

2018-21 Strategic Plan

University of Wisconsin Sea Grant College Program

INTRODUCTION

The physical properties of the Great Lakes parallel the enormity of responsibility Wisconsin Sea Grant undertakes with its efforts to foster the sustainable use of the lakes' resources through science and outreach as outlined in this 2018-21 strategic plan. Large; both are large.

Just as the lakes are impressive — 6 quadrillion gallons of water, 95 percent of the nation's supply of surface fresh water, according to the Great Lakes Information Network — so too is the task of ensuring that top-level actionable science is employed to safeguard and enhance the world's largest freshwater system, which supports a \$62 billion economy.

The lakes are a dominant part of the history and culture of this country and remain vital to the region's nearly 35 million binational and diverse people who call the 10,900-mile coastline home, as well as the epicenter of their recreational pursuits and benefactor of their livelihood, including subsistence living for 35 federally recognized tribes living in the Midwest region. In fact, the region supports more than 1.5 million jobs in the shipping, mining, manufacturing, fishing, tourism and agricultural sectors — all driven by the bounty of inland seas. All of this takes place within a tapestry of diverse cultural and economic backgrounds, orientations, genders and races — Wisconsin Sea Grant strives to prove responsive and relevant to that diversity.

The essence of Wisconsin Sea Grant is vested in the concept of actionable science: science that 1) is conducted with the highest standards for quality and integrity, 2) is valued by and, in fact, dependent upon a strong relationship with stakeholders, 3) is coupled with effective outreach and communication, and 4) results in information or decision-support frameworks that can inform likely outcomes of various challenges or potential decisions.

ABOUT SEA GRANT

For more than 50 years, the National Sea Grant College Program has funded cutting-edge research at the nation's leading academic institutions, forming a network of 33 programs. More than 375 Sea Grant outreach and education specialists share that research with businesses, educators, policymakers, diverse communities and citizens to enhance the practical use and conservation of Great Lakes, ocean and coastal resources to create a sustainable economy and environment. More than 3,000 university scientists, outreach specialists, educators and students participate in the program each year.

Administered by the National Sea Grant Office of the National Oceanic and Atmospheric Administration

(NOAA), U.S. Department of Commerce, Sea Grant's university-based programs are fundamental to the development of tomorrow's aquatic resources scientists and managers. Sea Grant thus provides integrated research, outreach and education programs that provide tangible benefits for ocean, coastal and Great Lakes environments and the communities they support.

Established in 1968, the University of Wisconsin Sea Grant College Program is one of the oldest and most vibrant programs in both the national and Great Lakes Sea Grant networks and is well equipped to meet the research, outreach and education demands posed by a state, region and nation transitioning to a new era of sustainability and job creation. Wisconsin has a strong K-12 public education system, as well as a wealth of institutions of higher learning — 33 public and private four-year colleges and 29 two-year colleges. Included in that group is the University of Wisconsin-Madison, one of the top ten research schools in the country. The school also holds, as a critical tenet, the Wisconsin Idea. The Wisconsin Idea is a public-service concept that the boundaries of the university extend to the boundaries of the state and beyond. This principle is also the heart of Wisconsin Sea Grant's efforts. Wisconsin Sea Grant, along with its complementary Wisconsin Water Resources Institute, is further well positioned to leverage the educational resources in the state through partnerships and collaborations, and research support.

That research has formed a legacy, one in which Wisconsin Sea Grant is a national leader on the topics of toxic contaminants, aquatic invasive species, data visualization for effective resiliency planning, coastal engineering, water quality, urban aquaculture and fisheries management. As an objective, non-advocate source of science-based information, the program reaches across Wisconsin and the Great Lakes basin, building bridges and fostering partnerships with businesses and industries, local communities, tribal entities and management agencies.

SEA GRANT MISSION, VISION AND VALUES – FROM DISCOVERY TO APPLICATION

Wisconsin Sea Grant undertakes all endeavors in pursuit of its mission to ***promote the sustainable use of Great Lakes resources through research, education and outreach***. That is done to fulfill a vision of ***thriving coastal ecosystems and communities*** and drawing on the core values of ***service, science-based discovery to application, and research and outreach that are academically grounded, collaborative, inclusive of diversity, educational and visionary***.

These concepts of mission, vision and values complement those of the National Sea Grant College Program. That program supports a future in which people live along the coasts in harmony with and in understanding of the environment and natural resources that attracted and sustain them. This is a vision of a coastal America using natural resources in ways that capture the environmental, economic, social and recreational benefits they offer while preserving their quality and abundance for future generations. This vision reinforces what is articulated in NOAA's Next Generation Strategic Plan: "NOAA's mission of science, service, and stewardship is directed to a vision of the future where societies and their ecosystems are healthy and resilient in the face of sudden or prolonged change."

Both the National and Wisconsin Sea Grant College Programs advance NOAA’s mission “to understand and predict changes in Earth’s environment and conserve and manage coastal and marine resources to meet our nation’s economic, social and environmental needs.”

