Introduction

Michigan is the only Sea Grant program in the region that is entirely within the boundaries of the Great Lakes watershed. With 99 percent of watersheds in Michigan draining to lakes Michigan, Superior, Huron and Erie, our connection to the Great Lakes is undeniable. Michigan Sea Grant (MI SG) continues to extend research efforts, respond to coastal needs and connect with a broad base of stakeholders and partners located throughout the 3,200 miles of Great Lakes coastline.

Our physical presence within two of the largest university campuses in the state of Michigan allows us to connect with top scientists in a variety of disciplines, including natural resources, law, business, agriculture, urban planning, engineering and more. The University of Michigan (UM) has 19 schools and colleges, more than 3,000 faculty, an annual research budget of more than $1 billion and more than 40,000 students. Michigan State University (MSU) is a land grant university, with 17 schools and colleges, 4,700 faculty and academic staff, an annual research budget of $477 million and nearly 50,000 students.

MI SG successfully leveraged our core NOAA-National Sea Grant funding, receiving $6,416,176 total support from regional and national competitions between 2010 and 2013. This report includes selected examples of how MI SG used this funding to support research, education and outreach efforts that enhance the sustainable use of Great Lakes resources to benefit Michigan, the Great Lakes and national economy, the environment and quality of life.

For example, during the 2010-2013 strategic planning period, MI SG contributed to the largest restoration effort in the Great Lakes region, the Great Lakes Restoration Initiative (GLRI). As a leader in efforts to improve fish habitat, manage invasive species and protect water quality, MI SG received more than $4.7 million in competitive GLRI funding from multiple federal agencies.

MI SG also contributed to significant state strategies, such as the Michigan Department of Environmental Quality Coastal Zone Management Program's Section 309 Strategy, focusing on water quality, fisheries, coastal hazards, climate adaptation, sustainable coastal communities, public health and safety and more.

The Great Lakes provide industry, domestic water, transportation and recreation to millions of citizens. Maintaining and enhancing their quality is the primary goal of MI SG. We provide research, education, outreach, and leadership in promoting Great Lake resources and are proud of our accomplishments, some of which are described in the following sections.

Integrated, Actionable Research Results

MI SG integrates research with outreach and education through the development of an Integrated Assessment program. With this approach, research teams develop new information by creating tools and building partnerships that help people better address challenging coastal issues, such as fish consumption advisories, stormwater runoff or wind energy conflicts. The concept is to create results ready to be put into action.

The 2010-2013 Strategic Plan

The MI SG Strategic Plan closely aligns with the National Sea Grant Strategic Plan, with changes to wording to address unique regional characteristics. The plan outlines the strategies MI SG followed to address three cross-cutting and four focus-area goals. The cross-cutting goals — development of sound scientific information, facilitation of an informed public, and support for inclusive decision-making processes — influenced and directed our core program activities within each focus area.

MI SG helped create a lake whitefish commercial fishing cooperative that helps members earn more by working together and selling higher value products.

Safe and Sustainable Seafood Supply

Michigan Sea Grant (MI SG) identified three program goals for creating a safe and sustainable seafood supply:

1. A sustainable supply of safe seafood to meet public demand at affordable prices.
2. A healthy domestic seafood industry that harvests, produces, processes and markets seafood responsibly and efficiently.
3. Informed consumers who understand the importance of ecosystem health and sustainable harvesting practices to the future of our domestic fisheries, and who appreciate the health benefits of seafood.

Progress toward Plan

Goal 1

To help meet its goal to achieve a sustainable supply of safe seafood to meet public demand at affordable prices, MI SG facilitated a lake whitefish commercial fishing cooperative. The group has increased demand through targeted promotions and expanded markets, maximizing profit for fishers and creating a movement toward value-added products. This represents a major shift for producers who have traditionally focused on catching and selling whitefish independently, but now earn more profits by working together and selling higher value products. The cooperative launched several new products under the *Legends of the Lakes* brand, expanding total offerings to five products. Cooperative members have begun cultivating new avenues for sales through e-newsletters, farmers' markets and community supported fish programs. The cooperative grew from a group of four to five dedicated commercial fishers, and in 2012, took over management of their website from MI SG.

In addition, MI SG organized a workshop in early 2010 to focus on fish waste composting and repurposing unused parts of the fish. A protocol for handling and selling fish parts was developed. MI SG helped Michigan fish producers establish a business relationship with a seafood processing company.

