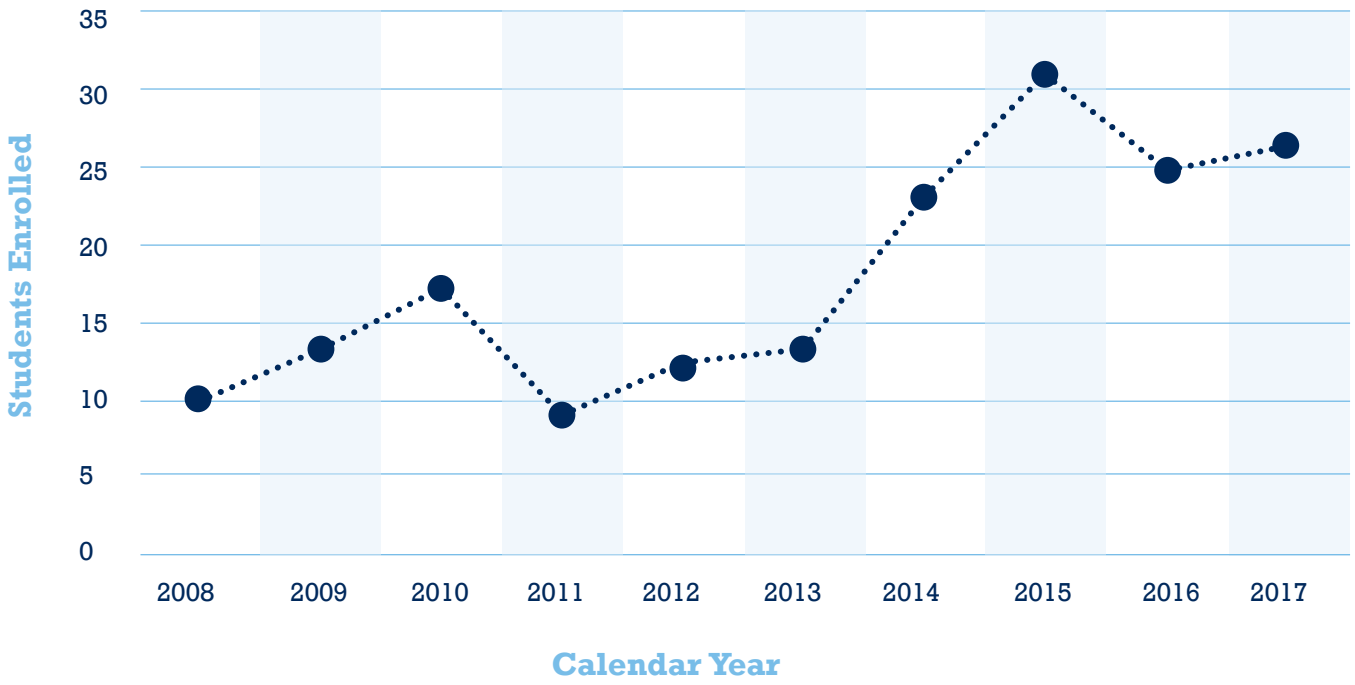
The DMC trains the next generation of scientists and marine professionals. Intensive short courses for graduate students, postdocs, faculty and professionals are offered at the DMC in the spring and summer, and independent research opportunities for graduate and undergraduate students are available year-around.

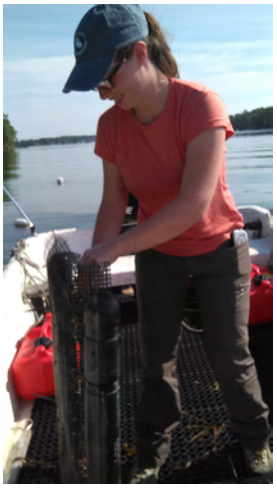
During the fall, undergraduate students immerse themselves in field- and lab-based learning through UMaine School of Marine Sciences' Semester-by-the-Sea (SBS). SBS includes field-intensive courses in topics such as oceanography, marine ecology, and scientific diving. Since it began in 1993, the residential program has received very strong reviews from students. SBS has had record enrollments in the last four years, with similar numbers projected for 2018.

This welcome challenge has deepened collaboration between the DMC and SMS on an array of issues, including curricula, options for expanding student housing, and enhanced residential life programs.

Education activities at the DMC are not limited to UMaine students. Twenty-nine University of Maine System groups and more than 50 non-UMaine groups of visiting college students have used the DMC as a base of operations in the last five years (2013-2017). Ninety-two of 181 undergraduate students researchers at the DMC in the last five years have hailed from other institutions. Hosting students with varied experiences and perspectives on the campus enriches the research environment and community life for all.