These organizations support the integration of research with constituent engagement. They have been pioneers in the translation of research — from discovery to application — and going forward will continue to ensure objective, science-based information is disseminated to diverse audiences in ways that encourage actionable science.

OUTLINE OF PROGRAM’S PLANNING PROCESS

The table below outlines Wisconsin Sea Grant’s strategic planning process:

Date	Activity
February 2016	Facilitated all-staff Wisconsin Sea Grant meeting to kick off planning efforts. Identified strengths, weaknesses, opportunities and threats
Spring 2016	Developed and released web-based stakeholder survey to assess important focus areas, critical coastal issues in Wisconsin; approximately 280 stakeholders responded
May 2016	First meeting with Wisconsin Sea Grant Advisory Council for strategic planning. Results of stakeholder survey were fully discussed as was input to the National Sea Grant strategic planning survey. Stakeholders formed the input for specific questions addressed in the national survey and represented Wisconsin’s input to the national plan
Summer 2016	Every member of the outreach staff and three members of the management team held topic-centered (e.g., education, coastal engineering, GIS, aquaculture, etc.) stakeholder engagement meetings across Wisconsin
Mid-September 2016	Second meeting with Advisory Council. This meeting focused on results from stakeholder engagement meetings with an eye toward identifying key Wisconsin strategies for plan
Late September – Mid-October 2016	Management staff completed first draft of strategic plan with mission, vision, core values and Wisconsin strategies included. Distributed to all staff and Advisory Council
November 1, 2016	Conference call with outreach staff to collect revisions to plan
November 2, 2016	Conference call with Advisory Council to revise overall plan
November 2016	Solicited additional input on research strategic priorities in advance of releasing the 2018-20 call for proposals
December 2016 – January 2017	Incorporated feedback from NSGO program officer and solicited feedback from Advisory Council and staff on updated draft
March 2017	Submitted revised Strategic Plan

Results from our web-based stakeholder survey are summarized below:

The majority of respondents (84%) were from Wisconsin. The most-represented employment sector (35% of respondents) was government at the local, state or federal levels. Another 26% of respondents indicated they were affiliated with a university or a K-12 setting and 12% were from private

industry/business. The remaining categories included a mix of self-employed, retired, non-profit/non-governmental agency or other (27%).

All focus areas were valued by stakeholders, with Healthy Coastal Ecosystems the highest at a 4.7 of 5 rating and the Workforce Development element of the ELWD focus area lowest at a 3.6 of 5 rating.

Broad focus areas most important to respondents were as follows:

Healthy Coastal Ecosystems, 49%

Sustainable Fisheries and Aquaculture, 20%

Environmental Literacy, 15%

Resilient Communities and Economies, 15%

Workforce Development, 1%

Among respondents, in order, these were the most important targeted topics: water quality/contaminants, coastal ecosystem health, aquatic invasive species, aquatic habitat, public awareness/citizen education, environmental literacy/aquatic science literacy, resilient coastal communities, recreational fisheries, K-12 aquatic science education, beach health, coastal tourism/recreation, aquaculture, ports/harbors/marinas, commercial fisheries, seafood safety, other coastal issue, developing workforce for coastal industries, coastal hazards and water sports safety.

In general, stakeholders saw value in all focus areas and topics addressed by Wisconsin Sea Grant. Segmenting focus area by organization showed that state government, university staff and retired people valued the Healthy Coastal Ecosystems focus area higher than average, while private industry and self-employed categories valued the Sustainable Fisheries and Aquaculture focus area at higher levels, local government staff highly valued the Resilient Communities and Ecosystems focus area and university staff saw high value in environmental literacy.

Survey respondents also offered extensive comments on three open-ended questions. A total of 215 comments were provided on the most important issues that should be addressed in the strategic plan – 181 people offered comments on important coastal/aquatic resource issues that may emerge in the next five years and 75 people shared a short note or story about how Wisconsin Sea Grant has made a positive impact on the Great Lakes. A sample of these comments includes:

Wisconsin Sea Grant has been indispensable in supporting research on the Great Lakes; no other state or federal agency has supported science in a comprehensive and coordinated way to further the wise management, conservation and restoration of Great Lakes ecosystems. Wisconsin Sea Grant has also been indispensable in developing careers of scientists who focus their interests and energies on the Great Lakes.

Sea Grant is supporting some really good work here in Chequamegon Bay and I am tracking some good projects on Lake Michigan—work that will allow coastal communities to make informed decisions and manage a long term, healthy economy.

Wisconsin Sea Grant has assisted the City of Ashland in receiving beach safety equipment such as life jackets, ring buoys, rescue tubes and rescue boards.

