2018-23 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 conservation and health of the Great Lakes ecosystems and sustainable use of the lakes' resources through science and outreach as outlined in this 2018-23 strategic plan. Large; both are large.

Just as the lakes are impressive — 6 quadrillion gallons of water, 95% 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 $82 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 using them 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 1.3 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 34 programs. More than 375 Sea Grant outreach and education specialists share that research with businesses, educators, policymakers, diverse communities and their 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, all while meeting the challenges born of a changing climate. 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, including two tribal colleges. Included in that group is the University of Wisconsin-Madison, one of the top 10 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, 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 nations 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, educational and visionary, while seeking and welcoming diverse perspectives.***

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 attract 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 for a plan that originally concluded in 2021 and is now extended under National Sea Grant College Program guidance to include an additional two years, as well as to encompass changing conditions brought about by the new coronavirus global pandemic that has altered service delivery and working conditions; a long overdue examination of social justice issues, and assessment of Sea Grant's approaches and actions in the areas of justice, equity, diversity and inclusion; a changing climate as evidenced by more active and deadly hurricanes and frequent Western wildfires both of whose effects can be felt in the Great Lakes Basin; and a severely shaken economic system, which is affecting the vitality of coastal communities and industries in Wisconsin and throughout the Basin.

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 2018-21 Strategic Plan.
Winter 2020	Receive guidance on update of strategic plans for the 2022-23 cycle from the National Sea Grant Office.
March 2020	Discussion of priority and emerging issues with WISG Advisory Committee on Outreach and Education.
Summer 2020	Staff evaluation of strategic plan and consultation with stakeholders.
August 2020	Meeting of Advisory Council to discuss priority and emerging issues and proposed changes to the plan.
September 2020	WISG management team incorporates feedback from stakeholders, staff and advisors and submits updated plan to NSGO program officer.

Results from a 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 Environmental Literacy and Workforce Development 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 Economies 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 2018-23 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. With regard to the principle of enhancing diversity and inclusion, the program has accelerated its implementation through targeted outreach, revised recruiting and educational opportunities.

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 two statewide advisory bodies. The plan was updated in 2020 in response to public health guidelines to prevent the spread of COVID-19. 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

2018-23-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 services[1] 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 management[2]. 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. Additionally, the impacts and loss of ecosystem services from degraded ecosystems are more likely to be felt by marginalized communities.

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 virtual or face-to-face stakeholder participation.
- Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal nations.
- 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.
- Community science initiatives are engaged and contribute to improving our knowledge with respect to coastal communities and ecosystems.
- Wisconsin communities, including the underserved, have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
- Wisconsin communities, including the underserved, can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.

<u>Wisconsin Strategies</u>

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. Specifically, work that better understands and prioritizes invasion pathways into the Great Lakes
- 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. Specifically, gather information on how contaminants, aquatic invasive species, harmful algal blooms, bacterial outbreaks, physical processes, climate change and changes to biodiversity and ecosystem structure are impacting diverse and marginalized communities.
- Advance understanding of aquatic invasive species ecology, socioeconomic impacts and management approaches. Specifically:
    - Innovative aquatic invasive species prevention methods
    - Tools and approaches that optimize invasive species prevention methods
    - Tools and approaches that better understand and can improve invasive species prevention actions by boaters in the absence of a watercraft inspector
- Promote and disseminate accessible outreach and education programs and events online to prevent the spread of COVID-19.

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% of what is consumed, leading to a seafood trade deficit of more than $16 billion per year. With global wild fisheries harvests at a plateau of around 185 million tons, further increases in seafood production will have to come from aquaculture. Currently, more than 50% of seafood consumed globally is now produced from aquaculture. Since 2013, global seafood production has surpassed global beef production. Although there are no projected increases in wild-capture fisheries, global aquaculture is predicted to increase by 33% 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% comes from aquaculture operations in the region. There is also room for growth in diversifying the aquaculture industry. Currently, women and minorities make up a small portion of aquaculture professionals.

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 peri-urban and 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.

- Diversity and inclusion in the aquaculture field is enhanced by seeking and welcoming diverse perspectives to enable the network to pursue its vision and mission effectively and efficiently.

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.

<u>Wisconsin Strategies</u>

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, contaminants, genetics and climate change as well as effective responses.
- Support research to improvement understanding of the impacts of food web change, climate, and other stressors on early life history of valuable sport and commercial species and develop management actions to mitigate impacts.
- 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.

