

UNIVERSITY OF MINNESOTA SEA GRANT COLLEGE PROGRAM
STRATEGIC PLAN 2009–2013



“Superior Science for You”



UNIVERSITY OF MINNESOTA

Minnesota Sea Grant College Program

*2305 East 5th Street
Duluth, MN 55812-1445*

218-726-8106

Fax: 218-726-6556

<http://www.seagrants.umn.edu>

15 October 2008

Dr. Leon Cammen
Director, National Sea Grant Office
NOAA/Sea Grant, R/SG
1315 East-West Highway
SSMC-3, Eleventh Floor
Silver Spring, MD 20910

Dear Dr. Cammen:

Accompanying this letter please find a copy of the Strategic Plan developed and submitted by the Minnesota Sea Grant College Program to fulfill its requirements to submit such materials.

It will be obvious to you upon perusal of our plan that we appreciated the guidance given to us via the strategic plan developed through your office. While certainly different from the previous plan outline that relied on thematic areas, the new format for the National Strategic Plan has provided us with an opportunity to take a fresh look at how Minnesota Sea Grant conducts itself to achieve its mission.

I congratulate my entire staff for their active participation and significant contributions to the final version of this plan. They took their role seriously and, as a result, I believe we have achieved the desired outcome of having a document that helps both the National Sea Grant Office and Minnesota Sea Grant in achieving their mutually inter-dependent goals and objectives for program success.

Your office should be congratulated as well for providing guidance and a new direction for the future of Sea Grant.

Please let me know if you have any comments regarding our strategic plan. Thank you for your continuing support for our program.

Sincerely,



Stephen A. Bortone, Ph.D.
Director, Minnesota Sea Grant College Program

MINNESOTA IN CONTEXT

Minnesota Sea Grant has offices near the port of Duluth-Superior. Even though this port lies 1,500 miles from the open ocean and operates only nine months out of the year, it is one of the most active by tonnage in the United States. The port spans the Minnesota-Wisconsin state boundary and opens into Lake Superior, a body of water that is so expansive it holds 10% of the Earth's fresh surface water and qualifies as an inland sea.

Lake Superior modifies weather, develops rip currents, supports fishing and maritime industries, and has held the attention and support of the National Oceanic and Atmospheric Administration (NOAA) Sea Grant Program for over 30 years. One-hundred-ninety miles of Lake Superior coastline warrants a Sea Grant program in Minnesota, but Lake Superior is not the states, nor Minnesota Sea Grant's, only conduit to the open ocean.

The Mississippi River trickles out of Lake Itasca near the middle of Minnesota. By the time it bisects the state's Minneapolis/St. Paul population center; it is large enough to float barges. It inspired the flour dynasties of Pillsbury and General Mills and the fortunes of other businesses reliant on hydropower and waterborne transportation. By the time it touches salt water, the river is carrying a potent nutrient load that contributes to the anoxic "dead zone" in the Gulf of Mexico. Some of these nutrients can be traced back 2,300 miles to Minnesota farming practices.

In Minnesota, Lake Superior and the Mississippi River must share the limelight with the state's plethora of lakes (Minnesota license plates carry a "10,000 lakes" motto, but there are at least 1,500 more). For every \$2 that NOAA allocates for Minnesota Sea Grant, the state provides \$1 with the expectation that the program's reach will include all of the state's aquatic resources. So, although Minnesota Sea Grant focuses much of its research and outreach on Lake Superior, notable effort is also spent on aquatic challenges elsewhere in the state.

Lake Superior

A product of volcanic fury and glacial scouring, Lake Superior is a 10,000-year-old puddle compared to some of the ancient lakes that covered parts of North America's Upper Midwest. Still, it's a whopper of a puddle, the largest potable lake by surface area in the world. Lake Superior contains over half of the water in the Laurentian Great Lakes, a quantity that translates into three quadrillion (3×10^{15}) gallons. For the last century, people in thirstier areas of the country, and the globe, have made various (and so far unsuccessful) attempts to claim some of this water for their own.

Humans began visiting the watershed as the last glacier retreated over 7,000 years ago. Four thousand years later, people of the Woodland Culture settled along Superior's shores. They were replaced by the Dakota, who were in turn replaced by Ojibwa tribes. Historians believe French explorers touched Lake Superior in 1623. Britain claimed the area in 1783 but lost most of it to the newly formed United States of America 20 years

later, at the end of the Revolutionary War. The U.S. and Canada share the lake and its basin, which they govern in coordination with Minnesota, Wisconsin, Michigan, Ontario, and First Nation and Native American Ojibwa. Of the roughly 670,000 people living within the Lake Superior watershed, most reside along western shores in Duluth, Minnesota; Superior, Wisconsin; and Thunder Bay, Ontario.

Despite the lake's size, Lake Superior's watershed is relatively small, spanning 491,300 predominantly forested square miles. The coastal communities around Lake Superior are historically dependant on resource extraction (timber, iron, fisheries) and transportation (shipping, railroad), and more recently on tourism. The economic outlook for Minnesota's Lake Superior region is promising, despite less rosy predictions being made for most of the U.S. The tonnage moved through the Duluth-Superior Harbor has increased since 2005, and its value has soared; in two years, the price of iron-producing rock (taconite) doubled, and grain prices almost tripled. Iron Range expansion and construction projects mean that taconite, a major export of the region, will be an even bigger facet of northern Minnesota's economy over the next decade.

High-value wind generator components are passing through the port with increasing frequency. Also, commercial and recreational fisheries generate over \$100 million of economic activity around Lake Superior. The region attracts about 10% of Minnesota's tourist traffic, which translates into over one billion dollars-worth of spending along Minnesota's North Shore. Economic indicators suggest this figure will continue to grow.

Lake Superior's communities face challenges common to coastal communities elsewhere; however, their ecological bent and modest size make them a litmus test for integrating concepts such as conservation design, green ports, and aquatic invasive species education into society. Keeping Lake Superior clean is important since waterborne contaminants flowing from Lake Superior contribute to the pollution levels in the other Great Lakes. In fact, the International Joint Commission's zero-discharge program for nine persistent toxic substances in the Great Lakes is being piloted on Lake Superior for this and other reasons.

Jokingly called a "distilled-water ice bath," Lake Superior is clear, cold, and viewed as a model for fisheries restoration, contaminant research, and climate change monitoring. The Lake Superior Basin has a relatively simple ecosystem and is comparatively free from urban development. As such, it serves not only as the headwaters of the Great Lakes but also as a benchmark for understanding and evaluating the rest of the system. Lake Superior is playing an important role as a testing ground for interdisciplinary research and the application of science to policy to management decisions.

Across the State

Minnesota's thousands of lakes range across three biomes: prairie grassland, coniferous forest, and deciduous forest. The lakes' surroundings range from wilderness to urbanized, and their clarity from see-through to algal soup. The number and variability of Minnesota lakes makes research comparisons meaningful, particularly for questions about the methylation of mercury, climate change, and water quality. Their number also helps

make Minnesota's aquaculture industry possible. The industry produces over three million pounds of food, sport, and baitfish each year.

Inland aquatic areas of national and international interest include the lakes of Voyager's National Park and the Boundary Waters Canoe Area Wilderness. Also, aside from the Mississippi, Minnesota encompasses all or part of the headwaters of major North American rivers, including the Minnesota, Red, St. Croix, St. Louis, and Rainy.

Minnesota is a paragon of environmental progress compared to many other states, especially because of its air and water quality achievements. Most Minnesotans (60%) live in the Twin Cities metropolitan of Minneapolis/St. Paul, which is lauded as one of the most literate urban areas in the U.S. Historically, Minnesotans turn to the outdoors for recreational activities and continue to hold a progressive environmental ethic. With over 828,000 registered watercrafts, Minnesota ranks the fourth "boatiest" state in the nation, despite ranking twenty-first in population. About 19% of state residents fish, and over 28.6 million people visit Minnesota each year, of which about a third purchase fishing licenses.