Because 90% of our seafood is imported to the US and the commercial fishing industry is declining, and in Wisconsin commercial perch fishing has been closed since 1996 in Lake Michigan, as a result our seafood sources are in question. Food from freshwater is gaining momentum and interest, investment, and opportunity. In major Great Lakes cities urban aquaculture and aquaponics have begun to support the role of food production from freshwater. In Wisconsin and Minnesota, two aquaponics operations are experiencing business success. Wisconsin Sea Grant is providing the scientific and technical support to make this happen. If this effort goes away tomorrow, our businesses become more difficult to operate, or perhaps even are terminated.

The input Wisconsin Sea Grant received throughout its one-year strategic planning process shaped the strategic directions described in the following pages.

STRATEGIC IMPLEMENTATION

Wisconsin Sea Grant's 2018-21 Strategic Plan is structured in accordance with the National Sea Grant College Program's 2018-21 Strategic Plan, which capitalizes on Sea Grant's unique capacities and strengths, and allows for flexibility and creativity on the part of state Sea Grant programs. Wisconsin Sea Grant embraces the challenges and opportunities inherent in identifying goals and outcomes and deploying strategies within four focus areas critical to a viable Wisconsin future — Healthy Coastal Ecosystems, Sustainable Fisheries and Aquaculture, Resilient Communities and Economies, and Environmental Literacy and Workforce Development.

In accordance with the National Sea Grant College Program, Wisconsin Sea Grant further commits to three principles in pursuit of coastal and freshwater conservation and use. These principles are:

- Cultivating partnerships
- Enhancing diversity and inclusion
- Expanding organizational excellence through trust and transparency

In order to achieve positive, measurable outcomes, the program connects researchers with the Wisconsin Sea Grant outreach and communications staff to make available and deliver research-derived information and findings to resource managers, policy- and decision-makers and public stewards — a clear demonstration of actionable science.

Built on this foundation, the Wisconsin Sea Grant strategic planning approach was a bottom-up process in which program priorities underwent review. As noted above, the plan was richly informed by surveyed stakeholder input, along with numerous facilitated discussions with involved parties, and it benefitted from the advice of a statewide advisory council. This strategic plan is also, importantly, primed for review and any possible realignment so as to guarantee a precisely calibrated response to evolving Wisconsin needs and priorities. This strategic plan, along with any potential tailored and

modified plans going forward, will employ rigorous and thoughtful strategies in pursuit of mission, vision and core values as outlined in the pages to follow. Evaluation and accountability are central to any program's credibility and success. To that end, there are two appendices to this plan that include Wisconsin Sea Grant 2018-20 performance measures and milestones.

Healthy Coastal Ecosystems

Wisconsin has more than 800 miles of shoreline adjoining the vast ecosystems of Lake Michigan and Lake Superior, including coastal, nearshore and deep-water environments. In Wisconsin, healthy coastal ecosystems, sustained by their surrounding watersheds, are the foundation of life along the coast.

Ecosystem health and associated ecosystem services¹ can directly and indirectly affect both human health and socioeconomics at both individual and community scales. Maintaining the health of coastal ecosystems is a challenge because of the diversity of stressors involved as well as the temporal and spatial scales at which systems can be affected. Responsible management of these systems requires a comprehensive way of thinking and acting, often termed ecosystem-based management². Ecosystem-based approaches require coordination among federal, state and local jurisdictions and the active engagement of the people who live, work and play along the coasts. They also require understanding of the characteristics of species, landscapes and their interactions within each ecosystem.

In general, increasingly rapid coastal development, a changing climate, greater demands on fisheries resources and other human activities have led to water-quality degradation, increased demands on water supplies, changes to fisheries stocks, wetlands loss, proliferation of aquatic invasive species and a host of other environmental, health and socioeconomic impacts. It is essential for decision-makers and Great Lakes coastal residents to understand the interconnectedness and interactions of these systems in order to maintain vital habitats and inform restoration efforts within ecosystems and watersheds.

The legacy of striving for healthy coastal ecosystems is a strong one for Wisconsin Sea Grant. A keystone effort was two decades of comprehensive, multidisciplinary research focused on Green Bay, Lake Michigan, making it one of the most rigorously studied estuarine systems of its size in the world. That baseline data has informed, for example, the U.S. Environmental Protection Agency's landmark national Green Bay PCB Mass Balance Study that for the first time developed an input-output model of all sources, movement and fates of a chemical contaminant in an aquatic system. That work was completed more than 20 years ago, and Wisconsin Sea Grant continues in a leadership role for the promotion of a healthy ecosystem within Green Bay and other Wisconsin Great Lakes sites. With this strategic plan, the map to continue those efforts is in place.

¹ Ecosystem services include provisioning (food and water), regulating (flood and disease control), cultural (spiritual, recreational and cultural benefits) and supporting (nutrient cycling).

² Ecosystem-based management is an integrated approach to management that considers the entire ecosystem, including humans, and drives decisions at the ecosystem level to protect the resilience and ensure the health of the ocean, our coasts and the Great Lakes. It requires managing ecosystems as a whole instead of separately managing individual components or uses. This includes the application of technology to coastal resource management through synthesis, integration, training and the development of new management tools.

