2010-14 Strategic Plan

University of Wisconsin Sea Grant College Program

INTRODUCTION

The Great Lakes are truly an international treasure. They contain more than 5,000 cubic miles of water—about 20 percent of the unfrozen fresh water on the surface of Earth. These sweetwater seas provide drinking water for about 30 million people and high-quality water for power generation and numerous other industries. They also generate billions of dollars in shipping, trade, fishing, recreation and related businesses, thereby supporting the economies and culture of hundreds of communities along their 94,000 miles of coastline. The citizens of Wisconsin and the other Great Lakes states—indeed, all Americans—share a special responsibility to preserve and protect this treasure for future generations.

To do so, we must continually identify and investigate threats to the sustainability of Great Lakes resources and respond to these in bold and creative ways. For its part, Wisconsin must strive to use its coastal lands, Great Lakes water and related natural resources in ways that preserve the health and productivity of these resources while optimizing their benefits to all citizens. How successful we are in achieving this goal has significant implications for our state, the region and our nation as a whole.

ABOUT SEA GRANT

Created in 1966, the National Sea Grant College Program is dedicated to enhancing the practical use and conservation of Great Lakes, ocean and coastal resources to create a sustainable economy and environment. Sea Grant today supports a national network composed of 32 university-based state programs, a national law center, a national library, and hundreds of participating institutions and public- and private-sector partners. 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 & 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 largest programs in both the national and Great Lakes Sea Grant networks. UW Sea Grant's highly diversified research agenda has made it a national leader on the topics of toxic contaminants, water quality, fisheries management and ecosystem dynamics. As an unbiased, nonadvocate source of science-based information, Sea Grant is ideally positioned to build bridges and foster partnerships

among all parties concerned with the management and protection of Great Lakes resources both in Wisconsin and throughout the region.

SEA GRANT VISION AND MISSION

The National Sea Grant College Program envisions a future in which people live along our coasts in harmony with the environment and natural resources that attracted and sustain them. This is a vision of a coastal America that uses these natural resources in ways that capture the environmental, economic and recreational benefits they offer while preserving their quality and abundance for future generations. This vision reinforces the vision articulated in NOAA's 2006-11 Strategic Plan of "an informed society that uses a comprehensive understanding of the role of the oceans, coasts and atmosphere in the global ecosystem to make the best social and economic decisions."

Sea Grant's mission is to provide research, extension and education activities that improve our understanding and responsible use of the nation's ocean, coastal and Great Lakes resources, and support the informed personal, policy and management decisions that are integral to realizing this vision. Sea Grant advances 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."

STRATEGIC IMPLEMENTATION

Wisconsin Sea Grant's 2010-14 Strategic Plan is structured in accordance with the National Sea Grant College Program's 2009-13 Strategic Plan, which capitalizes on Sea Grant's unique capacities and strengths, allows for flexibility and creativity on the part of state Sea Grant programs, and supports many of NOAA's strategic priorities, such as promoting the health of coastal ecosystems, increasing the accessibility and application of quality relevant research to support wise decision-making, increasing the number of fish stocks managed at sustainable levels, and expanding literacy about coastal ecosystems.

The national Sea Grant strategic plan provides a national guide for the work of the state Sea Grant programs. Each university program then develops its own strategic plan for contributing to the realization of national goals, while reflecting the specific needs and priorities of its state and region. For Wisconsin, state needs are broadly identified through a general situation analysis and needs assessment (**Appendix 1**), while specific needs are based on the regional research and information priorities identified by the Great Lakes Regional Research Information Network (**Appendix 2**) and the Great Lakes Regional Collaboration, Council of Great Lakes Governors and Wisconsin's Coastal Management Program, Department of Natural Resources and Department of Agriculture, Trade & Consumer Protection (see **Appendix 3**, *State of Wisconsin Great Lakes Priorities Fiscal Year 2008*).

The Wisconsin Sea Grant strategic plan also incorporates the institutional goals and priorities of the University of Wisconsin-Madison's strategic plan (**Appendix 4**). By combining the strategic goals and

priorities of the national Sea Grant network with those of our parent institution, our strategic plan thus provides a highly relevant basic blueprint for UW Sea Grant research, outreach, education and program administration.

Built on this foundation, our strategic planning approach is a bottom-up process in which our program priorities undergo review and updates every two years in connection with preparing our biennial Request for Proposals, and the entire plan is reviewed and updated every four years in connection with developing the program's core Advisory Services, Communications and Education work plans for the next four years (see **Appendix 5** for details).

UW Sea Grant's 2010-14 Strategic Plan thus presents a research, outreach and education agenda that carefully integrates and responds to clearly identified long-range goals and short-term priorities at the local, state, regional and national levels. Based on this plan, the research, education and outreach projects funded by the UW Sea Grant College Program through its highly competitive grants process will help provide the scientific knowledge necessary for addressing a wide range of Great Lakes resource issues.

The national Sea Grant strategic plan established three goals in each of four focus areas, and three cross-cutting goals that apply to all four focus areas. These goals and focus areas reflect America's most urgent needs in the coastal, ocean and Great Lakes arenas, NOAA priorities, and Sea Grant's strengths and core values. As part of the national implementation plan, university programs also identify quantitative performance measures in each area as part of their state-level implementation plans.

CROSS-CUTTING GOALS

NATIONAL RESEARCH GOAL: Sound scientific information to advance understanding of the nature and value of our Great Lakes resources; to identify new ways to conserve and use these resources and to support evaluation of the environmental impacts and socioeconomic trade-offs involved in coastal decision-making.

Wisconsin Sea Grant has a long history of supporting cutting-edge research and technological innovations related to informed conservation and use of our Great Lakes resources. Short-term economics often influence coastal decision makers to make their decisions without understanding the long-term social, environmental and economic consequences of their decisions. Ecosystem functioning and values, emerging economic opportunities, and the social and economic costs and benefits of various human activities need to be translated into factors understood by the public for sustainable uses of coastal environments to become a reality.

Wisconsin Sea Grant contributes to the science-based planning and development of coastal watersheds and shorelands through the development of tools and techniques to engage our citizens in "Smart Growth" planning for coastal areas. We also demonstrate the value and usefulness of Web-based GIS for coastal planners, resource managers and policymakers.

WISCONSIN NEEDS

- Techniques and technologies to address the effects of chemical contaminants, invasive species and projected climate changes on Great Lakes ecosystems.
- A Great Lakes Observing System to provide decision-support tools for Great Lakes resource managers and coastal planners.

STRATEGIES

- Utilize Sea Grant resources to engage researchers who can develop techniques and technologies to address the effects of chemical contaminants, invasive species and projected climate changes on Great Lakes ecosystems.
- Work with state and federal partners to implement the Great Lakes Observing System and provide decision-support tools for Great Lakes resource managers and coastal planners through Wisconsin Sea Grant outreach activities such as workshops, websites and publications.
- Integrate, translate and disseminate research findings and technological discoveries to the citizens, industries and leaders who need them to capitalize on opportunities and make wise management decisions.

NATIONAL EDUCATION GOAL: An informed public that understands the value and vulnerability of coastal and Great Lakes resources and demands informed science-based decisions about the conservation, use and management of these resources, and a well-trained workforce that will make this a reality.

The 2004 U.S. Commission on Ocean Policy Report emphasized that restoring and sustaining our coastal environments requires an informed citizenry that understands the value and vulnerability of these resources. NOAA has also identified ocean and aquatic literacy as a strategic priority. UW Sea Grant has long supported K-12, undergraduate, graduate, professional and technical education, and we remain committed to advancing coastal and Great Lakes literacy. This is accomplished by using Wisconsin Sea Grant's strong university partnerships and its education and extension capacities to develop educational programs for schools, professional education and workforce training. We also help teachers develop their scientific knowledge and skills to bring aquatic science to their students more effectively. We foster lifelong learning by extending aquatic science education to local communities, museums, parks and other public venues. One of our longstanding priories is to provide opportunities for graduate and undergraduate students to participate in all kinds of UW Sea Grant program activities.