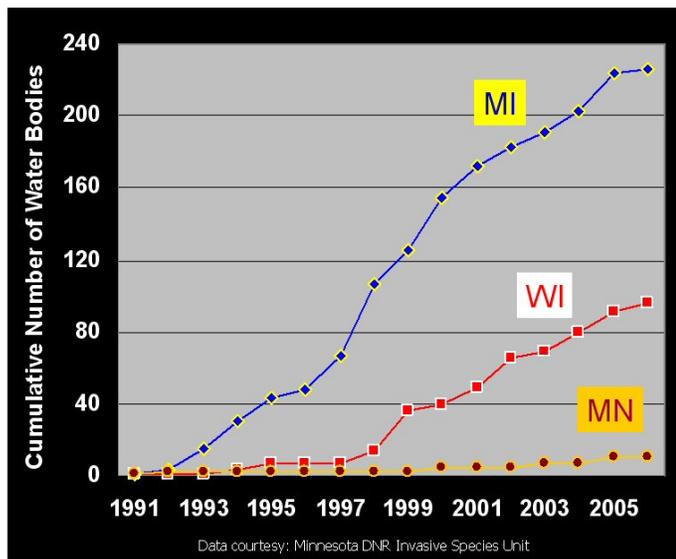
As an example of the way Minnesota invests in its aquatic resources, the state and its partners have worked with recreational boaters and anglers, and aquaculture facilities, encouraging them to act in ways that will prevent the spread of aquatic invasive species. It is not accidental that Minnesota has far fewer zebra mussel infestations than other neighboring Great Lakes states (see figure).

Sea Grant in Minnesota

As evidenced in the heart of this strategic planning document, Minnesota Sea Grant expects to capitalize on a blend of momentum and agility. By embracing tested methodologies and emerging opportunities, we will continue to construct a sturdy framework for sustaining coastal ecosystems and economies.

We are dedicated to providing scientific support for Minnesota's aquatic resources and their related economies. We partner with universities, federal and state agencies, the public, nonprofits, and industry to understand the complexity of environmental challenges such as sustainability, pollution control, and climate change. We then endeavor to help create innovative ways to confront such challenges.

Comparison of New AIS Infestations



Seeking a deeper understanding of environmental systems and societal potential for adapting to new information and new conditions in the Great Lakes, we are breaking ground in areas that include genetic engineering, persistent environmental toxins, endocrine-disrupting compounds in wastewater, and pheromone control of invasive fish. Using environmental psychology, social marketing, and business expertise, we continue to push science-based information into mainstream planning, particularly in port and other coastal community initiatives.

In 2008, Minnesota Sea Grant issued a special request for proposals for one-year research projects. This one-year, rather than two-year, time frame enables Minnesota Sea Grant to synchronize its funding cycle with that of Wisconsin Sea Grant. The hope is to create synergy between Lake Superior researchers and their expertise, to capitalize on the newly opened Freshwater Ballast Water Treatment Testing Facility, and to help answer questions such as, "What's eating the metal in the Duluth-Superior Harbor at an accelerated rate?"

Athelstan Spilhaus, former dean of the University of Minnesota's Institute of Technology, initiated the idea for Sea Grant in the early 1960's. We are proud of this legacy and continue to build on his pioneering vision through the education, research, and outreach strengths of Minnesota's universities. Our transfer of Great Lakes information to inland waters has demonstrated the responsiveness and relevance of Sea Grant to many non-Sea Grant states. Additionally, our collaborations within the Great Lakes Sea Grant Network and beyond have been recognized as extensive and important; one indication of this is President Bush's nod to Minnesota Sea Grant activities in his response to the Ocean Commission's *An Ocean Blueprint for the 21st Century*. We are excited about our plans for the next five years and look forward to the ways they will contribute to the betterment of our aquatic resources and economies.

THE ESSENCE OF SEA GRANT

Sea Grant was created almost 40 years ago to unite the academic power of the nation's universities with diverse groups from the public and private sectors. Leveraging broad partnerships, Sea Grant provides integrated research, outreach, and education programs aimed at creating tangible benefits for ocean and coastal environments and communities. As a division of NOAA, Sea Grant engages the resources of governments, universities, and citizens living and working in America's coastal and Great Lakes states to respond to problems and opportunities in these complex and dynamic environments.

Sea Grant is a network comprised of the National Sea Grant Office, 30 university-based state programs, the National Review Panel, a National Law Center, a National Sea Grant Library, and hundreds of participating institutions. This network enables NOAA and the nation to harness the best science, technology, and human expertise to balance human and environmental needs in coastal communities and in the oceans. Sea Grant's alliance with major research universities provides access to more than 3,000 scientists, outreach specialists, educators, and students. Sea Grant's university-based programs are important incubators for developing the scientists and managers needed to conduct research and to

guide the responsible use and conservation of coastal and ocean resources in the future. With its strong research capabilities, local knowledge, and on-the-ground workforce, Sea Grant offers NOAA and the nation an unmatched ability to identify and capitalize on opportunities and generate practical solutions to real problems in real places.

Sea Grant is required to match every \$2 of federal funding with \$1 of non-federal funds; many state programs, including Minnesota Sea Grant, often have exceeded this match. By leveraging additional money, Sea Grant expands the reach and effectiveness of NOAA and other partners in planning for and managing the future of America's ocean, coastal, and Great Lakes communities, resources, and economies.

SEA GRANT IN NOAA

The goals and strategies outlined in this plan include a wide range of NOAA's priorities: promoting the health of coastal ecosystems; increasing the accessibility and application of quality research to support wise decision-making; increasing the number of fish stocks managed at sustainable levels; and expanding coastal population literacy about coastal ecosystems.

The urgent need for practical solutions to coastal problems requires coordination, cooperation, partnerships, and effective investment. Sea Grant provides NOAA with access to Sea Grant's university-based capabilities to achieve shared goals. The National Marine Fisheries Service-Sea Grant Joint Graduate Fellowship, with its programs in population dynamics and marine resource economics and fisheries extension enhancement, is just one example of the importance and effectiveness of this partnership. Sea Grant also works closely with National Ocean Service coastal programs to set national priorities for coastal management and to ensure closer coordination of coastal activities. Numerous partnerships exist between Sea Grant and the National Weather Service on subjects such as climate change, ocean and coastal observing, and rip currents.

NOAA's coastal programs, which include the Coastal Services Center, the Office of Ocean and Coastal Resource Management, the National Centers for Coastal Ocean Science, and Sea Grant, are working to integrate their efforts more effectively. The purpose of this collaborative planning is to ensure that the individual NOAA coastal programs are focused on national priorities and that their work is coordinated, outcome oriented, and built around each program's strengths in ways that avoid duplication. The short-term goal is to collaborate on strategic planning, budgeting, and implementation. The long-range goal is to develop a joint coastal strategic plan that articulates agreed upon priorities, functional responsibilities, outcomes, and metrics. Two of the focus areas of this plan, coastal development and coastal community resiliency, are designed to advance these integration efforts.

MINNESOTA SEA GRANT IN CONTEXT

Minnesota Sea Grant is a state-federal partnership funded by NOAA and the University of Minnesota. Within NOAA, we are funded through the National Sea Grant College Program. As a statewide program, we fund and conduct research, outreach, and training in fields of aquatic study.