Likewise, Wisconsin Sea Grant recognizes the challenge of ensuring that ecosystems research is shared beyond the laboratory and makes its way to the settings where it can be used to inform decision-making. The program has committed to bridging the gap between the acquisition of new scientific knowledge, or the validation of a scientific concept or model, and the actions necessary to apply those facts. This practice of actionable science encourages the sharing and use of evidence-based tools and data to inform discussions, debate and decisions for the achievement of healthy coastal ecosystems.

National and Wisconsin Sea Grant goals:

- Habitat, ecosystems and the services they provide are protected, enhanced and/or restored.
- Land, water and living resources are managed by applying sound science, tools and services to sustain ecosystems

In turn, Wisconsin Sea Grant anticipates some or all of these outcomes:

- Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.
- Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal entities.
- Declining biodiversity, habitats and ecosystem functions and services are restored and sustained in Wisconsin.
- Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- Citizen science initiatives are engaged and contribute to improving our knowledge with respect to coastal communities and ecosystems.
- Wisconsin communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
- Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.

Wisconsin Strategies

In order to achieve the outcomes it seeks, Wisconsin Sea Grant will strive to implement these strategies:

- Support research and outreach that bridges natural sciences, social sciences and policy studies to support more holistic management and restoration of Green Bay and its watershed.
- Support research and outreach to understand the environmental and socioeconomic effects of current and emerging challenges on Great Lakes ecosystem and human health including, but not limited to, contaminants, aquatic invasive species, harmful algal blooms, bacterial outbreaks, physical processes, climate change and changes to biodiversity and ecosystem structure.

- Support research and outreach to improve Great Lakes ecosystem health through innovations in measurement, predictive modeling and potential treatment or management approaches.
- Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- Support research and outreach to develop dynamic and interoperable information systems to support adaptive management of Great Lakes ecosystems.
- Help residents, resource managers, businesses, industries and the agricultural sector understand the effects of human activities and environmental changes on coastal resources.
- Help managers incorporate public input in natural resource decision-making processes.

Sustainable Fisheries and Aquaculture

The nation has witnessed the decline of many of its major fisheries while seafood consumption has increased and continues to be encouraged because of health benefits. To address the disparity between seafood demand and domestic harvests, the U.S. imports 90 percent of what is consumed, leading to a seafood trade deficit of more than \$11.2 billion per year. With global wild fisheries harvests at a plateau of around 185 million tonnes, further increases in seafood production will have to come from aquaculture. Currently, more than 50 percent of seafood consumed globally is now produced from aquaculture. Since 2013, global seafood production has surpassed global beef production. There are no projected increases in wild-capture fisheries, but global aquaculture is predicted to increase by 33 percent over the next decade. These projections create opportunities for an expanded Great Lakes basin aquaculture industry and for innovative marketing strategies for the wild fisheries industry.

The overall economic impact of the commercial, recreational and for-hire fisheries and aquaculture industries in the Great Lakes region is \$7 billion annually. In Wisconsin, 1.4 million fishing licenses are issued each year, and anglers and the fishing industry deliver \$2.75 billion in economic impact and 30,000 jobs annually. There are 70 commercial fishers in Wisconsin who rely on fewer than 10 species and have a combined harvest of \$5 million annually.

Wisconsin's aquaculture industry contributes \$21 million in annual economic activity and more than 400 jobs to the state. There is definitely room for growth in food fish aquaculture — additional opportunities exist for job creation and meeting the demand for finfish. The Midwest consumes more than 1 billion pounds of seafood products per year but less than 4 percent comes from aquaculture operations in the region.

Wisconsin Sea Grant continues to play a leadership role in developing innovative technologies for all sectors of the seafood industry. In particular, the program has fostered the growth of urban aquaculture through research and outreach in the region's metropolitan areas. It has also capitalized on educating consumers interested in the buy-local movement. Wisconsin Sea Grant's partnership with NOAA, state

and tribal fisheries managers, seafood processors, fishing associations, the aquaculture industry and consumer groups will ensure safe, secure and sustainable supplies of domestic seafood, decreasing a reliance on seafood imports now and into the future.

National and Wisconsin Sea Grant goals:

- Fisheries, aquaculture and other coastal and freshwater natural resources supply food, jobs and economic and cultural benefits.
- Natural resources are sustained to support fishing communities and industries, including commercial, recreational and subsistence fisheries and aquaculture.