WISCONSIN NEEDS

- Awareness, understanding and knowledge of Great Lakes issues and aquatic science among students and teachers at all levels and adults of all ages throughout Wisconsin and beyond.
- Public understanding and awareness of Great Lakes history, culture, resources and current issues surrounding water supply, water quality, ecosystems and habitat.

STRATEGIES

- Advance Great Lakes, ocean and coastal literacy through formal and informal learning opportunities in our schools, museums, aquariums and other educational forums, such as the on-line, digital collections of the Aquatic Commons and the National Sea Grant Library;
- Work with regional Sea Grant, state and federal partners to develop and maintain a Web site or Web page that lists K-12 Great Lakes-related education resources.
- Collaborate with NOAA and other partners to provide life-long learning programs for people of all ages that enhance understanding of coastal, ocean and Great Lakes environments and promote stewardship of healthy ecosystems.
- Use Sea Grant's strong university partnerships to create new research and education opportunities in marine and aquatic science for undergraduate and graduate students and to develop information products and training opportunities that will help build the workforce capacity for coastal-related jobs and professions.

NATIONAL OUTREACH GOAL: Decision-making processes that involve the full-range of Great Lakes interests, that integrate efforts of public and private partners at the federal, regional, state and local levels, and that provide mechanisms for establishing common understandings and generating outcomes that balance multiple interests.

The continued migration of people to our Great Lakes coasts increases the complexity of decision-making and creates greater potential conflict among users at a time when decisions about coastal resources remain fragmented and narrowly focused. Wisconsin Sea Grant's long-standing relationships with a wide variety of stakeholders in coastal communities and its reputation as a source of unbiased information can play a key role in promoting effective information sharing, consensus building and integration of efforts in the coastal arena.

WISCONSIN NEEDS

- A public that is engaged in the development and implementation of Great Lakes protection and restoration plans.
- Reduced conflicts between and among Great Lakes resource users and managers.
- Public involvement in addressing a wide range of Wisconsin coastal issues.

STRATEGIES

- Draw upon Sea Grant's strength and expertise as a neutral facilitator to bring diverse groups together to generate understanding and consensus on Great Lakes issues including Lake-area Management Plans (LaMPs), "Area of Concern" Remedial Action Plans (RAPs), and comprehensive coastal development and watershed management plans.
- Convene conferences and workshops for tribal leaders, commercial interests and state and local public officials to meet and discuss differences and identify common issues to reduce conflicts between and among Great Lakes resource users and managers.
- Use Sea Grant's research, extension, communications and education capabilities to encourage and support the creation of public decision-making processes that minimize overlap, maximize effectiveness and provide an integrated response to coastal problems and opportunities.
- Develop and implement a wide range of communications, outreach and education strategies, tools and technologies to engage and educate audiences on Great Lakes issues.
- Build consensus on complex issues such as coastal land use, energy development, public access, invasive species control, and climate change impacts by supporting cutting-edge research, building broader understanding among various constituency groups and convening diverse groups of stakeholders to work together to find common solutions;
- Strengthen partnerships to promote national, regional and issue-related collaboration among federal and state programs and other partners in order to support more effective and integrated coastal decision-making.

FOCUS AREAS

1. Improve Great Lakes Ecosystem Health

Healthy ec***o***systems are the foundation for life along the coast. However, increasingly rapid coastal development and other human activities are causing water quality degradation, declining fisheries, wetlands loss, the proliferation of invasive species, and a host of other challenges that need to be understood in order to restore and maintain these ecosystems. Ecosystem functioning does not respect traditional political boundaries, and responsible management of ecosystems requires new kinds of thinking and actions. Sea Grant is a leader in multidisciplinary, regional approaches to understanding and maintaining healthy ecosystems, identifying information gaps, setting research priorities, and coordinating information and technology transfer to those who need it. Wisconsin Sea Grant has fostered efforts to address statewide problems such as invasive species and water quality issues and has staff specialists dedicated to tackling these problems. Sea Grant's regional consortia and networks and international contacts are particularly well-suited to helping Wisconsin address ecosystem health at the state and regional level.

Nowhere is an understanding of the linkages between terrestrial and aquatic environments more critical to resource quality, sustainability and management than in the Great Lakes region. With nearly 9,500 miles of shoreline, the Great Lakes are aquatic systems dominated by their coastal watersheds. Ensuring the health of the ecosystems of the Great Lakes and their watersheds is vital to ensuring the health of the residents of these basins, particularly those with a subsistence diet derived from these ecosystems.

Wisconsin Sea Grant's current priorities in this Focus Area are to develop new observational technologies and interpretive geospatial technology to help foster development of the Great Lakes Observation System (GLOS). The overarching goal is to help our nation maximize its environmental remote sensing capabilities in order to provide critical, real-time data for a broad suite of users, including resource managers, researchers, homeland security interests, the commercial shipping industry and the recreational boating community.

Aquatic invasive species (AIS) pose a major threat to coastal and Great Lakes ecosystems and create significant economic costs and human health risks. From parasitic sea lampreys in the 1940s to zebra mussels in the 1990s, the Great Lakes have been severely disrupted by invasions of nonindigenous species. To date, over 180 nonnative species have been confirmed in the Great Lakes. During the 1990s, the Great Lakes were invaded at a rate exceeding one new aquatic species per year, and some studies indicate the rate of introductions is likely to increase in the future. The cost of invasive species to the region is at least $200 million a year and growing, according to recent research at the University of Notre Dame Center for Aquatic Conservation.

During the next two biennia, Wisconsin Sea Grant will give special attention to addressing the research and information priorities identified at the 2008 "Predicting the Impacts of Invasive Species on Lake Michigan Food Webs" workshop organized by the Lake Michigan Coordination Team of the Great Lakes Regional Research Information Network (see Appendix 2). The Lake Michigan Coordination Team

surveyed nearly 300 organizations with a strong interest in lake issues, and invasive species ranked among the top five across a total of 379 priorities submitted by 52 organizations. The other top-five priority areas were ecosystems, pollutants, education and water.

NATIONAL GOALS

Sound scientific information to support ecosystem-based approaches to managing the coastal environment.

To realize the full potential of ecosystem-based management approaches, we need research that will lead to better understanding of present conditions, basic ecosystem processes, the effects of coastal and upland land uses on the health of coastal and Great Lakes environments, and the importance of healthy ecosystems to healthy fisheries. We also need to know more about how to transform our new knowledge and understanding into sound management principles and practices. Wisconsin Sea Grant will continue to build the scientific foundation needed by supporting research that provides accurate information related to ecosystem health and by accelerating the transfer of this information to coastal residents, resource managers, businesses and industries.

Widespread use of ecosystem-based approaches to managing land, water and living resources on our Great Lakes coasts.

Achieving widespread use of ecosystem-based management approaches will require extensive efforts to communicate the effects of ecosystem degradation on natural resources, local economies and human health to a wide range of audiences in ways that motivate them to respond. Wisconsin Sea Grant's strong research and extension capabilities can provide scientific information and technical assistance for approaches to ecosystem-based management. At the same time, Sea Grant's outreach and education capabilities engage citizens in stewardship activities that promote healthy ecosystems. Regional and other collaborative approaches can address problems that extend beyond traditional geographic or governmental boundaries.

Restored function and productivity of degraded ecosystems.

Human activities and climatic events have led to deterioration of nursery areas for wild fish populations, loss of wetlands and other coastal habitats, closure of beaches and the proliferation of invasive species. Wisconsin Sea Grant can help reverse these trends by identifying and assessing impaired ecosystems, and by supporting the development of new policies, technologies and processes that promote restoration of Great Lakes ecosystems in ways that balance the needs of the natural systems with the needs of the humans who inhabit them. Sea Grant's network of extension, education and communication specialists can provide technical assistance and transfer new information and technologies to local, state, regional, national and international partners and other constituents.