As part of NOAA and the National Sea Grant College Program, Minnesota Sea Grant's overall structure and direction derives from the intent of the Sea Grant founding legislation and reauthorization, calling for education, training, and research in all fields of aquatic study. The specifics of the Minnesota Sea Grant strategic plan were developed in accordance with national priorities and through a variety of other strategic planning initiatives. Below are offered the vision and mission statements of NOAA and the National Sea Grant College Program as these serve as guides to the overall development of Minnesota's vision and mission.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION'S VISION AND MISSION

NOAA envisions 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.

NOAA's mission is 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.

NATIONAL SEA GRANT COLLEGE PROGRAM'S VISION AND MISSION

The National Sea Grant College Program envisions a future where people live along our coasts in harmony with the natural resources that attracted and sustain them. This is a vision of coastal America where we use our natural resources in ways that capture the economic and recreational benefits they offer, while preserving their quality and abundance for future generations.

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

MINNESOTA SEA GRANT'S VISION AND MISSION

The Minnesota Sea Grant College Program's vision and mission statements encapsulate regionally important aspects of both NOAA's and the National Sea Grant College Program's statements. Rewritten and edited during the past year with the assistance of the

Minnesota Sea Grant's staff and advisory committee, Minnesota Sea Grant's vision and mission statements are as follows:

The Minnesota Sea Grant College Program envisions a future where its citizens use a science-based understanding of the environment to address issues concerning Lake Superior and Minnesota's aquatic resources and associated economies.

Minnesota Sea Grant's mission is to facilitate interaction among the public and scientists to enhance communities, the environment, and economies along Lake Superior and Minnesota's inland waters by identifying information needs, fostering research, and communicating results. More succinctly stated – Superior Science for You.

By streamlining our vision and mission statements we more clearly relate our intentions, goals, and objectives to the larger public of Minnesota. These statements serve as the cornerstone of the strategic plan presented here.

We take our state and national mandates seriously, focusing on Minnesota's inland aquatic resources as well as on Lake Superior. We look to Lake Superior research and outreach needs as our primary program guidance, but actively pursue opportunities to apply our findings and programs to inland aquatic resource issues as well. Many of our outreach and research results have national and international implications. For example, we have extended outreach programs on invasive species to states along the Mississippi River and in the West. Web sites we created have garnered large national and international audiences. In addition, our biotechnology, aquaculture, water quality and recreation/tourism programs have resonated with inland as well as Great Lakes audiences, receiving multi-state, national and international attention. We take care not to duplicate what other agencies do, particularly with regard to inland waters.

Environmental and economic sustainability are often perceived as potentially conflicting goals. Specialists working in isolation from one another often fail to understand the links between human and natural resources. This lack of integration among various disciplines to solve problems results in inadequate ecosystem stewardship. A goal of the Minnesota Sea Grant program is to encourage multidisciplinary, integrated solutions that incorporate science with economic, societal, and political concerns.

External Factors

To function within the unique historical, economic, and environmental characteristics of Minnesota, it is necessary to acknowledge factors external to our program that help direct our strategic plan. These include:

1. Conflicts between environmental and economic sustainability
2. Lack of understanding of the links between human and natural resources
3. Challenges in integrating disciplines to solve problems
4. A need to catalyze partnerships, awareness, and cooperation among organizations to improve ecosystem stewardship
5. Lack of application of the best technology to solve problems

Internal Factors

Additionally, our program has Minnesota-specific internal factors that should be acknowledged as giving direction to our strategic plan. These include:

1. State and Federal mandates
2. A priority to address Lake Superior issues
3. Inland water resource issues that require attention
4. The national and international expertise of our staff
5. A need to avoid duplication of effort, especially for inland waters
6. Financial constraints due to budget allocation
7. A capacity to address quickly emerging and immediate response issues

Values

Lastly, Minnesota Sea Grant has values that inspire the program's achievements. These values include commitments to:

1. Collaborations with partners to build community cooperation
2. A commitment to use multi-disciplinary approaches
3. Encouragement to use science in decision making
4. A responsiveness to inquiries with timeliness, conciseness, and accuracy
5. Generate results that are meaningful to the public
6. Incorporate social science methods to evaluate behaviors and attitudes
7. Encourage environmental stewardship
8. Pursue opportunities to increase environmental awareness and sustainability

THE MINNESOTA SEA GRANT PROGRAM – A DESCRIPTION

Administration

Our administrative program works to maintain and enhance our Sea Grant program and further the goals of sustainable coastal communities by encouraging innovative research, outreach, and education programs. We do this through quality programmatic and administrative leadership, integrated programming, rigorous peer review of research proposals, strong links among Sea Grant, government, non-government and industry professionals, and a quality advisory process to guide our program direction and development.

Disciplines

There are two major disciplines within Minnesota Sea Grant – research and outreach (including its sub-disciplines of extension, education, and communication). The foundation for these disciplines is based on practical need and function.

Research

Minnesota Sea Grant determines critical research directions through facilitated, priority-setting meetings with our advisory committee, as well as exploratory meetings with the university research communities and input from Minnesota citizens and stakeholders. We encourage university faculty to develop collaborative relationships with other academic institutions within and outside of Minnesota, resource management agencies, and

industries in developing their proposals. We expect each research project to include an outreach component and encourage research that addresses outreach needs.

Research proposals are reviewed for scientific merit by peers drawn from universities and agencies outside Minnesota. Reviews and proposals are then critiqued by a panel of scientific experts, also from outside the state. Highly-rated proposals are reviewed for relevance to current research and management needs by the Minnesota Sea Grant advisory committee. Scientifically rigorous research proposals considered most appropriate to our programmatic goals are supported within our omnibus program, contingent upon available funding.

Outreach

Outreach staff members work with researchers to ensure that outreach activities are built into research projects funded through our program. Staff also seeks peer reviewers for research proposals and provides valuable input on possible ways to connect research to coastal community needs. Biennially, we conducted staff retreats to review our strategic plan. We also consult our advisory committee, asking them for evaluations and recommendations for incorporating their ideas into our work plans. Staff retreats continue to facilitate our program management, and their results are reflected in this strategic plan.

Our outreach has three subsets: extension, communication and education. Here they are separated to provide an overview. In practice, the subsets overlap through shared ideas, methods, and objectives.

Extension

Our extension program conducts and evaluates programming within our focus areas to engage in local resource management problems and increase awareness of coastal resource opportunities, conflicts, and decisions. Through such activities as facilitating meetings, organizing symposiums, and conducting outreach projects, our goal is to advance the quality of life of Minnesota's citizens by enhancing Minnesota's environment and economy. Extension plays an active role as a liaison between clientele groups and the research community, alerting researchers to community needs and helping bring university research to the public. We strive to use new technologies in an effective and efficient manner to accomplish our mission and goals.

Communication

Minnesota Sea Grant uses strategic communication methods to help build and maintain long-term, mutually beneficial relationships with key constituencies. We do this by using the mass media, the World Wide Web, our "Seiche" newsletter, seminars, and event booths to disseminate research results and educational messages, and to develop interest in our program. We also develop marketing plans for our messages, products, and materials to ensure these reach their targeted audiences.

Education

Sea Grant has become a training ground for skilled researchers and outreach experts in the Great Lakes and Marine Science sub-disciplines. Sea Grant recruits, trains, and

employs graduate students, fellows, postdoctoral students, senior researchers, and professionals, helping to build a national "brain trust" to address economic and environmental challenges and opportunities in the coastal arena. Minnesota Sea Grant also remains committed to K-12 education, primarily through teacher training and developing educational resources to ensure that teachers have access to scientifically-sound information regarding coastal economic and environmental issues.

Minnesota Sea Grant Clientele and Stakeholders

Advisory Committee

We continue to cultivate a diverse advisory committee to guide our program. The committee helps us identify coastal resource issues, review research proposals for relevance to local needs, and assists us in disseminating research and outreach results back to the community. The committee is made up of a dozen leaders representing government, businesses, agencies, academia, and other Sea Grant audiences. Their three-year terms are staggered so that one-third of the committee is replaced or re-appointed every year. This allows the committee to become reinvigorated with ideas from new members, while maintaining stability and institutional continuity.