In turn, Wisconsin Sea Grant anticipates some or all of these outcomes:

- Increased understanding and technological solutions aid Wisconsin aquaculture management and production.
- Partnerships enable the Wisconsin aquaculture industry to adapt and acquire innovative technologies.
- Freshwater resource industries employ technologies and reinforce strategies to ensure safe and sustainable Great Lakes fisheries and products.
- Consumers understand the health benefits of Great Lakes fish and purchase safe and sustainable products.
- Freshwater resource industries employ strategies that balance economic, community and conservation goals.
- Commercial and recreational fishers and aquaculturists in Wisconsin are knowledgeable about efficient, sustainable and responsible tools, techniques and uses of coastal and freshwater resources.
- Innovative solutions that increase understanding of climate impacts on state and regional fisheries and aquaculture are available and accessible to resource managers and fishing and aquaculture communities.
- Resource managers and fishing and aquaculture communities have access to science and tools to increase Wisconsin-based capacity to adapt to future resource-management needs.

Wisconsin Strategies

In order to achieve the outcomes it seeks, Wisconsin Sea Grant will strive to implement these strategies:

- Support research and outreach to better understand our Great Lakes fisheries, including status and trends, measurement and modeling techniques, future scenarios, and socioeconomic costs and benefits under different management approaches and environmental conditions.
- Support research and outreach to advance an environmentally sustainable and robust recreational, commercial and subsistence Great Lakes fishery.
- Better understand threats to Great Lakes fisheries, including, but not limited to, nutrient enrichment, invasive species, food web changes, genetics and climate change as well as effective responses.

- Identify and better understand the barriers to expansion of the aquaculture industry in Wisconsin and implement innovative partnerships to address scientific, business, economic, policy and legal challenges.
- Collaborate in identifying Great Lakes regional aquaculture opportunities and best-management practices.
- Support research that leads to a better understanding of the benefits and risks of consuming Wisconsin-produced fish.
- Support research and outreach that encourages the application of behavioral and consumer sciences toward consumer perception and preferences, food safety, labeling and certifications, seafood demand studies and promotion of local seafood.
- Support research and outreach to develop and improve economically viable and environmentally sustainable aquaponics operations, with an emphasis on business planning, risks and socioeconomics.
- Support research to develop and improve commercially viable and environmentally sustainable aquaculture practices and techniques, including nutritional value of feeds, broodstock selection, water supply and quality, husbandry, and disease and pathogen prevention and diagnosis.
- Support the development of environmental and economically sustainable aquaculture through workforce development and trainings, K-12 education and technical assistance.
- Support development of urban aquaculture in new markets and provide knowledge resources to existing operations.
- Investigate emerging species suitable for aquaculture in Wisconsin.

Resilient Communities and Economies

Coastal communities provide crucial economic, subsistence, social and recreational opportunities for millions of people within the Great Lakes basin. A 2011 study completed by the University of Michigan reported that more than 1.5 million jobs, generating \$62 billion in wages are tied to the inland seas. The job breakdown is 994,879 in manufacturing; 217,635 in tourism; 118,550 in shipping; 118,430 in agriculture, fishing and food production; 38,085 in science and engineering; 10,980 in utilities; and 10,003 in mining. In Wisconsin, 173,969 jobs can be linked to the Great Lakes. To accommodate more people and activity while balancing demands on coastal resources, Wisconsin must develop innovative policies, institutional capacities and management approaches to increase community resilience.

Wisconsin Sea Grant will continue to support cutting-edge research in the areas of marine-related energy sources, climate change, coastal processes, energy efficiency, preparedness, hazards mitigation, stormwater management and tourism. In Wisconsin, Sea Grant will engage diverse and shifting coastal populations in applying the best-available scientific knowledge to address increased resource demands and vulnerability. Ultimately, Wisconsin Sea Grant will bring its unique research and engagement capabilities to support the development of resilient coastal communities – both human and natural – that sustain diverse and vibrant economies, effectively respond to and mitigate natural and technological hazards and function within the limits of their ecosystems.

National and Wisconsin Sea Grant goals:

- Coastal communities use their knowledge of changing conditions and risks to become resilient to extreme events, economic disruptions and other threats to community well-being.
- Water resources are sustained and protected to meet existing and emerging needs of the communities, economies and ecosystems that depend on them.

In turn, Wisconsin Sea Grant anticipates some or all of these outcomes:

- Members of the community, including the underserved, are aware of and understand changing conditions and hazards and the implications to their Wisconsin communities and are prepared to respond and adapt.
- Existing and innovative training programs improve community leaders' understanding of changing conditions in their Wisconsin communities and implement adaptive strategies.
- Wisconsin communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- Wisconsin communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.
- Members of the community, including the underserved, have access to information needed to understand how Wisconsin coastal economic activities and trends will impact environmental and community well-being.
- Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- Leaders in Wisconsin's coastal economic sectors understand how they can become more resilient through diversification and through conservation of ecosystem services.
- Community members throughout Wisconsin understand watershed functions and the services those watersheds provide to support communities and economies.
- Community members understand how actions will impact water quantity and quality and are able to make informed decisions.
- Wisconsin communities have access to sound science, data, tools and services to understand and anticipate changes in water quantity and quality.
- Wisconsin communities have diverse, sustainable economies and industries that support existing and emerging water-resource needs.
- Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

Wisconsin Strategies

In order to achieve the outcomes it seeks, Wisconsin Sea Grant will strive to implement these strategies:

- Support research and outreach that will lead to a better understanding of how the sediment supply from coastal bluffs influences beach and nearshore sediment transport in order to guide sound shore protection and bluff stabilization choices and build more resilient coastal communities and economies.
- Support research and outreach to promote the development and implementation of green infrastructure practices.