WISCONSIN NEEDS

Aquatic Invasive Species (AIS)

- To know why some water bodies are prone to invasion by nonnative species while others are not.
- Assessments of the near- and long-term effects of AIS on Great Lakes food webs, nutrient and contaminant transport, and the economic impacts of AIS on Wisconsin.
- A greater array of tools to deal with AIS control and management, including ballast water treatment technologies.

Water Quality

- To understand the sources, transport and fate of bacterial and viral pathogens and chemical contaminants in the Great Lakes; know the risks they pose to people and wildlife; and have tools and techniques to address these risks.
- Methods to address the problems the nuisance alga *Cladophora* causes for coastal communities, lakeshore power plants, beach goers and other Lake Michigan water users.
- Methods to address nonpoint-source phosphorus inputs and other nutrient issues in Green Bay and Lake Michigan.
- Techniques to reduce the adverse water quality impacts associated with Great Lakes marinas, ports and other lakeshore facilities.

Ecosystem Assessments

- To improve the design, function and assessment of coastal habitat rehabilitation restoration and remediation projects.
- Improved models of Lake Michigan and Lake Superior food web dynamics.
- To know the bioenergetics, trophic status and food web relationships of noncommercial and non-recreational fish species in Lake Michigan.
- Better knowledge of physical, chemical, biological and geological coupling and the current status and trends of nutrient inputs to Lake Michigan and Lake Superior during extreme precipitation events and other processes at the land-water interface.
- To understand the potential ecosystem effects of long-term low water levels for Lake Superior and Lake Michigan.
- An ability to monitor nearshore sedimentation and bathymetry

Education and Outreach

- Managers and the public who have up-to-date information on ecosystem change trends and insights that lead to adaptive management.
- Identification of critical coastal habitats and information leading to habitat protection and rehabilitation.

- Shoreland property owners and local officials who know the value of coastal habitats and how to protect, restore and manage them.

- To develop and implement a program to address water quality impacts in Wisconsin ports and harbors.

STRATEGIES

Aquatic Invasive Species (AIS)

- Use Sea Grant resources to engage researchers who can determine the social, physical and chemical factors that make water bodies prone to invasion by nonnative aquatic species.

- Support research to assess and evaluate the near- and long-term effects of AIS on Great Lakes food webs, nutrient and contaminant transport, the impacts of AIS on Great Lakes aquatic resources.

- Support research to expand the array of tools to deal with AIS control and management, including ballast water treatment technologies and determine the financial costs of AIS on Wisconsin's Great Lakes resources and economies.

Water Quality

- Engage University researchers to determine the sources, transport and fate of bacterial and viral pathogens and chemical contaminants in the Great Lakes; evaluate the risks they pose to people and wildlife, develop tools and techniques to address these risks and communicate these solutions to Great Lakes users.

- Identify, develop and deliver methods to address and ameliorate the problems *Cladophora* causes for coastal communities, lakeshore power plants, beach goers and other Lake Michigan water users.

- Develop and communicate to marina and port operators through publications and outreach techniques to reduce the adverse water quality impacts of Great Lakes marinas, ports and other lakeshore facilities.

Ecosystem Assessments

- Support research to improve the assessment and effectiveness of coastal habitat rehabilitation, restoration and remediation projects.

- Utilize Sea Grant outreach and communication products to provide technical support for citizens and businesses that need help with specific mitigation/ restoration problems, and provide them access to the latest information and techniques

- Contribute to the development of baseline data associated with physical, chemical, biological and geological coupling at Lake Superior and Lake Michigan land-water interfaces; work with state and federal partners such as NOAA's National Centers for Coastal Ocean Science to develop standards, and indicators to support ecosystem-based approaches for land use, water, fisheries, and other resource management and work.

- Support research to develop and improve models of Lake Michigan and Lake Superior food web dynamics.

- Develop a large-scale, partnered research program on the potential and realized impacts of aquatic invasive species on the Lake Michigan food web.

- Invest in the development and dissemination of new information, policies, technologies and methods to address water quality degradation, prevent the introduction and spread of aquatic non-native species, climate change and minimize the negative impacts of these on coastal, ocean and Great Lakes food webs.

Education and Outreach

- Work with partners within and outside of NOAA to develop data, models, and training activities that support ecosystem-based planning and management and protection approaches, and share these with a wide variety of constituencies.

- Develop outreach and communications strategies to inform the public about what can be done to prevent the spread of invasive species and protect coastal water quality and habitat.

Focus Area 2. Enhance Coastal Community Sustainability and Resilience

Wisconsin's coastal communities provide economic, social and recreational opportunities for millions of Americans, but decades of population growth have transformed our coastal landscapes and intensified demand on finite coastal resources. The increase in population has resulted in new housing developments and recreation facilities, a new generation of energy development activities, port expansions and a growth in business activities.

These changes are placing tremendous pressure on coastal lands, water supplies and traditional ways of life. To accommodate more people and activity, and to balance growing demands on coastal resources, we must develop new policies, institutional capacities and management approaches to guide the preservation and use of Great Lakes resources. Wisconsin Sea Grant helps our diverse and growing coastal population apply the best available scientific knowledge and uses its extension and education capabilities to support the development of healthy coastal communities that are economically and socially inclusive, are supported by diverse and vibrant economies, and function within the carrying capacity of their ecosystems.

Economic growth since 1950 has increased the urbanization of Great Lakes coastal areas—with corresponding increases in pollution and environmental degradation. Great Lakes urban shorelines have significant appeal, as evidenced by the demand for recreational, business and residential developments near the water. Communities and the state must balance economic and environmental values, manage the impacts of stormwater runoff and waste disposal, and consider needs for transportation, recreation and commerce—all while maintaining the integrity of coastal ecosystems that provide critical habitat and nursery areas for native aquatic species.

Protecting the water quality of the Great Lakes is essential to the region and the nation. Millions of Americans depend on the Great Lakes for drinking water, and the lakes support multibillion-dollar fisheries, shipping/boating and tourism/recreational industries. Population growth and development pose an increasing threat to water quality from chemical contaminants and nutrient loading as well as increasing demand for Great Lakes water. We urgently need to develop and support management programs designed to protect and enhance the quality of this vital ecosystem.

Wisconsin Sea Grant is developing new observational technologies and interpretive geospatial technology to help foster development of the Great Lakes Observing System (GLOS). Our overarching goal is to help the Great Lakes region maximize its environmental remote sensing capabilities to provide critical, real-time data for a broad suite of users, including resource managers, researchers, homeland security interests, the commercial shipping industry and the recreational boating community.

NATIONAL GOALS

Healthy coastal economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.

Great Lakes aquatic resources and coastal amenities sustain local and national economies through fisheries, seafood processing, trade, energy production, shipping, tourism and recreation enterprises. Sea Grant researchers can develop methods and models to improve management of Great Lakes commercial and recreational fisheries from a whole-ecosystem perspective. Urban ports and waterways continue to accommodate expanding regional and international trade, growth in tourism and recreational boating, and changes in fishing fleets. At the same time, development patterns along the coast are threatening to displace traditional water-dependent industries and cut off water and beach access for the public at large. Wisconsin Sea Grant research can evaluate and document the value and impacts of Great Lakes-based businesses to coastal communities. Wisconsin Sea Grant's longstanding relationships with coastal communities and industries make it ideally suited to provide information, tools and techniques to support the development of working waterfronts, responsible energy development, accessible recreation and tourism activities, and sustainable development practices.

Coastal communities that make efficient use of land, energy and water resources and protect the resources needed to sustain coastal ecosystems and quality of life.

The biggest challenge facing many coastal cities and towns today is how to manage growth in ways that do not diminish the health of the ecosystems upon on which these communities depend. This is reflected nationally and internationally in the high level of concern about climate change and its associated effects. To respond to the challenges of growth at a local and regional level, communities are looking to use land and water, generate energy, and dispose of waste in ways that preserve environmental health and economic vitality. Determining the amount of the land, water and other natural resources needed to sustain healthy communities is an essential first step in establishing sustainable policies and growth practices. Only when the dimensions of this environmental footprint are

identified can coastal communities understand what their carrying capacity is and what will be needed for generations to come. Sea Grant and its university partners are in a unique position to conduct research and develop models and forecasts that will help communities with this process.