Although there is great demand for Michigan's wild caught Great Lakes seafood, there is relatively little commercial aquaculture production in the state. Given the availability of water, aquaculture has great potential to contribute to Michigan's economy and employment. MI SG helped develop and

disseminate a proposed strategic plan for Michigan's aquaculture. As a result, three state agencies signed a Memorandum of Understanding to work on aquaculture development, and two state senate bills were introduced regarding tax breaks for new or expanded indoor aquaculture operations.

Working to find additional sustainable seafood products, MI SG conducted a feasibility study of fish oil extraction in collaboration with the University of Minnesota. Several coldwater Great Lakes species were found to contain high levels of Omega-3 fatty acids, which have commercial value. The results of the study were published in 2012.

MI SG's expertise in aquatic invasive species outreach and education is well respected by state agencies and elected officials. The public and legislators have questions about the potentially invasive Asian carp species found near the Great Lakes. MI SG conducted town hall meetings and business tours for elected officials and constituents to discuss the potential introduction of Asian carp and other invasive species to Michigan waters and to identify impacts to the environment and businesses.

Goal 2

Bringing individuals together with private and public groups to form consensus on actions has always been Sea Grant's strength. As part of reaching its goal of a healthy and efficient domestic seafood industry, MI SG helped facilitate a potentially controversial change in state fishery management regarding the stocking of Chinook salmon in the Great Lakes. Through surveys and meetings with anglers and officials, information on fish diet and other studies helped both parties recognize that a change in stocking methods was necessary. The state reduced or eliminated Chinook stocking at many sites, and the public was well informed on reasons for the change, which occurred with no controversy.

MI SG helped create a new opportunity for economic development with the Catch and Cook program. Anglers, charter boat captains and restaurants participate in the initiative that allows charter customers to have their fish prepared at local restaurants. This effort is generating new business for restaurants and promoting Great Lakes recreation in Michigan. The program expanded into four new counties and is now widely established. The program received the 2013 Governor's Award for Innovative Tourism Collaboration by the Michigan Travel Commission for offering participants an innovative and compelling tourism experience.

MI SG also developed a seafood safety and handling training video based upon the U.S. Food and Drug Administration's Hazard Analysis and Critical Control Points (HACCP) principles. Ongoing MI SG training around safe production of seafood has made an impact in this industry. Over the past 4 years, 208 people have participated in seafood HACCP training programs, resulting in 54 new or revised plans at facilities. A concerted effort was made to provide training to tribal businesses. MI SG also has developed an Aquatic Invasive Species HACCP in collaboration with fishery industry representatives, resource managers and other experts. Since 2009, nearly 100 aquaculture facilities have developed AIS-HAACP and biosecurity plans as part of their AIS-HACCP program participation to minimize the spread of fish disease and invasive species.

Goal 3

Building a Great Lakes literate population is one of the key missions of MI SG. In a new publication, MI SG is spreading the word to consumers to help them understand the importance of ecosystem health, locally sourced fish, and increasing their understanding of the benefits of fish consumption. The *Great Lakes Whitefish: Wild Caught and Close to Home* cookbook has

been sold online and through fish producers, chefs and retail outlets. It also received a first place Blue Pencil Award from the National Association of Government Communicators and increased traffic to the whitefish cooperatives website.

Among MI SG's many publications is a classic. *The Life of the Lakes* explores the ecology, history, culture, resource management, sustainability and future of the Great Lakes through the lens of the fishery. MI SG revised that publication and updated it with colorful illustrations. The book is distributed through MI SG's online bookstore.

Reaching out to consumers is more than just providing books, however. In 2013, MI SG-supported research helped develop new signage to inform anglers along the Detroit River about fish consumption risks, addressing a public health issue. New signs have been posted along the river. MI SG and partners also developed educational materials about fish habitats, including videos, maps, fact sheets and K-12 classroom lessons.

Another tried and true way to reach and inform consumers is to provide hands-on learning opportunities. The Salmon Ambassadors program, developed by MI SG, was launched to encourage anglers to become citizen scientists and gather specific data on Chinook salmon caught over the course of the year. The data helps biologists understand how stocked and wild fish contribute to fishing success at individual ports during the fishing season. The original goal was to include four or five anglers from one port for the 2013 pilot year. However, 13 anglers from 7 ports volunteered. Data was collected for 1,152 fish, leveraging mass marking efforts of the U.S. Fish and Wildlife Service and state agencies around the basin. Feedback from anglers helped improve the ambassadors program in 2014, with plans to expand it to other states and Lake Huron.

Contributions to Science and Technology

MI SG has made considerable contributions to science and technology that benefit its stakeholders and the public at large.