- Develop and apply innovative geodesign methods to promote resilient coastal communities and understand the consequences of alternative development scenarios.
- Work with management and regulatory agencies, tribal entities and vulnerable and at-risk communities to reduce vulnerability to fluctuating water levels, storm impacts and a changing climate.
- Support research and outreach to understand the value of and opportunities for subsistence, tourism, and commercial and recreation-related activities in coastal communities.
- Support research and outreach that documents and preserves cultural and historical resources in coastal and marine areas, including those within or adjacent to the proposed marine sanctuary.
- Support research and outreach to develop or enhance community planning and visualization tools that demonstrate the benefits, risks and impacts of land use on the coastal environment.
- Support research that evaluates the impacts of increased climate variability and change on coastal communities.
- Support research and outreach to assess and share the impacts of human activities on Great Lakes water quality and supply, as well as coastal and nearshore habitats.
- Support environmental and socioeconomic research to protect the supply and quality of fresh water.
- Support research to document the socioeconomic contributions of water-dependent industries.
- Promote research and outreach for sustainable and resilient ports, harbors and marinas, including beneficial use of dredged materials and science-based decision-making related to the timing of dredging to minimize impacts on critical fish spawning habitat.
- Support research and outreach on nature-based shore protection along Great Lakes coasts.

Environmental Literacy and Workforce Development

An environmentally literate person is someone who has a fundamental understanding of the systems of the natural world, the relationships and interactions between the living and non-living environment and the ability to understand and use scientific evidence to make informed decisions regarding environmental issues. Moreover, a Great Lakes-literate person understands the essential principles and fundamental concepts about the characteristics, functioning and value of the Great Lakes; can communicate accurately about the Great Lakes' influence on systems and people in and beyond his/her watershed; and is able to make informed and responsible decisions regarding Great Lakes and watershed resources. Wisconsin Sea Grant advances these literacy principles in formal and informal learning environments throughout the state to produce a diverse and skilled workforce that is engaged and able to address critical Great Lakes needs.

The efforts build on a rich educational tradition in the state—historically strong high-school graduation rates and top-ranked K-12 schools, as well as a vibrant network of higher learning and vocational-technical institutions serving all state citizens. Geographically, Wisconsin is situated in the nation's heartland with its shifting economy — from traditional manufacturing sectors to a diversified economy.

Technology and jobs resulting from the freshwater resources of the state provide a solid platform for potential growth.

National and Wisconsin Sea Grant goals:

- An environmentally literate public that is informed by lifelong formal and informal opportunities that reflect the range of diversity of the nation's coastal communities.
- A diverse and skilled workforce that is engaged and enabled to address critical local, regional and national needs.

In turn, Wisconsin Sea Grant anticipates some or all of these outcomes:

- Wisconsin communities are knowledgeable and equipped with the best available science and technology in order to contribute to adaptive management planning processes and stewardship.
- Teachers and students are better informed in science, technology, engineering and mathematics fields and can employ their knowledge to support sustainable practices within their communities throughout Wisconsin.
- Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources.
- Communities implement sustainable strategies when managing Wisconsin's natural resources and make decisions based on information acquired through informal science education.
- All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain the state's coastal communities and ecosystems.
- College-level courses, internships and fellowships provide increased literacy, experience and preparedness in all areas of watershed, coastal and freshwater ecosystems for all students, with a particular focus on those from under-represented groups.
- Undergraduate and graduate students, particularly those from under-represented groups, are supported and have access to formal and experiential learning, training and research experiences.
- Employment in all sectors of the U.S. marine and freshwater resources enterprise expands and diversifies.
- The existing and future workforce is able to adapt and thrive in changing environmental, social and economic conditions.

Wisconsin Strategies

In order to achieve the outcomes it seeks, Wisconsin Sea Grant will strive to implement these strategies:

- Support research that will provide robust data about the current level of Great Lakes and water literacy in Wisconsin students to serve as a foundation for future education efforts in the state.
- Work with education partners to promote Great Lakes literacy principles within formal and informal learning environments.
- Develop Pre-K-12 resources that address the Great Lakes literacy principles and support state and national educational standards.
- Support education projects that incorporate innovative technologies or practices in Great Lakes education.