Coastal citizens, community and tribal leaders, and industries that recognize the complex interrelationships between social, economic and environmental values in coastal areas and work together to balance multiple uses and optimize environmental sustainability.

According to NOAA's *Population Trends Along the Coastal United States: 1980-2008*, coastal counties constitute only 17 percent of the land area of the U.S. (not including Alaska) but account for 53 percent of the population, and they continue to be among the most rapidly growing areas in the country. Likewise, the pressures on Wisconsin's coasts and Great Lakes resources continue to increase. Citizens and decision makers have an urgent need for tools that will help them evaluate the implications of land-use changes, coastal development pressures and increased resource use in approaching the policy and management decisions they face. Regional cooperation and coordinated land-use and watershed planning are essential. Sea Grant can provide sound information for decision makers, convene stakeholders to seek common ground, and facilitate the development and implementation of new coastal policies, plans, management approaches and consensus-building strategies.

Widespread understanding of the risks associated with living, working and doing business along our state and nation's coasts.

Coastal communities and businesses are increasingly vulnerable to hazardous events brought on by climate-related changes, watershed land-use changes and increased economic activity in Great Lakes waters. A great need exists for information and tools to help communities assess the risks they face and identify the options available to them to minimize those risks. Sea Grant will support the work of NOAA's new Climate Program Office and its climate impact and adaptation-related activities. Sea Grant will also work with other federal, state, and local partners, the banking and insurance industries, and others to develop forecasting and risk assessment tools, economic and environmental impact models, and other mechanisms that will help families, businesses and industries, coastal communities, and regions understand their risks and take them into account in making personal, business, and community-related decisions.

WISCONSIN NEEDS

Sustainable Development

- To know the effects shoreline structures have on coastal habitat.
- Techniques to predict and prolong the life of coastal infrastructure.
- State-of-the-art "Smart Growth" coastal development planning tools that are user friendly and accessible to planners and decision makers.

- Technologies to provide ready access to ecosystem-based Great Lakes information for local, tribal, state and federal decision makers.

- Remote sensing data to improve our understanding of the physical, chemical, biological and geological coupling at the land-water interface and make these improved data access and visualization technologies available to decision makers.

- A Great Lakes Observing System and decision-support tools for Great Lakes resource managers and coastal planners.

Sustainable Economies

- Determination of the value of Great Lakes and coastal businesses, property, infrastructure and facilities.

- Ability for waterfront businesses to remain financially viable while satisfying state and federal environmental regulations related to protecting the Great Lakes and coastal ecosystems.

- Offshore wind energy and other forms of alternative energy in Great Lakes and coastal environments, communities and ecosystems.

- Energy conservation and alternative energy sources for water-based businesses, lakeshore industries and coastal communities.

Resilient Communities

- To know what causes extreme changes in Great Lakes water levels, the economic impacts of these changes and their effects on coastal infrastructure and coastal communities.

- To know what effect climate change will have on stormwater hydrology and the potential effects on coastal communities and Great Lakes industries.

- GIS, visualization technology, computer-aided designs and other technologies to assess and reduce the risks of coastal erosion, storm wave run-up and other natural hazards to coastal structures.

Education and Outreach

- Marina and harbor operators who can adapt to changing lake levels and infrastructure impacts associated with climate change

- Integration of habitat protection and rehabilitation into coastal development plans and infrastructure design.

- Local and tribal government officials who are aware of the ecosystem effects of urban areas and development in coastal watersheds and who know how to integrate land use planning, zoning and future development planning for environmentally safe, sustainable economies.

- Information about the effects of climate change on Great Lakes coastal erosion, stormwater hydrology, water quality and wave run-up so that Great Lakes users can improve public safety through greater awareness of Great Lakes hazards.

STRATEGIES

Sustainable Development

- Support research to predict and prolong the life of coastal infrastructure and determine the positive and negative effects shoreline structures have on coastal habitat and communicate strategies to cope with the infrastructure impacts of climate change and extreme changes in water levels in the Great Lakes to port and marina operators.

- Develop state-of-the-art "Smart Growth" coastal development planning tools that incorporate ecosystem-based information and that are user friendly and make them accessible to planners and decision makers.

- Integrate remote sensing data from systems like the Great Lakes Observing System to improve our understanding of the physical, chemical, biological and geological coupling at the land-water interface and make these improved data access and visualization technologies available to decision makers.

- Support the development of regional coastal observation systems and other collaborative efforts that advance our capability to predict the effects of human activities and environmental changes on coastal resources in order to take steps to mitigate their effects.

Sustainable Economies

- Evaluate and communicate the local, state and regional value of Great Lakes and coastal businesses, property, infrastructure and facilities.

- Support research to improve cost efficiencies, enhance energy conservation and develop environmentally sound alternative energy sources to help Great Lakes businesses and coastal economies remain viable.

Resilient Communities

- Utilize GIS, visualization technology and computer-aided designs to determine the effects of climate change on Great Lakes water levels and stormwater hydrology; evaluate the economic impacts of extreme water level changes and their effects on coastal infrastructure and coastal communities and means to reduce these risks.

- Conduct research to assess hazard-related risks and increase the availability and usefulness of hazard-related information and forecasting for citizens, industries, and decision-makers in coastal communities.

- Work with coastal businesses to assess the risks associated with doing business in coastal areas in the context of severe coastal storms, climate-related changes, and dramatic changes in port and international trade activities.

Education and Outreach

- Educate community planners, local and tribal government officials and decision makers about the ecosystem effects of urban areas and development in coastal watersheds and how to integrate land use planning, zoning and future development planning for environmentally safe,

sustainable economies; communicate Smart Growth techniques that integrate habitat protection and rehabilitation into coastal development plans and infrastructure design.

- Communicate information about the effects of climate change on Great Lakes and stormwater hydrology and water quality to Great Lakes users and improve public safety through greater awareness of Great Lakes hazards.

- Work with federal partners to develop, test and promote beneficial uses for dredged material and the reuse of clean dredged material to help maintain healthy coastal communities and habitats.

- Work with the NOAA Climate Change Program and other public and private sector partners to develop and deliver comprehensive education/literacy programs on the immediate and long-term effects of climate-related changes, and other hazardous events, on human safety and property along the coast, and how to prepare for and survive them.

Focus Area 3. Support Sustainable Fisheries and Aquaculture

Many major U.S. fisheries are in decline, while seafood consumption and demand are rising. The consequence is an $8 billion seafood trade deficit. Through its research, extension and education activities and work with partners, Sea Grant has produced important discoveries that have aided the stabilization and recovery of many endangered fisheries. According to the NOAA Aquaculture Program, fish farming is in its infancy in the U.S., amounting to just over $1 billion of a $70 billion worldwide industry. In Wisconsin, aquaculture sales in 2005 totaled $7 million. Aquaculture creates important new opportunities to meet the increased demand for seafood, but a number of questions need to be addressed for its full potential to be realized.

Seafood safety is a growing concern as international trade increases and fish diseases and toxic contamination become bigger problems. Sea Grant has several key roles to play in advancing public understanding of the nature of these problems and opportunities. Through the use of its research, extension and education capacities, Wisconsin Sea Grant supports the kind of informed public and private decision making that can lead to a sustainable supply of safe seafood long into the future.

Wisconsin has a diverse, moderately sized aquaculture industry for the production of food fish, baitfish and fish for stocking. The industry has good growth potential, particularly in the area of food fish production, because of the availability of new technology, ample supplies of high-quality water, land, labor and markets. The most likely candidates for expansion in Wisconsin are cool-climate, freshwater fish species. To achieve the state's aquaculture potential, within the framework of biosecurity standards, additional research needs to focus on intensive culturing techniques, such as developing genetically defined domesticated broodstocks and controlling reproduction, advancing early life stage finfish culture technology, improving nutritional requirements as a function of growth, and managing fish health. Practical, cost-effective production parameters are needed, along with the development of environmentally sound recirculating aquaculture systems focused on reducing water usage and managing effluents.