Annually, we ask the advisory committee to identify Great Lakes coastal and Minnesota water resource-related issues that could be aided by research and/or outreach. Issues identified by the advisory committee are compiled, categorized, combined with NOAA's National Sea Grant priorities, and used to help us structure our approach to achieving the three cross-cutting goals within each of four Focus Areas identified in NOAA's National Sea Grant strategic plan. The expertise of Minnesota Sea Grant clientele and our cooperators are drawn upon to help set programmatic priorities for each two-year proposal cycle. This document is, in large part, a culmination of those interactions.

Research Community

We periodically meet with university researchers to exchange information. These meetings can take place between individuals or through more formal events where Minnesota Sea Grant's director or staff presents a seminar and meets with interested faculty. This process was instituted to engage researchers at all university campuses, to attract new faculty, to inform researchers of Sea Grant-related funding opportunities both in our state and nationally, and to seek their expertise in identifying research priorities. At these gatherings, we typically provide a research update from a recently completed or ongoing project. We then engage the research community in a facilitated discussion to discover emerging issues, relevant technologies, and research needs. We also help familiarize new faculty with our Request for Proposals (RFP) process through dissemination of materials such as announcements, invitations for visits, and dialogs.

Clientele Groups

The expertise of Minnesota Sea Grant clientele and cooperators is drawn upon to help set programmatic priorities for each two-year proposal cycle. Outreach staff identifies and communicates with stakeholder groups to help determine priority areas of emphasis, programmatic objectives, and action plans. Staff talks with committees, commissions,

and boards that they serve on or interact with to help determine programmatic priorities. Formal evaluations and surveys seeking information on clientele satisfaction are regularly conducted, and the results are used to polish our products and services. Priority needs collected from these related programs, agencies, and groups are included in this strategic plan. Newsletter reader surveys help keep communication efforts targeted and timely.

Regional Outlook

It has become increasingly important for Sea Grant programs to include a more regional approach to its program activities and strategic planning. Besides efficiency, there are significant gains to be made through cooperative interaction with programs having similar goals, objectives, and desired outcomes – especially given the reasonably consistent bio-geographic province that surrounds all Sea Grant programs concerned with the Great Lakes

Recently Minnesota Sea Grant has increased and broadened its outlook, increased its influence, and strengthened its effectiveness by participating in several joint, regionally-based enterprises. Among these is the Great Lakes Regional Information Network (GLRRIN). This is voluntary network of research oriented agencies and organizations from Canadian and the U.S. that have joined together to develop a more regional approach to problem solving, technological development and extension activities in the Great Lakes.

Additionally, Minnesota Sea Grant was a signee to the GLROC (Great Lakes Research and Outreach Consortium) agreement that was co-signed by representatives from all Great Lakes Sea Grant programs. This agreement facilitates cooperation and interactions among Great Lakes Sea Grant programs, especially with regard to allowing these programs to function as a regional network on grants and contracts that affect more than one program.

These are just two of many other initiatives in which Minnesota Sea Grant actively participates to increase its effectiveness a the regional level within the Great Lakes.

MINNESOTA SEA GRANT'S STRATEGIC APPROACH

We view our strategic plan as a multifaceted guide reflecting the circumstances and conditions we expect to face over the next five years. Our current strengths and activities give this plan its momentum. Based on expertise and experience we can successfully apply our tightening resources toward the problems, conditions, and situations identified within this plan. Providing direction to our efforts, this strategic plan points towards bold goals that are achievable through our skill at funding research and our rapport with academia and a broad array of stakeholders. In concert with research, our varied outreach efforts will assure that Minnesota will have an informed citizenry.

This strategic plan documents the direction of Minnesota Sea Grants activities and intentions from 2009-2013. The plan builds on the unique capacities and strengths of the Minnesota Sea Grant staff to address national, regional, and state-based needs in coastal

and ocean environments, allows for flexibility and creativity on the part of existing staff (including its skills, expertise, and ideas), and supports attaining the goals within the focus areas in National Sea Grant's strategic plan.

One regional issue, climate change, warrants special attention. We developed a Climate Change Initiative, which is included in the appendix of this document. Our goal with the initiative is to provide scientifically sound information to the public and serve as an information source to communities regarding regional climate change.

The four focus areas and three cross-cutting goals that emerged from the strategic planning process of the National Sea Grant Office are easily transferable to the circumstances and conditions found in Minnesota. These goals and focus areas reflect America's most urgent needs in the ocean and coastal arenas, NOAA priorities, and the strengths and core values of Sea Grant.

Focus Areas

We adopted the outline of the National Sea Grant Office's strategic plan to create our own with respect to Minnesota waters, shores, and its citizens' varied environmental, social and economic interests. Focus areas serve to crystallize and energize our response to significant issues brought forth by our stakeholders. Using the National Sea Grant Office's focus areas allows a broader perspective and more imaginative approach toward addressing problems identified as pertinent to Minnesota's waters and shores. These focus areas resonate with NOAA's mission, are consistent with the work of the NOAA coastal program integration effort, and are areas in which Sea Grant has made and is positioned to make substantial contributions. With reference to Minnesota's aquatic environs, we describe the four *Focus Areas*:

- I. Healthy Coastal Ecosystems,
- II. Sustainable Coastal Development,
- III. Safe and Sustainable Seafood Supply, and
- IV. Coastal Community Resilience

Cross-Cutting Goals

Second, within each focus area we address three *Cross-Cutting Goals*. Sea Grant has identified goals it will pursue and strategies designed to take advantage of its strengths in integrated research, outreach, education capabilities, and an established presence in coastal communities. Understanding relationships and synergies across focus areas is vital to achieving the goals expressed in this plan. Complementary or supportive activities within Minnesota Sea Grant's efforts toward leveraging partnerships will be central in achieving the objectives outlined in this plan. The cross-cutting goals described in the National Sea Grant Office's strategic plan and applied here are:

- A. Scientific Understanding – Scientific information to advance understanding of the nature and value of our coastal, ocean, and 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.
- B. An Informed Citizenry – An informed public that understands the value

and vulnerability of coastal, ocean, 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.

- C. Integrated Management Decisions – Decision-making processes that involve the full-range of coastal interests, which integrate efforts of public and private partners at the federal, regional, state, and local levels, and provide mechanisms for establishing common understandings and generating outcomes that balance multiple interests.

Lastly, we parse each cross-cutting goal by way of strategic initiatives that we have organized under the term *Disciplines*, consisting of two major types: research and outreach (including its three subsets: extension, education, and communication).

FOCUS AREAS

I. HEALTHY COASTAL ECOSYSTEMS

Healthy coastal ecosystems are the foundation for life along the coast, but increasingly rapid development, overfishing, and other human activities are leading to water quality degradation, decline of fisheries, wetlands loss, proliferation of invasive species, and other challenges that need to be understood in order to restore and maintain coastal ecosystems. Responsible management of ecosystems requires new kinds of thinking and actions. Sea Grant is a leader in regional approaches to understanding and maintaining healthy ecosystems, with planning efforts underway across the country to identify information gaps, set research priorities, and coordinate information and technology transfer to those who need it. It has fostered efforts to address widespread problems such as invasive species and harmful algal blooms that are found in geographically dispersed areas and has hired staff, shared among several state programs, to tackle these problems. Sea Grant's regional consortia, nationwide networks, and international contacts are particularly suited to helping the nation address ecosystem health at the appropriate local, state, regional, national, and global levels. In particular, Minnesota Sea Grant provides specialized expertise to University of Minnesota Extension and participates in extension research.