UNDERGRADUATES ENROLLED IN SEMESTER-BY-THE-SEA, 2008-2017





Building capacity for coastal stewardship and citizen science

"The atmosphere of excitement, enthusiasm, and commitment in the room was palpable," enthused Jim Belano, a retired fisherman who participated in a one-day workshop hosted by the DMC in April 2016.

The DMC partnered with a local land trust, the Damariscotta River Association, and the Maine Coastal Observing Alliance to co-sponsor TORCH, Training for Observation of Coastal Habitats, in April 2016. The goal was to enable citizen scientists to get hands-on experience with a wide variety of monitoring methods and equipment, and network with others involved in estuarine and coastal monitoring. Workshops like this—linking participants with critical science knowledge and hands-on experiences—are held for conservation, education, and industry organizations on a variety of topics each year at the DMC.

To learn more about DMC scientists' contribution to citizen science and coastal stewardship in Maine, visit dmc.umaine.edu.

OUR VISION: The Darling Marine Center will continue to be an internationally recognized center for marine research, education, and engagement, enabling scientific discovery and helping to sustain coastal communities, ecosystems, and economies in Maine and beyond.

Vision for the Future

In the next 10 years, we will strengthen our role as a center of marine research, education, and community engagement. By enabling both discovery-oriented and applied research, the Darling Marine Center will be a recognized resource for developing new knowledge to help solve environmental challenges and sustain marine resources. We will share and apply knowledge in partnership with community, industry, and government leaders. As a University of Maine campus in the state's dynamic midcoast region, our activities will provide an important and highly visible portal to UMaine and the university's signature research and education programs in Marine Sciences.

Research at the Darling Marine Center will encompass the full extent of coastal marine ecosystems, from the heads of coastal watersheds to the blue water of the continental shelf. We will deepen knowledge of the biological, physical, and human dimensions of these coupled social-ecological systems. We will integrate and share this knowledge in ways that benefit coastal communities and economies of Maine and beyond.

Educational opportunities for undergraduate and graduate students at the Darling Marine Center will be expanded and gain further international recognition. Through experiential, field-based courses, industry and community-supported internships, and independent research experiences, we will train the next generation of science, engineering, and industry professionals in the interdisciplinary, collaborative approaches required to meet the challenges of 21st century ocean stewardship and resource management. Our commitment to diversity will guide program development for students from the undergraduate through the postdoctoral and professional levels.

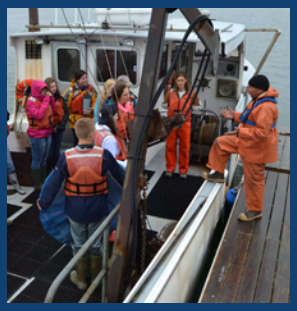
As we forge stronger connections with partners in industry, government, and community-based conservation and development organizations, the DMC will be an even stronger incubator for marine-related businesses, enabling researchers to work collaboratively with traditional fisheries, aquaculture, and biotechnology entrepreneurs and other marine industry partners.

Strategic Goals and Investments

We will make meaningful progress toward achieving our vision for the future of the Darling Marine Center by focusing on three overarching goals: Research, Education, and Engagement.

To achieve these goals, we have identified priorities for strategic investment in infrastructure, programs, and people. These priorities are described in the following pages.

With these investments, the DMC community will work vigorously to ensure sustainability in all its dimensions. Diverse sources of funding and significant input from the many constituents of the DMC will be required. A full needs assessment and analysis of the anticipated return on investment will be conducted for each proposed investment. Development of a business plan and funding and communications strategies to support this work is underway.



Goals for the next 10 years (2018-2028)

GOAL 1: RESEARCH

The Darling Marine Center will provide facilities that support cutting-edge research of UMaine faculty and students, and attract researchers and students from near and far who seek access to coastal and ocean ecosystems for research and education.

GOAL 2: EDUCATION

The Darling Marine Center will contribute to training the next generation of marine researchers and industry professionals and enhancing the skills and opportunities of the current generation.

GOAL 3: ENGAGEMENT

The Darling Marine Center will connect people to the ocean in collaboration with research, government, and community partners in order to help sustain coastal communities, ecosystems, and economies in Maine and beyond.

Connecting people to the ocean

"For a few weeks mid-fall I was on a boat or in the water every single day. This is not something you can experience on the main campus [in Orono]."

UMaine alum from Semester by the Sea, the School of Marine Sciences' undergraduate residential program at the DMC

"Every time I dive I feel like I've accomplished something that few have."

Elise Hartill, who chose UMaine's undergraduate marine science program because "it's one of the best in the country."

"Best workshop I ever attended!"