The sustainability of Wisconsin's commercial fishery is threatened by changes in fish communities caused by invasive and introduced species, a changing climate, and economic pressures deriving from higher fuel costs for its fishing fleet. The fisheries of the Great Lakes have been strongly influenced by ecological changes brought about by deliberate as well as unintentional introductions of exotic species. Sea lampreys contributed to the collapse of native fish populations. New invaders—such as zebra mussels, round goby, ruffe and white perch—pose significant challenges.

Key research challenges include developing ways to control the spread of exotics, creative methods for reducing their adverse effects on native fish populations, and the combination of conceptual and analytical tools required to evaluate fishery sustainability and restoration efforts, particularly with regard to how all of these might be affected by climate change. Improvement in the fuel efficiency of charter and commercial fishing boats is another important need.

NATIONAL GOALS

A sustainable supply of safe seafood to meet public demand.

Ensuring a sustainable supply of safe seafood requires an understanding of the effects of historic management decisions and climate change on U.S. wild fish populations as well as the role ecosystem-based fisheries management can play. Ensuring a safe, sustainable seafood supply also requires better understanding of the range of complex issues related to development of the domestic aquaculture industry. Wisconsin Sea Grant will make major contributions by supporting research that provides the knowledge needed to understand the factors stressing wild fisheries and to understand the complexities of aquaculture development. Sea Grant also translates and transfers useful research findings through extension and education activities to ensure responsible and productive use of these resources in the future.

A healthy domestic seafood industry that harvests, produces, processes and markets seafood responsibly and efficiently.

A healthy seafood industry requires harvesting techniques that minimize by-catch and damage to aquatic habitats. Sea Grant supports research and outreach to develop value-added products, enhance quality assurance and educate producers about how to harvest and market underutilized species. Wisconsin Sea Grant involves harvesters, recreational fishermen, producers and managers in being responsible stewards as well as successful entrepreneurs. Sea Grant also supports the development of new technologies and participates in collaborative efforts to increase the range of wild harvested products, enhancing our competitiveness in regional and global markets.

Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our domestic fisheries, who appreciate the health benefits of seafood consumption, and who understand how to evaluate the safety of the seafood products they buy.

Increased attention to the safety of domestic and international seafood has created an urgent need for rapid assessment techniques, certification programs, and standards for domestic and international seafood products so consumers will have reliable information to inform their buying decisions. Sea Grant involves industry representatives in the application of seafood safety standards, trains inspectors and wholesalers in how to assess seafood quality, and develops educational materials related to seafood safety, quality and security, and makes these materials readily available to consumers.

WISCONSIN NEEDS

Fisheries

- New and improved models for sustainable management of Great Lakes fish and fisheries.
- Successful rehabilitation efforts for native Great Lakes fish species.
- New markets and uses for traditionally harvested Great Lakes species as well as underutilized and established nonnative species.

Aquaculture

- Sustainable, cost-effective intensive production technology and domestication methods for economically important farm raised species.
- Improved growth and reproductive success of farm raised species to enhance the sustainability of Wisconsin's aquaculture operations.
- Techniques to reduce the risk of VHS and other pathogens associated with baitfish production and distribution.

Education and Outreach

- Consumer education and communication products to help them understand and evaluate the benefits, risks and ecological consequences of their seafood purchases.
- Aquaculture producers who understand how to apply the methods and techniques developed through research.

STRATEGIES

Fisheries

- Support research to develop new and improve existing fisheries population and stock assessment models for sustainable management of Great Lakes fish and fisheries.

- Support research and state and federal partners in their efforts to assess the success of lake trout, lake sturgeon and yellow perch rehabilitation efforts.

- Engage university researchers in the development of new uses and identification of alternative markets for traditionally harvested Great Lakes species as well as underutilized and established nonnative species.

- Support research, development, and transfer of new technologies to keep the Great Lakes commercial fishing industry financially competitive and environmentally responsible.

- Engage harvesters, recreational fishermen, producers and managers in the development of research and management innovations related to the condition, use, and conservation of the natural resources they depend on.

Aquaculture

- Support efforts to develop sustainable, cost-effective intensive production technology and improve growth and reproductive success of economically important farm raised species to enhance the sustainability of Wisconsin's aquaculture operations.

- Work with state and federal partners to identify, expand and apply techniques to reduce the risk of VHS and other pathogens associated with baitfish production and distribution and use.

Education and Outreach

- Develop educational programs and materials that enhance the American public's understanding of what is required to maintain sustainable fisheries.
- Work with Great Lakes state, federal and regional partners to develop communication products for consumers and communities living on a subsistence diet to help them understand and evaluate the benefits, risks and ecological consequences of their purchases and consumption of fish and other seafood.

- Cooperate with the Northern Aquaculture Demonstration Facility and UW-Extension to help Wisconsin residents apply sound aquaculture production techniques.

APPENDIX 1
Wisconsin Situation Analysis & Needs

With nearly 1,000 miles of shoreline on Lakes Michigan and Superior, Wisconsin has many Great Lakes-related issues in common with the rest of the region. All of the state's coastal communities and electric power plants draw their water from the lakes, and since 1990 hundreds of millions of dollars have been spent to prevent them from becoming clogged with zebra mussels. Preventing the spread of zebra mussels and other **aquatic invasive species** to the state's 15,000 lakes and other inland waters is a continuing concern.

Five of the 43 U.S.-Canadian International Joint Commission's severely polluted Great Lakes "Areas of Concern" (AOC) are located in Wisconsin, and the Fox River-Green Bay AOC in particular is one of the largest single sources of the PCBs, mercury, dioxin and other **toxic chemical contaminants** in Lake Michigan fish today. Toxic contaminants and invasive aquatic plants and animals are of special concern because **fishing** and **boating** are exceptionally popular activities throughout Wisconsin, where there are more than a half-million registered boats and more than 700,000 resident fishing licenses are sold annually. Wisconsin typically sells about 1.4 million fishing licenses during the regular fishing season, which ranks it fifth nationally in total number of licenses sold. About 90 percent of Wisconsin's 250 Great Lakes charter fishing boats operate on Lake Michigan, which also supports about 50 commercial fishing operations.

More than a dozen other large rivers and numerous smaller tributaries that drain rural, suburban and urban coastal watersheds also contribute significant sediment and contaminant burdens to Wisconsin waters of Lake Michigan, which adversely affect the water quality, habitat and biota of tributary and nearshore water alike. As in other coastal areas of the region and nation, **beach closings** due to bacterial contamination are a major problem, and nuisance ***Cladophora* algal blooms** in Lake Michigan are increasing as a result of high nutrient loads in watershed runoff.

About 2.5 million people—nearly half of the state's population—live in the watersheds that drain into Lakes Michigan or Superior, including several federal Indian Reservations on which many residents rely on local natural resources for their subsistence. It is likely that continued coastal development and urbanization, if not planned carefully, will have increasingly adverse effects on **water quality and habitat** both within the watersheds and in coastal waters. Recognizing that accurate land-use data is essential to "smart growth" planning, Wisconsin leads the nation in modernization of its land information system through the use of computer-based Geographic Information Systems (GIS). Ultimately, however, the restoration and protection of Great Lakes water quality and coastal habitat will require that **GIS and other geospatial data** from coastal watersheds be integrated with data obtained from *in situ* lake observation systems and remote satellite data to develop an analytical tool with predictive capability.