Lake Superior is the largest, deepest, coldest, clearest, and in many ways the most pristine of all the waters of the Great Lakes system. Minnesota flanks Lake Superior's western shores and, along with Minnesota Sea Grant, the state's government recognizes the economic and ecological importance of the lake. Minnesota Sea Grant concentrates on Lake Superior and the Lake Superior watershed. Nevertheless, the program also applies effort toward maintaining the health of Minnesota's other natural waters including lakes, wetlands, rivers, and streams. The Mississippi River has its headwaters in the state so Minnesota Sea Grant views the stewardship of this fluvial resource as a national obligation.

Since ecosystem stresses do not adhere to political boundaries, Minnesota Sea Grant values partnerships with geographic neighbors including contiguous states, states that border the Great Lakes, and Canadian provinces.

Given the importance of Minnesota’s waters to the residents and visitors of Minnesota and the prominence that Lake Superior and the Mississippi River play in the greater economy of the United States, Minnesota Sea Grant is devoted to the functional well-being of Minnesota's waters. Changes to these aquatic biotopes can have long-term and far-reaching effects in Minnesota as well as a significant effect on the United States, Canada, and in the Gulf of Mexico. Minnesota Sea Grant seeks to discover new information and disseminate information relative to the status and trends of the ecosystem functions of the aquatic environment. Monitoring, assessing, and investigating causes and effects of stressors on these biotopes is a critical role that Minnesota Sea Grant plays in facilitating the stewardship of these resources.

Cross-Cutting Goals

A. Scientific Understanding – Generate scientific information that clarifies how coastal ecosystems function as well as identify and better understand the stressors to allow restoration and/or mitigation solutions.

B. An Informed Citizenry – Provide target audiences with education, outreach, and materials to improve their understanding of ecosystem functions, threats, and predictions that allow informed decisions to protect and restore healthy ecosystems.

C. Integrated Management Decisions – Incorporate coastal ecosystem science into models and other applications to determine and implement management recommendations as well as improve ecosystem protection and restoration.

Overall Focus Area Objective: To create, generate, and disseminate scientific information supporting ecosystem-based approaches to managing the coastal environment in Minnesota.

	OBJECTIVE	RESEARCH	OUTREACH
1	Ecosystem Functions	Examine the function of freshwater ecosystems at multiple trophic levels, with particular reference to interactions that involve aquatic invasive species.	Provide easy public access to information on coastal and aquatic ecosystems via the Internet, newsletters, popular articles, podcasts, etc.
2	Aquatic Ecosystem Literacy	Define effective ways to explain ecosystem health and modeling by identifying audiences and their characteristics (i.e., background, knowledge, motivations, etc.).	Regularly use mass media, strategic marketing, and the classroom to extend messages about current findings in ecosystem research.

3	Modeling	Support modeling efforts that are likely to yield more effective forecasting, management, planning, and restoration.	<p>Explain the need and practical use of models to build public appreciation for modeling's role in modern science.</p> <p>Translate model output into understandable strategies for planners and government agents.</p>
4	Behavior Change	Determine the most effective communication and outreach approaches to achieve lasting attitude and behavior change regarding healthy coastal ecosystems.	Increase public appreciation the aquatic environment as a way to improve ecosystem services in coastal areas and encourage preservation.
5	Sustainability	Investigate how aquatic ecosystem sustainability may be affected by global climate change.	Provide materials and training to a variety of audiences on issues related to coastal sustainability and processes.
6	Information Gaps	<p>Identify and help fill data gaps that will provide a clearer understanding of aquatic and coastal ecosystems, and how climate change could affect these resources.</p> <p>Provide critical data for constructing models that achieve better planning for and prediction of restoration actions.</p>	Identify gaps in the public's understanding of ecosystem functioning and work to fill these gaps.
7	Environmental Stressors	Identify stressors (including cumulative environmental factors) on the coastal ecosystem and their level of interaction in influencing coastal ecosystem structure and function.	Increase awareness and sense of responsibility to reduce environmental stress on coastal ecosystem health, both on an individual and community level.
8	Decision Processes	<p>Evaluate the decision-making strategies of various coastal user groups.</p> <p>Establish criteria that allow communities and agencies to evaluate restoration success.</p>	<p>Increase inter-agency and industry cooperation and coordination regarding preservation, management, and restoration activities and effectiveness.</p> <p>Provide support for the use of coastal observing system information in decisions related to coastal sustainability.</p>

II. SUSTAINABLE COASTAL DEVELOPMENT

As the interface between land and water, shorelines serve as the platform for numerous activities (both recreational and commercial) that constitute a way of life for Minnesotans. As development continues along Minnesota's coasts, both river and lake shorelines are at the forefront of changes that Minnesotans see or perceive happening to their coastal habitats. Few Minnesotans understand that economic sustainability requires environmental sustainability, particularly around shorelines where the quality of the environment positively correlates with property values.

Lake Superior continues to inspire development in the coastal communities of Minnesota. Minnesota Sea Grant helps these communities understand the options available to them and the consequences of their decisions on the environment, economy, and society. Today's development patterns set the stage for how community infrastructure will function in the future, as well as help determine a community's resilience to environmental hazards related to climate change and other phenomena.

Changes in Minnesota's coastal communities have transformed landscapes and intensified demand on finite coastal resources. New housing developments and recreation facilities, a new generation of energy development activities, port expansions, and other business activities are affecting coastal lands, water supplies, and traditional ways of life. To balance growing demands on coastal resources, we must develop new policies, institutional capacities, and management approaches to guide the preservation and use of coastal and Great Lakes resources. Minnesota Sea Grant will engage a diverse coastal population in applying the best available scientific knowledge by using its outreach capabilities to support the development of healthy coastal communities that are economically and socially inclusive, encompass varied and vibrant economies, and function within the carrying capacity of their ecosystems.

Cross-Cutting Goals

A. Scientific Understanding – Develop a scientific understanding of the nature, value, and culture of Minnesota's coastal resources so that socio-economic and environmental factors can be evaluated.

B. An Informed Citizenry - Provide citizens, community leaders, and industries with an understanding of the complex inter-relationships between social, economic and environmental values in coastal areas; and work with partners to balance multiple uses and optimize sustainable coastal development.

C. Integrated Management Decisions – Incorporate scientific understanding of the social, economic, and natural environment, predictions, and other applications, to make efficient and appropriate use of land, energy, and water resources that protect the ecological base needed to sustain coastal communities, the environment, and quality of life.

Overall Focus Area Objective: To facilitate conditions allowing communities to thrive and to impart the necessity of protecting and managing coastal resources to sustain cultural, environmental, and economic well-being.

	OBJECTIVE	RESEARCH	OUTREACH
1	Evaluation	Evaluate the status and sustainability of the natural resources along Minnesota's coasts relative to the intensity of use. Evaluate social, economic, and environmental responses to alternative community development plans.	Help coastal communities evaluate infrastructure needs relative to sustaining the region's economic and environmental integrity.
2	Environmental Assessment	Develop methods to assess the value of environmental resources and the effect that community development has on that value.	Increase community awareness of the importance of resource valuation and establishing sustainable economic, agricultural, and environmental practices.
3	Information Gaps	Identify gaps in long-term and short-term data sets that can be used to determine sustainable levels of natural services as they relate to social services along Minnesota's coasts.	Provide information and materials that prompt citizens to take informed, scientifically based actions toward sustainable environments and communities. Provide avenues for researchers and the public to exchange information that fosters sustainable practices in coastal communities.
4	Cumulative Impacts	Quantify cumulative watershed impacts from development, forest management, climate change, and wetland conversion.	Maintain public awareness regarding the threats and stressors to the sustainability of Minnesota's coastal resources.
5	Economic Relationships	Analyze the relationships among water quality, fisheries, and community economic sustainability. Define ways coastal communities could improve their use of materials and resources to stimulate economic and environmental health.	Help coastal communities advance cost-effective management approaches that support diverse and vibrant economies that function within sustainable ecosystems.