- Identify and better understand the barriers to women and Black Indigenous, and people of color in joining the aquaculture profession.
- Collaborate in identifying Great Lakes regional aquaculture opportunities and best-management practices along with sustainable production systems such as recirculating aquaculture systems (RAS).
- Support research that leads to a better understanding of the benefits and risks of consuming Wisconsin-produced fish as well as how aquaculture can address food safety and security issues during times of national and global health and food supply chain concerns.
- 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 aquaponic operations.
- 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, including in underserved communities.
- Support development of peri-urban and urban aquaculture in new markets and provide knowledge resources to existing operations.
- Investigate emerging species and new technologies suitable for aquaculture in Wisconsin.
- Promote and disseminate accessible outreach and education programs and events online to prevent the spread of COVID-19.

Resilient Communities and Economies

Coastal communities provide crucial economic, subsistence, social and recreational opportunities for millions of people within the Great Lakes basin. A 2020 study completed by the University of Michigan reported that more than 1.3 million jobs, generating $82 billion in wages are tied to the inland seas. The job breakdown is 823,735 in manufacturing; 240,864 in tourism; 153,060 in transportation; 133,352 in agriculture, fishing and food production; 26,326 in science and engineering; 10,803 in utilities; and 5,416 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, including underserved communities, in applying the best-available scientific knowledge to address increased resource demands and vulnerability. It is essential to recognize the barriers that prevent marginalized communities from accessing Great Lakes coastal ecosystems and work towards equitable coastal decision-making. 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, including the underserved, 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 all the diverse communities, economies and ecosystems that depend on them.

In turn, Wisconsin Sea Grant anticipates some or all of these outcomes for members of the community, including the underserved:

- Awareness and understanding of changing conditions and hazards and the implications to their communities and are prepared to respond and adapt.
- Existing and innovative training programs improve community leaders' understanding of changing conditions in their communities and implement adaptive strategies.
- Access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- Employment of adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.

- Access to information needed to understand how Wisconsin coastal economic activities and trends will impact environmental and community well-being.
- Access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- Increased understanding by coastal economic sector leaders that greater resiliency can be realized through diversification and through conservation of ecosystem services.
- Understanding watershed functions and the services those watersheds provide to support communities and economies.
- Understanding how actions will impact water quantity and quality and are able to make informed decisions.
- Access to sound science, data, tools and services to understand and anticipate changes in water quantity and quality.
- Diverse, sustainable economies and industries that support existing and emerging water-resource needs.
- 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.
- Build collaborative and diverse networks to promote sustainable tourism and outdoor recreation.
- 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 national 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, including suitability, performance, habitat benefits, and design guidance for the various practices that are applicable to the Great Lakes.
- Support research to improvement understanding of the impacts of food web change, climate, and other stressors on early life history of valuable sport and commercial species and develop management actions to mitigate impacts.
- Work with organism in trade industries to identify non-invasive alternatives to commonly sought-after NR40-prohibited species
- Promote and disseminate accessible outreach and education programs and events online to prevent the spread of COVID-19.

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 their watershed; and is able to make informed and responsible decisions regarding Great Lakes and watershed resources. Wisconsin Sea Grant advances these literacy principles (as described within the Great Lakes Literacy Principles document - see https://www.cgll.org/for-educators/great-lakes-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.

Geographically, Wisconsin is situated in the nation's heartland with its shifting economy — from traditional manufacturing sectors to a diversified economy — opening doors to new career fields. Technology and jobs resulting from the freshwater resources of the state provide a solid platform for potential economic and personal professional growth whether in blue-collar or white-collar professions.

Wisconsin's education and workforce development efforts build on the 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 communities from across the state. However, it is essential to also acknowledge educational opportunities do not reach all marginalized groups in Wisconsin and that educational disparities exist. Wisconsin Sea Grant recognizes it cannot independently solve the issue of inequity in education so the goal is to infuse work with multicultural perspectives and approaches.

Standardized test results are one tool to measure knowledge. Wisconsin leads the nation with the widest academic disparities between Black and White students when measured by standardized test results. It is important to recognize that standardized test results are not the sole or the predominant mechanism for assessing environmental literacy. Furthermore, the notion of academic disparities is problematic in that it presumes one type of knowing—knowledge of abstract items, from words to equations, which typically form the basis of standardized tests—is more important than other forms of knowing. Wisconsin Sea Grant, continues to reflect on mechanisms to incorporate diverse cultural heritages, traditional ecological knowledge and scientific research into environmental literacy and workforce development work. The questions Ibram X. Kendi (2016) asks provide guideposts for the program's environmental literacy and workforce development initiatives:

- "What if we measured literacy by how knowledgeable individuals are about their own environment;
- What if we measured intellect by an individual's desire to know?
- What if we measured intellect by how open an individual's mind is to self-critique and new

ideas?
- What if our educational system focused on opening minds?"