Alum of Developmental Biology, a faculty development workshop taught for the last 25 years at the DMC

" Investing in the DMC will help sustain scientific and support positions at the Center, as well as the thousands of resource-dependent jobs in Maine that are the subject of much of the DMC's research and development activities, particularly for the lobster fishery and shellfish aquaculture."

Mary Ellen Barnes, Executive Director
Lincoln County Regional Planning Commission

STRATEGIC INVESTMENT 1: INFRASTRUCTURE

Significant improvements to campus infrastructure are needed to meet the DMC's strategic goals for the next decade. These are detailed in the Master Plan that has been developed in conjunction with this Strategic Plan.

A number of acute and long-term facilities needs are already evident. Many buildings date from the early 1900s, and even some of the more recent teaching and research buildings have presented significant maintenance issues and do not meet the needs of modern scientific work. Without significant infrastructure investment in the next 10 years, the DMC's role in undergraduate education and as a hub for marine research and business incubation vital to Maine's marine economy will be compromised.

Immediate priorities:

- Replace the large pier and update the flowing seawater system, including the pumphouse and the DMC's oldest flowing seawater laboratory.
- Design and construct a new Marine Science Education Center to replace aging and scattered infrastructure.
- Enhance connectivity via video and web conferencing with Orono and other University of Maine System campuses to enable collaborative teaching, learning, and research across the state.

Longer-term priorities:

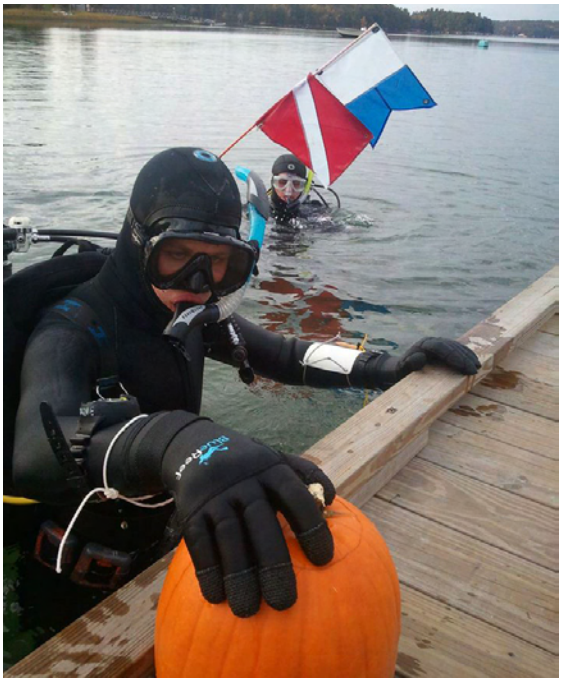
- Increase the amount of safe and functional housing for students and visiting researchers through renovation of legacy buildings and/or new construction.
- Replace the large vessel used for research and education.
- Construct a new maintenance facility and revitalize the vessel operations center.
- Design and construct a new Community Engagement Center, to replace aging infrastructure and serve as the administrative and public gateway to the campus. This building will include much needed space for scientific and public meetings and exhibits.

STRATEGIC INVESTMENT 2: PROGRAMS

Program investments will focus on enhancing the research, education, and engagement activities of resident and visiting scientists. They will be well aligned with the DMC's strategic goals and vision, and contribute to UMaine's Signature and Emerging Areas, particularly Marine Sciences.

Immediate priorities:

- Deepen connections with the School of Marine Sciences and other allied units so as to best respond to the opportunities and challenges before us, within and beyond UMaine.
- Enhance academic and research collaborations with other UMS campuses in ways that leverage the unique setting and capabilities of the DMC.
- Develop and/or host graduate and postdoctoral-level short courses in areas of identified need where the location and facilities of the DMC offer particular advantages.



Longer-term priorities:

- Develop and/or host marine industry and environmental professional courses and workshops in areas of identified need, in partnership with industry, government and environmental conservation and management professionals.
- Catalyze knowledge synthesis, communication, and application by UMaine researchers, students, and our partners in research, education, industry, government, and local communities. Examples include hosting science synthesis workshops and facilitating broader impact activities, including citizen science and K-12 programs.

Program investments will focus on enhancing the research, education, and engagement activities of resident and visiting scientists.

STRATEGIC INVESTMENT 3: PEOPLE

The DMC includes outstanding faculty and staff. Retaining and developing these professionals is critical to achieving our strategic goals.