6	Community Assistance	Test models that have been and will be used to manage resource use in nearshore, onshore, and offshore developments (i.e., wind farms, marinas, ports), especially with respect to community economic and environmental benefits.	Assist in developing comprehensive community plans, ordinances, incentives, and educational programs designed to achieve community goals that protect Minnesota's aquatic resources. Help decision makers understand the role of local, regional, and statewide plans for sustainable development, and how to develop plans to achieve community goals.
---	----------------------	---	--

III. SAFE AND SUSTAINABLE SEAFOOD SUPPLY

Seafood safety is a growing concern as international trade increases and fish diseases and contamination become bigger problems. Sea Grant has obligations to advance the nation's understanding of fish consumption advisories, the benefits of eating fish, aquatic food synergy, organic labeling, and the risks and benefits of creating genetically modified fish for food and management. Through the use of its research, extension, and education capacities, Sea Grant supports the kind of informed public and private decision-making that will sustain a safe supply of seafood through the next century.

The U.S. has witnessed the decline of many of its major fisheries yet seafood consumption is rising, resulting in a seafood trade deficit of \$8 billion per year, according to U.S. Department of Agriculture Foreign Agricultural Service statistics in a 2005 international trade report. At the same time, Sea Grant, through its research, extension, and education activities and work with partners, has made important discoveries that have aided the stabilization and recovery of many endangered fisheries.

Aquatic foods, derived from both commercial and recreational sources, are paramount in Minnesota's past, present, and future. Lake Superior's relatively pristine waters serve as habitat for a variety of fish stocks that include lake trout, whitefish, salmon, walleye and perch. Other foods directly harvested from Minnesota waters and considered important by the public include crayfish, smelt, cisco, and wild rice.

Maintaining the size, extent, number, and quality of these aquatic food resources is paramount for a sustained, preferred lifestyle for Minnesota's populace. While the condition of these resources is important, the ability of their respective fisheries to handle, transport, prepare, and serve these food items is also crucial. Minnesota Sea Grant seeks to maintain and improve the availability and condition of these resources

According to the NOAA Aquaculture Program, aquaculture is in its infancy in the U.S., amounting to just over \$1 billion of a \$70 billion worldwide industry. Aquaculture

creates opportunities to meet the increased demand for aquatic foods and also the demand for baitfish for the recreational fishing industry. Aquaculture in Minnesota has a baitfish industry that deserves further development and encouragement, but there are also other aquatic resources that deserve attention as well.

Cross-Cutting Goals

A. Scientific Understanding – Develop a sound scientific understanding of factors associated with ecologically and socially sustainable production of safe seafood for human consumption and to supply baitfish and shellfish from commercial harvest, aquaculture, and recreational fisheries.

B. An Informed Citizenry – Inform consumers, industry representatives, and policy makers of the importance of ecosystem health and sustainable harvesting/culture practices to the future of our domestic fisheries and aquaculture production, and educate people about the health benefits and safety issues associated with seafood consumption within a food-synergy approach to nutrition.

C. Integrated into Management Decisions – Incorporate sound scientific understanding, predictions, and risk assessment tools to assist policy and ecosystem-based management decisions and to ensure safe and sustainable fish and shellfish production from commercial harvest, aquaculture, and recreational fisheries.

Overall Focus Area Objective: To assist in generating a sustainable supply of safe foods from aquatic environs for commercial harvest, aquaculture, and recreational fisheries.

	OBJECTIVE	RESEARCH	OUTREACH
1	Sustainable Harvests	<p>Evaluate species' life histories, harvest opportunities, and other attributes important to the sustainable harvest of aquatic foods and recreational fishes from Lake Superior and Minnesota.</p> <p>Assess cost/benefit of harvesting a variety of aquatic foods with a greater emphasis on socio-economic research, environmental impact studies, and other evaluation methods.</p> <p>Investigate better methods of sustainable, low-impact aquaculture for the Great Lakes.</p>	<p>Provide educational resources to citizens related to the sustainable harvest and aquaculture of freshwater seafood.</p> <p>Identify needs related to Lake Superior sustainable fisheries and ecosystem approaches to management, and communicate them to university researchers.</p> <p>Assist in creating and promoting a healthy domestic seafood industry that harvests, produces, processes, and markets seafood responsibly and efficiently.</p>

2	Technology	Facilitate the cooperation among industry, government, and the public to guide the production and use of genetically modified aquatic organisms for food and control of invasive species.	Contribute to a better public awareness regarding the role of biotechnology in fisheries management and aquaculture. Explain the risks and benefits of genetically modified organisms (GMOs) to the public.
3	Management of Aquatic Resources	Develop models to facilitate sustainable management of Lake Superior fisheries that also assess the interactive features of species, populations, communities, and their environment. Facilitate the development of models that will help managers implement plans that account for limits that stressors place on recreational and commercial aquatic natural resources.	Provide Lake Superior fishery managers, anglers, and environmental organizations with research results that assist them in making appropriate management decisions for rehabilitation of native species and sustainable harvest of fish. Provide leadership training for members of fishing and environmental organizations to enhance access to sustainable and safe seafood. Enhance explanations of issues related to the rehabilitation and management of Lake Superior fisheries in an ecosystem context, in cooperation with tribal partners and communities.
4	New Products and Approaches	Assess the feasibility of developing new products (like fish oil from siscowet lake trout) and evaluate marketing approaches to increase the availability and profitability of seafood. Examine public perceptions about the use of genetically modified fish products.	Promote appreciation and understanding of the need for sustainable seafood harvest as well as an ecosystem approach to the management of Lake Superior fisheries. Ensure that coastal citizens, community leaders, and industries recognize the complex relationships between social, economic, and environmental values related to safe and sustainable seafood. Assist agencies to improve cooperation and coordination regarding potential with fishery-related business and

			fisheries management.
5	Food Interactions	Fill information gaps regarding the role of aquatic foods in achieving optimal nutrition and health benefits.	Improve public explanations of the health benefits of eating products from the lower part of the aquatic food chain (algae to herbivorous fish).
6	Climate Change	Improve understanding of how climate change will alter fisheries species composition and productivity in Lake Superior and inland waters.	Improve public understanding of the types and degree of influence climate change has on fisheries.
7	Healthy Populace	Evaluate or assess human health relative to changes in environmental features related to water quality. Determine the safest ways to harvest, process, and prepare freshwater food products to protect human health.	Help citizens better understand the advantages of consuming aquatic-based resources within a food-interaction approach to nutrition. Help citizens better understand the risks associated with eating fish coming from Minnesota waters by standardizing and simplifying consumption guidelines.
8	Aquaculture	Investigate systems for farming baitfish species in Minnesota and the profitability of baitfish farming in an environmentally sustainable manner.	Assist baitfish and other aquaculture industries in Minnesota with outreach and marketing as they explore new markets and sustainable culture techniques.

IV. COASTAL COMMUNITY RESILIENCY

Residents of coastal communities need to understand the risks of living near large waterbodies and learn what they can do to reduce their vulnerability and respond quickly and effectively when hazardous events occur. Sea Grant will use its integrated research, training, and technical assistance capabilities and its presence in coastal communities to help citizens, decision-makers, and industries plan for hazardous events and optimize the ability of their communities to remain physically, economically, and environmentally stable through hazardous conditions.

Large-scale hazards and extreme events can have a devastating effect on coasts and Minnesota's coasts are not immune from these effects. Flooding, droughts, rip currents, pollution (by way of spills or long-term runoff), severe storms, harmful algal blooms, anoxia, seiches, and global climate change, stress both the living and non-living features of coastal areas. Unable to predict the timing, location, or severity of such events much in advance, we can only rely on their inevitability. Each hazard comes with its own range of impacts, and its own temporal and spatial scales of influence.