Wisconsin Sea Grant, and its many partners, understand it has a unique opportunity to incorporate multicultural perspectives and approaches into educational and workforce development programming. The goal is to provide equitable environmental literacy education and workforce development opportunities to the diverse communities that call Wisconsin home.

National and Wisconsin Sea Grant goals:

- An environmentally literate public that is informed by lifelong formal and informal educational 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 teachers and students are better informed in science, technology, engineering, mathematics fields and the ways that humans are inextricably interconnected with the Great Lakes. They can employ their knowledge to support sustainable and culturally sensitive practices within their diverse communities and watersheds.
- A diverse group of stakeholders develops 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 formal and informal education.
- Wisconsin communities are knowledgeable and equipped with the best available science and technology in order to contribute to adaptive management planning processes and stewardship.
- 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 underrepresented 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:

- Ensure multicultural perspectives and approaches to Great Lakes education and workforce development by engaging with leaders of diverse community partners.
- Develop Pre-K-12 resources that address the Great Lakes literacy principles and support state and national educational standards.
- Provide financial support for education projects that incorporate multicultural perspectives and approaches, innovative technologies or practices that enhance 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 communities in local stewardship and commitment to preserving and protecting the environment.
- Identify, promote and expose students, working professionals and the unemployed to Great Lakes related career pathways to build a diverse and skilled Wisconsin workforce.
- Promote and disseminate accessible outreach and education programs and events online to prevent the spread of COVID-19.

Appendix 1. National Sea Grant Performance Measures, Metrics and Targets for Wisconsin Sea Grant for 2018 to 2023

	National Performance Measure and Metrics	WISG 6-Year Target (2018-2023)
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 (HCE)**	2,000
2	**Number of acres of coastal habitat protected, enhanced, or restored as a result of Sea Grant activities (HCE)**	1,000
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 (SFA)**	2,500
4	**Number of communities that adopt/ implement sustainable economic and environmental development practices and policies as a result of Sea Grant activities (RCE)**	75
5	**Number of communities that implemented hazard resiliency practices to prepare for, respond to or minimize coastal hazardous events as a result of Sea Grant activities (RCE)**	20
6	**Number of Sea Grant products that are used to advance environmental literacy and workforce development (ELWD)**	40
7	**Number of people engaged in Sea Grant-supported informal education programs (ELWD)**	15,000
8	**Number of Sea Grant-supported graduates who become employed in a job related to their degree within two years of graduation**	150
9	**Number of Sea Grant tools, technologies and information services that are used by our partners/customers to improve ecosystem-based management**	60

	National Performance Measure and Metrics	WISG 6-Year Target (2018-2023)
10	**Economic and societal impacts derived from Sea Grant activities (market and non-market; jobs and businesses created or sustained)**	NA
	Economic Benefit	100,000,000
	Jobs Created	30
	Jobs Sustained	400
	Businesses Created	6
	Businesses Sustained	60
	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

	National Performance Measure and Metrics	WISG 6-Year Target (2018-2023)
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

	National Performance Measure and Metrics	WISG 6-Year Target (2018-2023)
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**	100
22	**Number of Attendees at Sea Grant-Sponsored/Organized Events**	10,000
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 for 2018 to 2023

Healthy Coastal Ecosystems

Investment in research projects that hold promise to address Wisconsin strategies in the Healthy Coastal Ecosystems focus area. **Our goal is 20 research projects for the 2018-23 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 2018-23 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 400,000 cubic yards for the 2018-23 time period.**

The number of training sessions for stakeholders and key stakeholder groups on Great Lakes aquatic invasive species prevention efforts. **Our goal is 20 training sessions for the 2018-23 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 2018-23 time period.**

The number of previously unaddressed or under-addressed invasion pathways evaluated. **Our goal is two pathways for the 2018-23 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 2018-23 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 2018-23 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 12 research projects for the 2018-23 time period.**

The number of Wisconsin Coastal Atlas-based resilience tools used by Great Lakes coastal communities. **Our goal is 50 tools for the 2018-23 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 2018-23 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 250 partners for the 2018-23 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 2018-23 time period.**

Environmental Literacy and Workforce Development

Investment in education projects that seek to improve environmental literacy or workforce development. **Our goal is 10 projects for the 2018-23 time period.**

The number of Wisconsin Sea Grant graduate fellows who actively participate in Wisconsin Sea Grant educational outreach activities. **Our goal is 6 fellows for the 2018-23 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 200 products for the 2018-23 time period.**

Number of PK-12 resources that address the Great Lakes Literacy Principles and support state and national educational standards. **Our goal is 10 resources for the 2018-23 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 20 events for the 2018-23 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 20 events for the 2018-23 time period.**

Number of visitors to Wisconsin Sea Grant web-based material to build environmental literacy. **Our goal is 700,000 visitors for the 2018-23 time period.**