Wisconsin's population in 2000 was estimated at 5.4 million, more than 37 percent of whom live in the 11 counties bordering Lake Michigan and Green Bay. These coastal counties and adjacent inland counties have experienced above-average population growth for the last 20 years. The state's four most heavily urbanized and industrialized southeastern coastal counties—Kenosha, Racine, Milwaukee and Ozaukee—are home to about 25 percent of Wisconsin's population. Much of this area has experienced severe drawdowns in local groundwater supplies, creating a growing **demand for Lake Michigan water** for residential and industrial uses—a contentious issue because most of this area lies outside the Lake Michigan basin.

Erosion is a perpetual problem along the shores of these geologically young lakes, and where shoreline development takes place, property damage from **coastal erosion** is common. This erosion accelerates during times of high lake water levels, while low water levels create navigation hazards for ships and other watercraft and increase the need for dredging channels and harbors.

One of the fastest-growing segments of Wisconsin's agriculture industry is **aquaculture**. According to a recent survey by the Wisconsin Department of Agriculture, Trade & Consumer Protection, aquaculture in the state has been growing at a rate of more than 10 percent per year and now has an annual value of almost $9 million. Wisconsin has the requisite resources and climatic conditions for culturing several marketable cold- and cool-water species of fish, including trout, salmon, whitefish, ciscoes, walleye and perch. This represents a huge potential for significant long-term economic development, not only of food fish, but baitfish and hatchery enterprises as well.

With agriculture and manufacturing, **tourism** is one of the state's top three industries—and Lake Michigan is a big part of it. Tourists from Chicago and neighboring states are drawn to Wisconsin's Lake Michigan coast, which offers an attractive selection of eight state parks, two state forests, dozens of public beaches and some 73 lake access points, many featuring marinas and boat launches.

While the population of the state's four Lake Superior coastal counties grew less than 3 percent during the 1990s, they have shown steady growth in recreation and tourism businesses directly related to the lake—particularly in the Apostle Islands National Lakeshore area—including charter boat fishing, marinas, sailboat and sea kayak rentals and instruction, and related tourist support services. The area is also home to the largest harbor on the Great Lakes, the Port of Duluth-Superior, which handles 38 million tons of bulk cargo and hosts 1,100 ships annually—and where **accelerated corrosion of steel harbor structures** could cost up to $100 million to repair if the causes and a solution are not found soon.

As elsewhere in the U.S. and the rest of the Great Lakes region, **high and rising energy costs** rising are affecting the health of the Great Lakes shipping industry, commercial and charter fishing operations, and coastal tourism, and developers are seriously contemplating the construction of wind energy farms in Lake Michigan and along its coast.

Climate change projections for this region of the world are beginning to raise a number of issues at the local and state levels. **Regional climate change** projections call for an accelerating rise in average temperatures throughout the year, leading to more frequent severe storms and greater amounts of stormwater runoff, extreme heat waves and drought in summer, and bigger snowfalls yet briefer

periods of snow cover and ice cover on lakes due to shorter, warmer winters. Such projected changes in precipitation patterns, runoff and evaporation rates, and their effects on groundwater recharge have significant implications for Great Lakes and coastal resources, including shipping and port facilities, municipal sewerage and stormwater systems, and drinking water supplies as well as for recreational and commercial fishing, tourism and numerous other coastal industries.

Wisconsin's universities and colleges are a vital force in meeting the challenges of these Great Lakes issues. The University of Wisconsin-Madison offers unique research strengths with its internationally recognized Center for Limnology and its Environmental Chemistry & Technology Program. The UW-Madison Biotechnology Center coordinates a multidisciplinary research program involving more than 50 campus units. The UW-Milwaukee Aquaculture Institute and Great Lakes Wisconsin Aquatic Technology and Environmental Research (WATER) Institute provide the Wisconsin Sea Grant program with leaders in aquaculture and estuarine and coastal processes research. Well-developed natural resources research, extension and education programs at UW-Stevens Point, UW-Green Bay, UW-La Crosse, Lawrence University, Marquette University and other Wisconsin campuses add to the wealth of the state's academic talent and capabilities.

The high-quality applied and basic research, education and outreach projects funded by the UW Sea Grant College Program via a highly competitive grants process help provide the scientific knowledge necessary for addressing the full range of Great Lakes resource issues.

APPENDIX 2
Great Lakes Regional Research Information Network (GLRRIN)

GLRRIN is a recently created voluntary network of 23 U.S. and Canadian governmental, academic and private programs involved in Great Lakes research. Participants include Wisconsin Sea Grant and five other Great Lakes state Sea Grant programs, NOAA's Great Lakes Environmental Research Laboratory, the International Joint Commission, Great Lakes Commission, Great Lakes Fishery Commission, U.S. Environmental Protection Agency-Great Lakes National Program Office, U.S. Fish & Wildlife Service-Great Lakes/Big Rivers Region, U.S. Army Corps of Engineers-Detroit District, U.S. Geological Survey-Great Lakes Science Center, three Canadian agencies and two Canadian universities.

GLRRIN's goal is to develop a comprehensive regional research and information plan designed to focus research, technology transfer and outreach efforts on the highest priority issues for each of the five Great Lakes. To that end, it has created five coordination teams composed of individuals from the above organizations to identify the research and information needs for each of the Great Lakes.

Members of GLRRIN's Lake Michigan Coordination Team include Wisconsin Sea Grant Director Anders Andren; Phil Mankin, interim associate director and research coordinator for Illinois-Indiana Sea Grant; Stephen Brandt, director of NOAA's Great Lakes Environmental Research Laboratory, and Paul Horvatin, director of the U.S. EPA Great Lakes National Program Office.

In 2007, the Lake Michigan Coordination Team conducted a survey of nearly 300 organizations with a strong interest in lake issues. **Invasive species** ranked among the top five issues identified from a total of 379 priorities submitted by 52 organizations. The other top-five priority areas were **ecosystems**, **pollutants**, **education** and **water quality** issues. The Lake Michigan team is now compiling a Scientific Resources Database that will provide an online listing of people collecting data on Lake Michigan and their areas of interest.

During the next two biennia, Wisconsin Sea Grant will give special attention to addressing the research and information priorities established by the GLRRIN Lake Michigan Coordination Team, particularly those identified in 2008 at its "Predicting the Impacts of Invasive Species on Lake Michigan Food Webs" workshop. These GLRRIN priorities for Lake Michigan have been woven into Wisconsin Sea Grant's 2010-14 Strategic Plan and were among the priorities listed in UW Sea Grant's 2010-12 Request for Proposals.

APPENDIX 3

State of Wisconsin Great Lakes Priorities Fiscal Year 2008

Distributed by the Office of Governor Jim Doyle with the endorsements of the Wisconsin Coastal Management Program and departments of Natural Resources and Agriculture, Trade & Consumer Protection, this four-page document identifies the Great Lakes Regional Collaboration's eight highest-priority topics and calls upon Congress to undertake "a series of actions that are needed in Wisconsin and the region to implement the regional strategy to protect the Great Lakes."

The following summarizes that document, omitting specific appropriation requests for existing federal programs and pending legislation. The terms italicized for emphasis were likewise emphasized in the original document:

1. **Immediate action to stop the introduction of more *aquatic invasive species* and prevent significant future ecological damage to the Great Lakes.**
    - Upgrade the temporary and complete the permanent barriers in the Chicago Sanitary and Ship Canal to prevent the introduction of Asian carp into Lake Michigan and the Great Lakes.
    - Enact regulations to prevent future releases of exotic species through ballast water discharges from ships.
    - Reauthorize the National Aquatic Invasive Species and provide funding to prevent further introductions and control the spread of existing populations of invasive species.
    - USDA funding to combat the spread of viral hemorrhagic septicemia (VHS) fish disease from Lake Michigan into tributaries and inland lakes.
2. **Habitat conservation and species management to protect the plants and animals of the Great Lakes.**
    - Begin restoration work immediately on 200,000 acres of wetlands in the Great Lakes basin and funding in support of the Great Lakes Fish & Wildlife Restoration Act of 2006. In Wisconsin specifically:
        - Protect and restore priority wetland areas on the west shore of Green Bay, Lake Superior estuaries and critical wetland sites in southeastern Wisconsin.
        - Protect and restore Wisconsin Great Lakes tributaries, associated wetlands and smaller fish spawning streams that are critical to self-sustaining Great Lakes fish populations.
        - Acquisition of coastal habitat areas in Ozaukee and Bayfield counties.
        - Designation of a Wisconsin Lake Superior Estuarine Research Reserve.