Minnesota Sea Grant has an obligation to its constituents to relay reliable information about the potential presence and impact of these events and hazards so that people can respond in ways to protect their livelihood and health. Climate change has been identified as an area that requires special attention with regard to informing the public. To meet this need, Minnesota Sea Grant as developed a special Climate Change Initiative that can be found in the Appendix of this document. Planning for the future, assisting with recovery, and minimizing risks are avenues through which Minnesota Sea Grant can help coastal communities remain resilient.

Cross-Cutting Goals

A. Scientific Understanding – Develop a scientific understanding of the widespread risks and risk mitigation strategies associated with living, working, and doing business along Minnesota’s and other Great Lakes’ coasts.

B. An Informed Citizenry – Build community capacity to prepare for, respond to, and recover from hazardous events.

C. Integrated Management Decisions – Incorporate sound scientific understanding, predictions, and other tools into coastal community policy and management decisions related to hazardous events and coastal catastrophes.

Overall Focus Area Objective: To augment community capacity to prepare for, respond to, and recover from hazardous events and coastal catastrophes.

	OBJECTIVE	RESEARCH	OUTREACH
1	Climate Change	Determine ramifications of long-term changes in temperature and weather patterns on stormwater runoff and community infrastructure needs. Evaluate regional responses to climate change and how environmental components, including Lake Superior, are likely to respond.	Implement a climate change initiative that brings information regarding the multiple facets of climate change (see Appendix) to all Minnesotans, communicating how lives, property values, health, and safety will be affected and how to mitigate and adapt to the changes.
2	Stormwater/Runoff	Determine effective ways of relieving excessive runoff due to human activities to aquatic systems.	Facilitate community planning with respect to improved infrastructure to accommodate increasingly intense rain events and associated storm runoff.

3	Reoccurring Events	Construct models to assess the potential effect anticipated stressors (such as climate change) might have on communities subjected to varying environmental conditions.	Provide publicly accessible and timely information on: rip currents and how to escape them; hypothermia and how to avoid it, survive it, and rescue someone; seiches and potential large wave events; harmful algal blooms and the likelihood that these will increase in frequency with climate change, and how to protect children and pets from them.
4	Public Perception	<p>Conduct public perception assessments of outreach efforts by Minnesota Sea Grant and its partners on climate change and stormwater issues.</p> <p>Evaluate the role of public perception in influencing policies and management with respect coastal catastrophes.</p>	Increase public awareness of challenges including: Lake Superior's response to climate change; aquatic invasive species; harmful algal blooms; and pollutants such as mercury, endocrine disruptors, and bio-accumulative compounds.
5	Responses to Risks	Determine the changes governmental units need to make to be prepared for global climate change, including risk evaluation relative to changing weather patterns and their effect on ecosystems, infrastructure, community health, and the economy.	<p>Prepare individuals and communities to respond to both long- and short-term disturbances including seiche events, climate change, and severe but localized storms.</p> <p>Increase understanding by local governments and developers of water quality impacts, erosion rates, and ordinances and coastal building codes to facilitate development planning.</p>

DEVELOPMENT AND IMMEDIATE RESPONSE CAPABILITIES

Sea Grant programs are fortunate to be flexible in their programming to provide funds that encourage the development of new and innovative ideas as well as respond to immediate response circumstances that are largely unpredictable. Minnesota Sea Grant includes here, as part of its strategic plan, the formal recognition of this program-specific feature that makes Sea Grant a unique federal/state cooperative effort.

Minnesota Sea Grant will provide, on an as-needed and on an as-affordable basis, funds to encourage the development of research and outreach projects that meet the overall objectives of its strategic plan. Also on an as-needed and as-affordable basis, our program

will support research and outreach efforts that will provide valuable information regarding the effect and extent of natural hazards and extreme conditions.

This part of our program is meant to be distinct from our traditional grant-cycle program. As part of its development and immediate response capabilities, our program will act to facilitate efforts that meet the overall objectives of our program given the constraints of responsiveness, immediacy, and importance to our overall mission.

ADMINISTRATIVE STRATEGIES

Beyond the strategic plan presented above, it occurs that there are some long-term, goals and objectives that have been identified that give direction to future efforts. Rather than redevelop and entire new set of objectives, we think it valuable to document staff thinking with regard to longer-term initiatives that will give overriding direction to the future of the program. The items listed below are presented to give direction to Minnesota Sea Grant administration as it conducts the strategic plan.

- Develop more shared positions – Minnesota Sea Grant has been fortunate to have developed shared positions to expand its influence, increase its expertise, and meet changing needs. Forming shared positions with partners will be explored as opportunities arise. Minnesota Sea Grant will continue to seek partners with whom we share mutual interests and in which both parties would benefit from shared position associations. Given limitations on budgeting at the federal level, expansion Minnesota Sea Grant’s influence and effectiveness is likely to develop through partnerships.
- Revitalize recreation/tourism expertise within Minnesota Sea Grant – Perhaps the most visible, and one of the most financially valuable assets in Minnesota is the recreation/tourism industry, especially as it pertains to water-related activities. As funds become available, Minnesota Sea Grant will endeavor to reinstate programs that support this important facet of Minnesota’s economic and environmental future.
- Engage new audiences – Minnesota Sea Grant interacts with many groups, but there are others that could benefit from our information and we could benefit from learning their perspectives. We plan to look at our current projects and record the specific audiences they reach. This will help identify audiences and perspectives we may be missing and will help direct future program development.
- Increase Internet capabilities – Many modern stakeholders rely heavily on the Internet for information about environmental and economic sustainability issues. Minnesota Sea Grant’s Internet expertise and capabilities need to be continually updated and evaluated to attain optimal effectiveness in reaching these audiences.
- Develop evaluation techniques – Minnesota Sea Grant can stay efficient and effective in delivering messages and products by having a firm understanding

about how its offerings are being received. While this field is not new to Minnesota Sea Grant, developing more sophisticated and directed evaluations will help the organization.

- Increase Sea Grant's exposure along the North Shore – Major stakeholders for Minnesota Sea Grant services, programs, and information are residents and visitors to the North Shore of Lake Superior. While programs are currently delivered to these stakeholders, the office plans to investigate the need for seasonal or full-time assignment of extension personnel to the North Shore.
- Assess the appropriate mix of state, regional, and national programs with which staff members become involved.
- Examine how Sea Grant relates to other University of Minnesota centers and programs such as:
 - Extension
 - Large Lakes Observatory
 - Natural Resources Research Institute
 - Great Lakes Maritime Research Institute
 - Water Resources Center
 - Institute on the Environment
 - Humphrey Institute
 - Center for Freshwater Research and Policy
- Seek additional funding opportunities.
- Explore options that become available if staff members retire during this planning period
- Increase and expand training/education to meet staff and program needs.
- Expand regional activities to further broaden our interaction with other Great Lakes Sea Grant programs as well as increase interaction with U.S federal and Canadian agencies that have jurisdiction and interests in Lake Superior.