Immediate priorities:

- Define and develop a governance structure for the DMC that leverages the talents of administrators, faculty, students, and staff and ensures organizational effectiveness and support and professional development for all personnel.
- Review all operational and financial departments for efficiency and effectiveness. This initiative will include drafting a staff development plan, to ensure that the DMC has the human resources to achieve our strategic goals.
- Promote and expand access to the DMC by graduate students, junior faculty, and other early career investigators. Possible mechanisms include clear policies for use of DMC facilities; competitive research assistantships; an internationally advertised visiting scholar program; and hosting and developing programs that connect researchers and industry partners with students, including those from groups underrepresented in science, math, engineering, and technology fields.

Longer-term priorities:

- Ensure a strong core of faculty, staff, and students are in residence year-around.
- Continue to focus on enhancing access to the DMC, particularly by students, early career investigators and individuals belonging to underrepresented groups.
- Develop shared technical support for DMC-based research and education activities.
- Enhance capacity for community engagement and communications. This effort will be conducted in partnership with other UMaine units to ensure our science is accessible to coastal communities and marine industries throughout the state and beyond.

Measures of Success

To evaluate progress towards our strategic goals and vision, we will develop specific, measurable indicators. Quantitative metrics and milestones will be identified for each goal, based on the strategic priorities articulated in the focal areas of Infrastructure, Programs, and People.

To capture synergistic outcomes that emerge from these investments we will answer a number of key questions, including:

Research: What new findings or discoveries have emerged from the DMC? How are these results significant for science and society?

Education: How has the DMC contributed to student success? How many students, marine industry professionals, and other citizens have participated in courses, workshops, and other training experiences? How has the DMC contributed to their success and professional impacts?

Engagement and Outreach: How has the DMC advanced economic development in the state? How many businesses have sought advice or support through the DMC? How many jobs have been created and/or sustained? What outreach and community engagement activities were conducted in the past year, and who participated? What are the outcomes of these activities, for Maine and beyond?

Overall: How have coastal communities and ecosystems been supported and sustained through the research, education, and community and industry engagement enabled by the DMC?

The Director, with input from the Steering Committee and other advisors, will review progress and communicate regularly with the constituents and partners of the DMC. The College and UMaine leadership will receive regular updates on progress and adjustments to the plan. Quantitative measures that track progress of each focal area will be collected annually, along with narratives that provide context for the return on each investment. A subset of measures will be reported publicly each year.

This strategic plan is a living document. We intend to be flexible and adaptive as new priorities arise or old ones come into better focus. In five years, we will revisit these goals and priorities for investment to ensure that we are 'on track' with our vision, responding to the needs of the communities we serve, and well aligned with the University of Maine's goals and vision for the future.

Appendix

Darling Marine Center campus

Participants in the DMC Strategic Planning Steering Committee

Dan Belknap
Professor, School of Earth and Climate Sciences, UMaine

Damian Brady
Asst. Professor, School of Marine Sciences (SMS), UMaine & Assoc. Director of Research, Maine Sea Grant

Chris Davis
Director, Maine Aquaculture Innovation Center & shellfish aquaculture entrepreneur

Walter Golet
Asst. Research Professor, SMS, UMaine & Gulf of Maine Research Institute, Portland

Amalia Harrington
UMaine School of Marine Sciences graduate student

Linda Healy
DMC Programs and Communications Manager

Kim Jenkins
Facilitator & UMaine Lean Coordinator

Lewis Incze
Professor Emeritus, SMS, UMaine

Jessica Leahy
Interim Assoc. Dean for Research, UMaine's College of Natural Sciences, Forestry & Agriculture

Heather Leslie
DMC Director & Libra Associate Professor, SMS, UMaine

Larry Mayer
Agatha B. Darling Professor, SMS, UMaine

Tim Miller
DMC Laboratory Manager

Dana Morse
Maine Sea Grant Extension Agent

Carter Newell
Shellfish aquaculture entrepreneur & research scientist

Lili Pugh
DMC K-12 Education Coordinator

Paul Rawson
Associate Professor, SMS, UMaine

Jeremy Rich
Asst. Professor, SMS, UMaine

Jeff Runge
Research Professor, SMS, UMaine & GMRI, Portland

Fred Servello
Dean & Director, UMaine's College of Natural Sciences, Forestry, and Agriculture and Maine Agricultural and Forest Experiment Station

Robert Steneck
Professor, SMS, UMaine

Kathleen Thornton
SMS Research Specialist

Rebecca Van Beneden
Professor & Director, SMS, UMaine

Richard Wahle
Research Professor, SMS, UMaine

Rhian Waller
Associate Professor, SMS, UMaine

Carl Wilson
Director, Bureau of Marine Science, Maine Dept. of Marine Resources

THE UNIVERSITY OF MAINE

Darling Marine Center
193 Clarks Cove Road
Walpole, ME 04573
dmc.umaine.edu