- Purchase of development rights of working forests in northern Wisconsin to prevent fragmentation in support of sustainable forestry and protect habitat and riparian areas.
- Purchase of development rights of working farmland in eastern Wisconsin to prevent fragmentation in support of sustainable agriculture and protect habitat and riparian areas.

3. **Protecting *nearshore waters and coastal areas* to protect drinking water and enhance recreational opportunities.**
    - Funding for wastewater treatment upgrades to protect and improve Great Lakes water quality.
    - Review and upgrade the U.S. Environmental Protection Agency's Great Lakes wet weather programs, including stormwater management, combined sewer overflow control, and National Pollutant Discharge Elimination System permits and enforcement, plus funding for Great Lakes states to implement anti-degradation rules relating to sewage system expansions.
4. **Dramatically accelerating the cleanup of contaminated *Areas of Concern*.**
    - Great Lakes Legacy Act funding to remediate contaminated sites. Key project areas in Wisconsin are the Milwaukee remedial action plan sites of Estabrook Park and the Kinnickinnic River.
5. **Reducing *nonpoint-source pollution* that is contributing to areas of concern and other locations in the Great Lakes, including the open waters.**
    - Increase pollutant reductions through the installation of riparian buffers and urban waterway restoration via stormwater management.
    - Select Great Lakes basin watersheds for Conservation Security Program funding.
    - A water quality loan program for livestock producers in targeted Great Lakes drainage areas to install nonpoint-source pollution control practices.
    - Development of a farm certification program that provides incentives for reducing pollution from agricultural sources.
    - Conservation Reserve Enhancement Program funding for enrolling Great Lakes basin agricultural acreage in riparian buffers.
    - Develop comprehensive nutrient management plans for agricultural land that drain into tributaries to the Great Lakes.
6. **Action to reduce discharges of *toxic pollutants* and increase research and surveillance.**
    - Funding to support toxic pollution reduction efforts and supplement state activities directed towards reducing discharges, emissions and other possible sources of mercury and other bioaccumulating pollutants targeted for reduction in the Great Lakes.

- Funding to support the collection and proper disposal of unused pharmaceuticals to reduce the amount of pharmaceutical pollutants entering the Great Lakes and affecting both aquatic live and drinking water.

7. **A *sound information base and representative indicators* to help decision makers understand what is happening in the Great Lakes system.**
    - Replace aged Great Lakes monitoring and research vessels used to assess fish populations, conduct fish health and other biological assessments, and monitor related habitat conditions and trends.
    - Funding to implement an automated fish marking system needed by all governments in the basin to establish the levels of natural reproduction and effectiveness of state, federal and tribal fish stocking programs.
8. **Making changes in land use, agriculture and forestry, transportation, industrial activity, and other areas to ensure the *long-term sustainability* of the Great Lakes.**
    - Authorization for NOAA to restore and remediate waterfront areas.
    - Funding for NOAA's Coastal Community Assistance Grants to help local communities in the Great Lakes basin develop land use plans.
    - Support for the Wisconsin Brownfield Coalition's application for U.S. EPA revolving loan funds for grants to local governments to remediate and redevelop contaminated brownfield sites.

APPENDIX 4
University of Wisconsin-Madison Strategic Priorities and Goals for 2007-09

Amplify the Wisconsin Idea

Goal 1: Foster the core value of the Wisconsin Idea and service to the state.

For more than 100 years, a core value of UW–Madison has been the Wisconsin Idea — the principle that the boundaries of the campus are the boundaries of the state and beyond. Under the new Wisconsin Idea Project, the university will conduct community research on how UW–Madison can strengthen existing and create new partnerships that provide tangible benefits to state citizens, better document how our work impacts the state, and provide increased opportunities to create meaningful interactions between the university and state constituents, including partnerships with UW System institutions.

Goal 2: Promote the development of new outreach efforts and partnership programs in the sciences, arts and humanities.

We can contribute to quality of life for citizens of the state and world. We will expand our efforts through programs such as the Science Alliance, the Wisconsin Book Festival, Odyssey Project, Humanities Forums on Contemporary Issues with the Dane County Library System, Teacher Enhancement Programs in Biology Education and the Institute for Biology Education.

Goal 3: Address the growing health care crisis in the state.

A growing number of citizens in our state have limited access to basic health care needs. Our university will work to expand the health care workforce, especially in underserved rural and central city areas. We will apply our expertise in developing policies and approaches that will lead to the greatest efficiency and effectiveness in resource utilization. Our research programs will lead the way in developing new approaches for preventing, diagnosing and treating disease.

Economic Development

Goal 1: Expand campuswide entrepreneurship.

UW–Madison has been given the opportunity to build a unique entrepreneurship initiative within the context of the Wisconsin Idea. A Kauffman Foundation grant will be used to educate students about the principles and practices of entrepreneurship, connect newly educated students with technology and ideas that can evolve into new ventures, and increase availability of investment funding to start, grow and sustain companies that our entrepreneurs create. This program, once honed at the campus level, will serve as a model and will be expanded to UW System campuses statewide, with an early focus in Milwaukee.

Goal 2: Increase funding for research commercialization efforts.

One of the major challenges in the commercialization of university technology is the funding needed to advance early-stage inventions to a point that they can be licensed to industry. We will seek additional funds to help more researchers move their technology forward to a point where industry or other investors are willing to fund commercialization.

Promote Research

Goal 1: Promote interdisciplinary research through centers and institutes.

Many of the world's most complex problems require interdisciplinary approaches to understand and solve. We will develop and implement core facilities, architectural designs and support systems to foster interdisciplinary research.

Goal 2: Advance research compliance.

Issues involving responsible conduct of research are critical to successful research. We can better assist our researchers in managing this increasingly complex environment through enhanced administrative practices, education and funding.

Goal 3: Improve the university's processes for negotiating agreements with industrial sponsors.

Industry is increasingly interested in contracting with universities to conduct research. We can advance knowledge and contribute to economic benefit by increasing our industry-sponsored research efforts.

Advance Learning

Undergraduate Education

Goal 1: Cultivate, develop and nurture ways for students to engage fully in the Wisconsin Experience:

Students benefit from their "Wisconsin Experience" — a culture that engenders a belief that one's work and life should be meaningful and have real impact on our world. We see evidence of this belief every day, as our students go on to volunteer and play leadership roles in Wisconsin, the state and the world. To enable these successes, we provide research experiences, global and cultural competencies, and leadership and activism opportunities. We help students apply knowledge in real-world settings through internships, service learning and community-based research.

Graduate and Professional Education

Goal 1: Develop an integrated approach to funding support for graduate students.

We must enhance our recruitment and funding efforts to compete with our peers for attracting the best students. To do so, we will assess and build on recruitment best practices, monitor the policy on graduate assistant tuition remission, and address tuition remission issues for fellows and trainees.

Goal 2: Create efficiencies in diversity recruitment and degree approval/review processes.

Recruitment of graduate and professional students from diverse backgrounds is crucial to the continued excellence and relevance of our programs and to the success of our graduates in an increasingly global and diverse economy. Campus units will work together to develop policies and processes to meet anticipated increases in doctoral degrees beyond the PhD and established professional degrees.

Goal 3: Broaden professional development opportunities for graduate and professional students.

It is critical for graduate and professional students and postdoctoral scholars to be trained in responsible conduct of research and to be engaged in contributing to the Wisconsin Idea. We will broaden ways that graduate and professional students can participate in professional development and community-engagement activities.

Lifelong Learning

Goal 1. Sustain and strengthen our national stature in continuing education.