ADVISORY COMMITTEE MEMBERS

Dr. Charles Anderson
Minnesota Department of Natural Resources
St. Paul, Minnesota

Dr. Janet Keough
U.S. Environmental Protection Agency
Duluth, Minnesota

Mr. Keith Hanson
Barr Engineering
Duluth, Minnesota

Ms. Suzanne Hanson
Minnesota Pollution Control Agency
Duluth, Minnesota

Ms. Cindy Marshall Hayden
Lake Superior Magazine
Duluth, Minnesota

Dr. Tim Holst
Research Administration
University of Minnesota
Duluth, Minnesota

Mr. Thomas Huntley
State Representative
Duluth, Minnesota

Ms. Jackie Morris
Congressman James Oberstar
Duluth, Minnesota

Ms. Nancy Schuldt
Fond du Lac Reservation
Cloquet, Minnesota

Mr. Kurt Soderberg
Western Lake Superior Sanitary District - Emeritus
Duluth, Minnesota

Dr. Nelson Thomas
U.S. Environmental Protection Agency - Emeritus
Duluth, Minnesota

STAFF MEMBERS

Name	percent-time	Responsibilities
Dr. Stephen Bortone	65%	Director
Mr. Jeff Gunderson	70% 30%	Associate Director for Outreach Fisheries/Aquaculture Specialist
Dr. Valerie Brady	50%	Research Coordinator
Ms. Marie Zhuikov	100%	Communications Coordinator
Ms. Sharon Moen	75%	Science Writer
Mr. Chris Benson	100%	Communications Designer
Ms. Dee Angradi	50%	Publications Assistant
Ms. Josie Thole (student)	50%	Publications Distribution
Mr. Dale Bergeron	100%	Maritime Extension Educator
Ms. Cindy Hagley	50%	Environmental Quality Educator and Marine Education Specialist
Mr. Doug Jensen	100%	Aquatic Invasive Species Program Coordinator
Dr. Anne Kapuscinski*	25%	Aquaculture and Biotechnology Specialist
Ms. Barb Liukkonen*	50%	Water Quality Educator
Mr. Jesse Schomberg	100%	Coastal Communities Educator
Ms. Judy Zomerfelt	100%	Executive Secretary
Ms. Connie Post*	80%	Senior Accountant
Ms. Debbie Bowen	100%	Information Technology & Business Specialist
Ms. Hannah Fossum (student)	50%	Office Assistant

* Located on the St. Paul campus rather than on the University of Minnesota Duluth campus.

APPENDIX

CLIMATE CHANGE INITIATIVE
Strategic Approach for Addressing Climate in Priority Areas
University of Minnesota Sea Grant Program
2009-2013

Vision - *People and communities in Minnesota and the Lake Superior Basin using information from Sea Grant as they plan for changes in the Earth's climate and adopt practices that reduce the effects of climate change.*

Mission - *To provide scientifically sound information to the public and serve as an information source to communities regarding regional climate change.*

Objectives

External

- To explain the concepts of uncertainty, probability, and risk as they relate to climate science and predictions to lay audiences.
- To share information with residents, businesses, and communities of the Lake Superior Basin about climate change that will raise awareness, encourage discussions, and inspire actions.
- To assist Lake Superior coastal community leaders/policy makers, the Great Lakes maritime industry, and Minnesota universities as they prepare for the consequences of a changing climate, and strive for economic and environmental sustainability.
- To advise university researchers on effective ways to communicate climate science to lay audiences.

Internal

- To integrate climate change science into the four NOAA Sea Grant/MN Sea Grant priority areas.
- To keep staff abreast of the current understanding of climate change, especially as it relates to Lake Superior and Minnesota.

Message Attributes

- 1) Scientifically based: a) Almost all climate scientists agree that humans play a role in climate change, b) Eliminate hyperbolic and alarmist language.
- 2) Focus on science and impacts to Lake Superior and aquatic resources in Minnesota.
- 3) Articulate that average climate trends are very different from the variability of annual climate ("*Climate is what you have in your closet and weather is what you are wearing today.*" *Source unknown*). Explain the uncertainty and risk.
- 4) Recognize that climate science is constantly being refined, and the way humans apply what is known needs to remain fluid.
- 5) Give multiple reasons for action/behavior change.

- 6) Help people visualize threats and solutions by incorporating pictures as well as words
- 7) Overcome these barriers: a) Someone else will do something about it, why should I? b) Changes will be too far in the future, so why worry now?
- 8) Contain adaptation concepts to prepare for change. Societies (infrastructure) are not as mobile and ecological systems are not as resilient as in past climatic fluctuations. (Tell story of past climate impacts on collapsed societies).
- 9) Reflect an understanding that community and industry efforts to curb carbon emissions will have a large impact but that individual actions are cumulative.
- 10) Reiterate that Minnesota has committed to reducing state's greenhouse gas emissions, and that people and their communities need to do their parts (MN goal: reduce 15% by 2015, 30% by 2025, and 80% by 2050).

Methods

- 1) Activities - Focus on activities/mediums where people are prepared to learn: web pages, print media, news radio, classes, conferences, meetings. Repeat the messages in various ways so audiences hear it more than once. Keep messages consistent.
- 2) Written Plans (Using United Way model) - By 2013, eight communities on the North Shore will have a plan for maintaining/building infrastructure that reflect climate predictions for extreme weather events.

Actions Planned

- Build messages/actions into our strategic plan and all our programs as a crosscutting theme. Plan to extend climate messages to audiences in a variety of ways: written, verbal, visual, Internet, etc.
- Gather peer-reviewed regional climate science and translate it for the public.
- Submit proposals for climate outreach.
- Choose appropriate messengers to address different groups.
- Look at U of MN climate change web site and see what we can do differently or additionally.
- Develop a climate change section on our site.
- Promote actions to mitigate climate change. For example:
 - 1) Work with policy makers and businesses to maintain boreal wetlands in northern Minnesota, which are efficient carbon "sinks".

- 2) Develop message/position on biofuels and alt. energy sources. Emphasize they are not a solution to climate change, but were developed as a way to reduce dependence on foreign oil.
 - 3) Enter the 'low carbon diet discussion'--Food miles and embodied greenhouse gas emissions to raise awareness of why we need to rebuild sources of locally available freshwater fish.
- Support research and outreach that will aid discussions and decisions about regionally important aspects of climate change. For example: climatic and hydrologic changes could be resulting in increased mercury methylation rates, translating into higher fish tissue mercury concentrations.
 - Describe the carbon cycle, and greenhouse gases and their increase.
 - Use our advisory committee to extend messages.
 - Facilitate interactions among experts at conferences and North Shore town meetings.
 - Combine tourism and climate change specialties in future staff hires.

Evaluation

- Conduct surveys of workshop/conference audiences before and after the events to document any changes in intention.
- We expect to measure:
 - 1) A shift in attitude toward more climate change adaptation and mitigation efforts in individuals, businesses, and coastal communities
 - 2) Heightened awareness about the regional impacts of climate change based on science.
 - 3) Behavioral changes reflecting an understanding of climate-related science (depending on the project and audience).

Audiences

Lake Superior coastal community leaders
 Policy makers
 Great Lakes maritime industry
 Reporters
 UMD staff and students
 Lake Superior coastal residents
 Local natural resource agencies
 Minnesota science teachers
 Great Lakes Sea Grant Network staff

Interested regional industries
Researchers

Cooperators

Within University

UMD--Large Lakes Observatory, Natural Resources Research Institute

UMTC--Office of Tourism; Institute on the Environment; Water Resources Center;
Department of Soil, Water and Climate; Minnesota Climatology Working Group
(climate.umn.edu/)

Within Minnesota

Local tribes, City of Duluth Climate Change Committee, Minnesota Department of
Natural Resources, Minnesota Power, Minnesota Pollution Control Agency, Minnesota
Department of Health, MN Sea Grant Advisory Committee, Governor's Task Force on
Climate Change/ Minnesota Climate Change Advisory Group
(www.mnclimatechange.us/)

Within NOAA

Great Lakes Sea Grant Network,

Lake Superior Coastal Program,

Great Lakes Environmental Research Laboratory (www.glerl.noaa.gov/)

NOAA Climate Program Office (www.cpo.noaa.gov)

Other cooperators

International Joint Commission Water Board; the U.S. EPA Mid-Continent Ecology
Laboratory