MI SG has helped educate, organize and empower fish consumers and the commercial fishery throughout the state. Baitfish facilities and state-run fish hatcheries have struggled to avoid acquiring and spreading aquatic invasive species and fish diseases such as viral hemorrhagic septicemia. In collaboration with industry representatives, resource managers and other experts, MI SG developed an aquatic invasive species HACCP that has been implemented throughout the region. Consistent AIS-HACCP and biosecurity protocols have dramatically reduced potential for diseases on fish farms and their spread to other farms or the wider environment. These trainings benefit individual industry operators, as well as the region and state in terms of economic gain and safe food supplies.

MI SG research studying the challenges and opportunities for Michigan aquaculture produced a suite of strategies and tools, including detailed enterprise budgets for operations suited to Michigan's climate and resources, as part of the strategic plan. Ensuing project advisory meetings and research products have generated new interest in aquaculture at the state capitol. Additionally, eight new aquaculture facilities were licensed during 2013, and two new applications for discharge permits were filed for commercial-scale aquaculture operations.

Launched in late May 2012, the Michigan Catch and Cook program brought together the recreational sport fishing and restaurant industries to provide charter fishing clients the opportunity to enjoy dining on their catch, prepared by a professional chef only hours after coming off the water. MI SG and project partners helped take the idea from concept to

reality. To help charter operations meet specific state requirements for food handling, MI SG developed a seafood safety and handling training video, which was debuted to charter boat captains in 2013. The video is accessible via the *Michigan Catch and Cook* website and continues to function as a food safety training requirement for the Michigan Department of Agriculture and Rural Development, and the Michigan Restaurant Association.

Targeted research helps MI SG back up its proposals and programs with facts. MI SG research on fish diets, and its use of citizen scientists such as Salmon Ambassadors, helped anglers and fisheries managers understand the scope of the Chinook salmon stocking issue and helped to implement a change in the state process. A recent feasibility study of fish oil extractions in coldwater Great Lakes fish might lead to new economic opportunities. A study of fish advisory signage along the Detroit River showed a need to expand outreach efforts to improve public health.

Contributions to Society

MI SG also has made a number of significant contributions to society beyond science and technology. Indeed, in the tradition of extension programming, MI SG makes a significant impact in the lives of individual constituents, as well as the entire state and region. The program helps bring about constituent behavior and policy changes through sharing research, information and educating the public in best practices.

Through its work with the fisheries industry and market researchers, MI SG projects have had an economic impact in Michigan. MI SG helped develop new income opportunities for commercial fisheries through supporting development of a cooperative that shifted focus from a single commodity to value added products with increased earnings. Working together, the participants earn more profits and reach new markets. In addition, MI SG helped fish producers develop new strategies for disposing of fish waste, which led to new products. The processors are now paid $12,000 per truckload, allowing them to sell their fish waste instead of paying to dispose of it.

Safe seafood handling programs have benefited the public and improved the industry. In order to reach a broader audience, MI SG provided low-cost training for HACCP in remote areas in the Upper Peninsula and northern Michigan. This allowed these fish producers to comply with regulations without causing them an economic hardship.

To address declines in Chinook salmon and associated prey fish, MI SG held regional fishery workshops bringing together fishers and fishery scientists to exchange information and bring the layman up to date on scientific advances. A participatory outreach effort with fishers was made to analyze fish stomach contents for diet information.

MI SG works daily with business owners, government officials, researchers, educators and community members to understand constituent needs. With field staff around the state and close connections with researchers and natural resource managers, MI SG is a nimble organization that can effectively identify emerging issues, raise awareness and build networks to address the issue. As the issue progresses, our role typically evolves from leader to supporter of other organizations that are positioned to implement management strategies. Our goal is to engage and empower stakeholders to become educated stewards of the Great Lakes, so they make informed decisions about our natural resources.

PIER PRP Program Focus Area Report

Michigan Sea Grant

Safe and Sustainable Seafood Supply

Program Focus Area: SUSTAINABLE SEAFOOD

Program Goals

1. A sustainable supply of safe seafood to meet public demand at affordable prices.
2. A healthy domestic seafood industry that harvests, produces, processes, and markets seafood responsibly and efficiently.
3. 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

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Full Text of Impacts
Program Performance Measures
Objectives

Impacts and Accomplishments toward Program Goals

1. **Program Goal: A sustainable supply of safe seafood to meet public demand at affordable prices.**
   Impact(s)
   - 20339 - Increasing collaboration and planning to expand Michigan's aquaculture industry (Update on FY 13-14 IMPACT)
   - 19231 - Increasing Collaboration and Planning to Expand Michigan's Aquaculture Industry
   - 17928 - Sea Grant Research Sparks New Investment and Guides Business Decisions for Aquaculture
   - 6292 - Sea Grant Helps Whitefish Cooperative Develop New Products and Expand Markets
   - 6290 - Sea Grant helps Whitefish Processors Turn Byproducts into Profits