- Support a graduate student and post-graduate fellows program to provide emerging professionals with opportunities to practice stakeholder engagement and actionable science and to connect them with the full range of Sea Grant activities and Great Lakes-related employment opportunities.
- Support research projects that engage and train graduate and undergraduate students and lifelong learners about Great Lakes and marine resources.
- Promote the intersection of the arts, sciences and humanities to inspire a science-informed society.
- Promote place-based learning as a way to engage citizens in local stewardship.
- Identify and promote Great Lakes-related career pathways in Wisconsin.

Appendix 1. National Sea Grant Performance Measures, Metrics and Targets for Wisconsin Sea Grant from 2018 to 2021

	2018-2021 National Performance Measure and Metrics	WISG 4-Year Target (2018-2021)
1	Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities	500
2	Number of acres of coastal habitat protected, enhanced, or restored as a result of Sea Grant activities	500
3	Number of fishermen, seafood processing and aquaculture industry personnel who modify their practices using knowledge gained in fisheries sustainability and seafood safety as a result of Sea Grant activities	800
4	Number of communities that adopt/ implement sustainable economic and environmental development practices and policies as a result of Sea Grant activities	8
5	Number of communities that adopt/implement hazard resiliency practices to prepare for and respond to/minimize coastal hazardous events as a result of Sea Grant activities	NA
	Number of Communities	24
	Number of hazard resiliency training/ technical assistance provided	12
	Community hazard resiliency improved	8
6	Number of Sea Grant products that are used to advance environmental literacy and workforce development	40
7	Number of people engaged in Sea Grant-supported informal education programs	25,000
8	Number of Sea Grant-supported graduates who become employed in a job related to their degree within two years of graduation.	25
9	Number of Sea Grant tools, technologies and information services that are used by our partners/customers to improve ecosystem-based management.	NA
	Number of Products 'developed'	8
	Number of Products 'used'	48

	2018-2021 National Performance Measure and Metrics	WISG 4-Year Target (2018-2021)
10	Economic and societal impacts derived from Sea Grant activities (market and non-market; jobs and businesses created or sustained)	NA
	Economic Benefit	20,000,000
	Jobs Created	16
	Jobs Sustained	100
	Businesses Created	4
	Businesses Sustained	50
	Patents	1
11	Number of Marinas Certified as "Clean Marina" by the Clean Marina Program as a result of Sea Grant Activities	8
12	Number of individuals certified or recertified in Hazard analysis critical control point (HACCP) as a result of Sea Grant activities	0
13	Number of peer-reviewed publications produced by Sea Grant	40
14	Number of individuals and full-time equivalents (FTEs) by Sea Grant	NA
	Administration (# of Individuals)	7
	Administration (# of FTEs funded by Federal SG\$)	0
	Administration (# of FTEs funded by Match and non-Sea Grant \$)	12
	Communications (# of Individuals)	12
	Communications (# of FTEs funded by Federal SG\$)	2.92
	Communications (# of FTEs funded by Match and non-Sea Grant \$)	26
	Extension (# of Individuals)	29
	Extension (# of FTEs funded by Federal SG\$)	16
	Extension (# of FTEs funded by Match and non-Sea Grant \$)	20
	Education (# of Individuals)	10
	Education (# of FTEs funded by Federal SG\$)	0.8
	Education (# of FTEs funded by Match and non-Sea Grant \$)	3
	Research (# of Individuals)	67
	Research (# of FTEs funded by Federal SG\$)	56.8
	Research (# of FTEs funded by Match and non-Sea Grant \$)	5
	Individual Staffing in Program in all areas	110

	2018-2021 National Performance Measure and Metrics	WISG 4-Year Target (2018-2021)
15	Number and Origination of Core Funding Pre-and Full Proposals	NA
	Pre-proposals submitted (# of proposals)	160
	Pre-proposals submitted (# of Institutions involved)	30
	Pre-proposals submitted (# from home institution)	25
	Full-proposals submitted (# of proposals)	80
	Full-proposals submitted (/# of Institutions involved)	20
	Full-proposals submitted (/# from home institution)	10
	Full-proposals submitted (# of proposals/# of Institutions involved/# from home institution)	80
	Proposals Funded (# of proposals)	36
	Proposals Funded (# of Institutions involved)	10
	Proposals Funded (# from home institution)	5
16	Number of Postsecondary Students Financially Supported by Sea Grant in Higher Education Programs (Undergraduate, Graduate)	NA
	Undergraduate Students (# of new Students)	60
	Undergraduate Students (# of Continuing Students)	60
	MS/MA Students (# of new Students)	40
	MS/MA Students # of Continuing Students)	40
	PhD Students (# of new Students)	20
	PhD Students (# of Continuing Students)	20
	Other Sea Grant supported Professional Degree Graduate Students (# of new Students)	0
	Other Sea Grant supported Professional Degree Graduate Students # of Continuing Students)	0
17	Number of Postsecondary Degrees Financially Supported by Sea Grant in Higher Education Programs (Undergraduate, Graduate)	NA
	Undergraduate Degrees	30
	MS/MA Graduate Degrees	20
	PhD Graduate Degrees	10
	Other Sea Grant supported Professional Degree Graduate Students	0