UW–Madison is considered a national leader in the provision of continuing education. To preserve this stature, we must respond to the needs of people in various markets. Cross-campus leadership will ensure the viability of these programs, which operate on a program-revenue, self-supporting basis and currently serve more than 135,000 learners via continuing education, credit outreach and independent-learning courses.

Goal 2: Expand educational services and lifelong learning programs.

The volume of demonstrated interest in lifelong learning programs creates a steady market for these programs. We will continue to expand our services beyond the thousands already being served, including part-time and non-degree students, learners in retirement, alumni, donors and youth.

Goal 3: Foster learning opportunities for part-time and nontraditional students.

Working adults who cannot easily leave their jobs and attend school full time are seeking continuing education opportunities. We will foster and support new courses, capstone degrees, certification programs and degrees, including the development of new master's and capstone degrees, and certificate programs that serve working adults throughout the state and region.

Accelerate Internationalization

Goal 1: Expand global competence of our students.

Corporations, educational institutions and government agencies in Wisconsin and the nation are suffering from a shortage of globally literate professionals. The economy of Wisconsin depends on our students having this global competence. We will increase participation in academic overseas programs and internationally focused curriculum.

Goal 2: Extend international research partnerships.

To achieve a position as a leading global public research university, we must establish more international research partnerships. We will expand Worldwide Universities Network and partnerships with international educational, corporate and governmental organizations, pursue transnational collaborations and solutions, and form mutually beneficial partnerships.

Goal 3: Connect international expertise with business, civic and government agencies:

To increase the state's international knowledge base and global competitiveness, we will advance the connections between the university and the community through collaborations with private and public sectors, and the university's alumni around the world.

Nurture Human Resources

Students

Goal 1: Provide seamless and comprehensive student-service delivery.

Student success is fostered by excellent services, such as housing, health, safety, leadership development and recreation. We will enhance those services through coordinated implementation of the master plans from University Health Services, UW Police Department, University Housing, Recreational Sports, Enrollment Management, Wisconsin Unions and the Student Activities Center.

Goal 2: Increase need-based financial aid to students.

As tuition increases, and as much of our financial aid money continues to be distributed on a merit basis, many students' demonstrated need is not met by their financial-aid packages. As a result, UWâ€"Madison is becoming increasingly inaccessible to lower-income families. We will increase the percentage of gift aid within financial-aid packages, resulting in aid awards that meet undergraduate students' demonstrated financial need.

Goal 3: Engage parents in supporting student success.

Our students' parents are becoming increasingly involved in the academic and social decisions their students make. We will seek to provide the services and resources that parents expect, and helpful venues for engagement, while encouraging the development of students into independent adults.

Employees

Goal 1: Develop leaders.

Our distributed organization relies on leadership at many levels, including department chairs, center directors, principal investigators and administrative leaders. We are enhancing our work environment by developing leaders and enhancing accountability.

Goal 2: Recruit and retain excellent and diverse faculty and staff.

UW–Madison's success in carrying out its mission and serving the needs of the state are dependent on attracting and retaining excellent and diverse faculty and staff. To succeed in an increasingly competitive environment, we will improve our recruiting expertise, seek domestic-partner benefits, foster family-friendly policies and practices, promote peer networking and mentoring opportunities, and create a student-to-employee pipeline.

Climate and Diversity

Goal 1: Build into diversity and climate programs.

It would be irresponsible to request funding from either the state or private sources without evidence of program success. We are building assessment processes into our programs and bringing together program directors to compare methods and results. We will provide training and discussion opportunities to improve workplace and classroom climate.

Goal 2: Develop long-term fiscal stability in diversity and climate programs.

Diversity pipeline and academic support programs have led to more enrolled students of color, and better retention and graduation rates. Climate programs are ready to grow beyond pilots and bridge funding. These programs are essential to sustaining and attracting diversity. We will develop a comprehensive plan for future funding to sustain the growth and success of these programs.

Professional Development

Goal 1: Implement a competency-based system for leadership development.

We are building a professional development culture where ongoing learning for all staff and faculty is expected and supported. We are creating an interactive Web site to assess leadership knowledge, skills and abilities, and to guide the creation of a personalized Integrated Development Plan.

Goal 2: Articulate expectations of leaders and build them into development and evaluation processes.

By increasing the capacity and competence of leaders and managers, we can improve workplace climate, leading to a more satisfied (and retained) workforce. We will articulate expectations of leaders and build those expectations into development and evaluation systems.

Enhance our resources and their strategic use

Goal 1: Enhance our resources and their strategic use.

As the proportion of state funding has declined during the past decade, we have actively developed

approaches for maximizing the use of the resources we do have, and for sustaining and increasing resources from alternative sources. We will continue these efforts in many ways, including using the power of information technology, conserving energy, improving campus processes, forming industry partnerships, and pursuing patent and licensing opportunities.

APPENDIX 5
Our Strategic Planning Process

First and foremost, Wisconsin Sea Grant's 2010-14 Strategic Plan is structured in accordance with the National Sea Grant College Program 2009-13 Strategic Plan. The national Sea Grant strategic plan provides a guide for the work of the state Sea Grant programs. Each university program then develops its own strategic plan for contributing to the realization of national goals, while reflecting the specific needs and priorities of its state and region.

The UW Sea Grant strategic plan also addresses the institutional goals and priorities of the University of Wisconsin-Madison's strategic plan. By combining the strategic goals and priorities of the national Sea Grant network with those of our parent institution, our strategic plan thus provides a highly relevant basic blueprint for UW Sea Grant research, outreach, education and program administration.

Built on this foundation, our strategic planning process is a bottom-up process in which our program priorities undergo review and updates every two years in connection with preparing our biennial Request for Proposals, and the entire plan is reviewed and updated every four years in connection with developing the program's core Advisory Services, Communications and Education work plans for the next four years.

This process begins with a review of our existing plan by our Advisory Committee on Outreach and Education. This is followed by a needs assessment conducted by our six Advisory Services specialists, who serve as the primary mechanism for identifying the research, outreach and education needs of local resource managers, users and other constituent groups, which are then communicated to program managers. The specialists survey the constituents of their respective coastal service areas for new or emerging priorities in each focus area and also take into account the strategic priorities of various local, state, regional and federal Great Lakes resource managers with whom they work. Program priorities are also developed through conference calls and meetings with key user groups as well as forums and workshops with other stakeholders.

The first draft of our strategic plan is then circulated for comment to a distribution list of more than 900 individuals statewide, including representatives of local, state and regional constituent groups; city, county, state and federal government officials; past and present UW Sea Grant principal investigators, and research scientists and research administrators at public and private colleges and universities throughout the state. It is also posted on the UW Sea Grant Web site for public comment. All comments received are compiled and reviewed by program management, after which the Wisconsin priorities under each national theme are revised to incorporate suggested deletions, revisions and additions.

The final draft is then presented to the UW Sea Grant Advisory Council and Advisory Committee on Outreach and Education for their review and approval. Representing other units of the UW System,

state and local government, industry, and the public, these two advisory bodies represent a wide range of viewpoints and help ensure the program's accountability to faculty, staff and constituents statewide. These advisory bodies, along with UW Sea Grant staff, are also actively involved in helping program managers identify special research opportunities and new research talent.

Although our strategic plan is built with a five-year horizon, near-term priorities are regularly adjusted based on the continual feedback and input we receive from our many constituents both directly and via our advisory bodies and outreach specialists in aquaculture, aquatic invasive species, coastal engineering, marine and aquatic science education, fisheries, geographic information systems, habitat restoration, water quality and water safety.

Revised and updated in this manner on a continuing basis, the UW Sea Grant Institute strategic plan is thus a working document that is constantly evolving. This keeps the Wisconsin Sea Grant program flexible, innovative and responsive, enabling it to adapt relatively quickly to meet changing situations and take advantage of new opportunities. This continual strategic planning process helps guarantee that UW Sea Grant is national issues-oriented, constituent priorities-driven and fully integrated program that serves the goals and priorities of our state, university and nation.