	2018-2021 National Performance Measure and Metrics	WISG 4-Year Target (2018-2021)
18	Number of P-12 Students Reached through Sea Grant-Trained Educators or Directly through Sea Grant Education Programs	20,000
19	Number of P-12 Educators who participated in Sea Grant education programs	400
20	Number of Volunteer Hours	5,000
21	Number of Sea Grant-Sponsored/Organized Events	200
22	Number of Attendees at Sea Grant-Sponsored/Organized Events	20,000
23	Number of Public or Professional Presentations	800
24	Number of Attendees at Public or Professional Presentations	25,000

Appendix 2. State-Specific Performance Measures, Metrics and Targets for Wisconsin Sea Grant from 2018 to 2021

Healthy Coastal Ecosystems

Investment in research projects that hold promise to address Wisconsin strategies in the Healthy Coastal Ecosystems focus area. **Our goal is 8 research projects for the 2018-21 time period.**

The number of Great Lakes ports and harbor projects that initiate the beneficial use of their harbor's navigation channel dredged material as the result of Wisconsin Sea Grant research and outreach. **Our goal is 5 projects for the 2018-21 time period.**

The amount of Great Lakes dredged material put to beneficial use as the result of Wisconsin Sea Grant Institute research and outreach, in cubic yards. **Our goal is 500,000 cubic yards for the 2018-21 time period.**

The number of training sessions for stakeholders and key stakeholder groups on Great Lakes aquatic invasive species prevention efforts. **Our goal is 12 training sessions for the 2018-21 time period.**

The number of promotional events on how to prevent the introduction and spread of aquatic invasive species and organisms in trade in the Great Lakes region. **Our goal is 8 events for the 2018-21 time period.**

Sustainable Fisheries and Aquaculture

Investment in research projects that hold promise to address Wisconsin strategies in the Sustainable Fisheries and Aquaculture focus area. **Our goal is 6 research projects for the 2018-21 time period.**

Increased production of aquaculture facilities as a result of Wisconsin Sea Grant activities. **Our goal is 500,000 pounds for the 2014-17 time period and for the 2018-21 time period.**

Trap net location maps are used by anglers. **Our goal is 2,000 maps for the 2018-21 time period.**

Trap net location maps are used by anglers. **Our goal is 10,000 downloads for the 2018-21 time period.**

The Lake Michigan Fisheries Forum educates sport and commercial fishermen through seminars and discussion. **Our goal is 8 meetings of the fisheries forum for the 2018-21 time period.**

Resilient Communities and Economies

Investment in research projects that hold promise to address Wisconsin strategies in the Resilient Communities and Economies focus area. **Our goal is 6 research projects for the 2018-21 time period.**

The number of Wisconsin Coastal Atlas-based resilience tools used by Great Lakes coastal communities. **Our goal is 8 tools for the 2018-21 time period.**

The number of training sessions for coastal hazards decision-support tools conducted by Wisconsin Sea Grant staff and partners. **Our goal is 4 training sessions for the 2018-21 time period.**

The number of Wisconsin Sea Grant partners that, as a result of Wisconsin Sea Grant research and outreach, design, modify an initial design, permit and/or provide grant assistance to a project. **Our goal is 50 partners for the 2018-21 time period.**

The number of Great Lakes coastline erosion control, shoreline bluff stabilization or ports and harbor infrastructure projects that are completed utilizing significant Wisconsin Sea Grant coastal engineering research results, outreach and/or design assistance. **Our goal is 10 projects for the 2018-21 time period.**

Environmental Literacy and Workforce Development

Investment in education projects that seek to improve environmental literacy or workforce development. **Our goal is 4 projects for the 2018-21 time period.**

The number of Wisconsin Sea Grant graduate fellows who actively participate in Wisconsin Sea Grant educational outreach activities. **Our goal is 4 fellows for the 2018-21 time period.**

The number of products developed by Wisconsin Sea Grant PIs with Wisconsin Sea Grant outreach staff to effectively communicate their research projects to Great Lakes stakeholders. **Our goal is 42 products for the 2018-21 time period.**

Number of PK-12 resources that address the Great Lakes Literacy Principles and support state and national educational standards. **Our goal is 2 resources for the 2018-21 time period.**

Number of Wisconsin Sea Grant-supported events or products that promote the intersection of the arts, sciences and humanities to inspire a science-informed society. **Our goal is 2 events for the 2018-21 time period.**

Number of Wisconsin Sea Grant-supported events or products that profile the coastal-related workforce in Wisconsin to promote career pathways for a “blue economy.” **Our goal is 2 events for the 2018-21 time period.**

Number of visitors to Wisconsin Sea Grant web-based material to build environmental literacy. **Our goal is 1 million visitors for the 2018-21 time period.**