   Accomplishment(s)
   - 16023 - Michigan Sea Grant Townhall Meetings on Asian Carp Educate Legislators, Business Owners and the Public

2. **Program Goal: A healthy domestic seafood industry that harvests, produces, processes, and markets seafood responsibly and efficiently.**
   Impact(s)
   - 20339 - Increasing collaboration and planning to expand Michigan's aquaculture industry (Update on FY 13-14 IMPACT)
   - 17930 - Michigan Sea Grant's Low-cost Training Provides Opportunities for Tribal Businesses
   - 17929 - Catch and Cook: Michigan Sea Grant Facilitates Creation of Statewide Tourism Initiative
   - 15835 - Michigan Sea Grant Helps Facilitate Change in Fishery Management
   - 6290 - Sea Grant helps Whitefish Processors Turn Byproducts into Profits

   Accomplishment(s)
   - 19235 - Developing a Seafood Safety and Handling Video to Support the Michigan Catch and Cook Program

3. **Program Goal: 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**
   Impact(s)
   - 19242 - Expanding the Catch and Cook Program Increases Angler Satisfaction
   - 19239 - Establishing a Salmon Ambassador Program for Anglers to Monitor Chinook Salmon Populations in Lake Michigan
   - 6289 - Sea Grant Project Helps State Agency Develop Innovative Public Health Solutions

   Accomplishment(s)
   - 17938 - Life of the Lakes: The Story of the Great Lakes Fishery

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Full Text of Impacts and Accomplishments

20339 - Increasing collaboration and planning to expand Michigan's aquaculture industry

(Update on FY 13-14 IMPACT)
Relevance: Although there is great demand for Michigan's wild-caught Great Lakes seafood, there is relatively little commercial aquaculture production in the state. Given the availability of water, along with the agriculture and commercial fishing heritage of the state, aquaculture has great potential to contribute to Michigan's economy and employment.

Response: Michigan Sea Grant (MSG) funded an Integrated Assessment to study the challenges and opportunities for Michigan aquaculture and to help develop a strategic plan. The research team assembled an advisory group of industry and state resource agency representatives to guide the assessment. The project produced a suite of strategies and tools, including detailed enterprise budgets for operations suited for Michigan's climate and resources, as part of the strategic plan. The research team presented their plan at 6 meetings in 2013, including a state legislative committee hearing.

Results: Two additional National Pollutant Discharge Elimination System permits have been issued for commercial trout production in Michigan. A collaborative of state agencies, through the Quality of Life Working Group serving to improve regulatory processes, released a guidance document regarding the permit application process for net pen operations in Michigan. Additionally, at least two requests were made to the working group on the potential to develop demonstration facilities for commercial scale net pen culture in the Great Lakes. The MSG-funded research team also developed a flow-through budget model for rainbow trout and is finalizing a GIS mapping project to identify potential net pen culture sites in the Great Lakes.

RECAP: An MSG assessment continues to effectively promote aquaculture by providing tools and information to facilitate development of aquaculture in the Great Lakes region, resulting in two new permits issues and two applications for net pen operations. Back to Goals

19242 - Expanding the Catch and Cook Program Increases Angler Satisfaction
Relevance: Great Lakes charter fishing is an important contributor to tourism in Michigan's coastal communities. According to a study produced by Michigan Sea Grant in 2009, the number of charter excursions per year has fluctuated, and angler satisfaction is critical to attracting both new and repeat customers.

Response: Anglers, charter boat captains and restaurants participate in the Catch and Cook program, an initiative that allows charter customers to have their fish prepared at local restaurants. This effort is generating new business for restaurants and promoting Great Lakes recreation in Michigan. This effort was aligned to the highly successful statewide marketing campaign focusing on unique Pure MichiganÂ® tourism experiences. It expanded into four new counties and is now widely established in Michigan.

Results: The Catch and Cook program has generated considerable involvement of anglers, charter captains and restaurants. The program received the 2013 Governor's Award for Innovative Tourism Collaboration by the Michigan Travel Commission for offering participants an innovative and compelling tourism experience.

RECAP: MSG's leadership and collaboration in the development of a unique lake-to-plate tourism program provided continued economic growth to the state's charter fishing and restaurant industries, and was recognized by the state tourism industry as an innovative and collaborative program.
Back to Goals

19239 - Establishing a Salmon Ambassador Program for Anglers to Monitor Chinook Salmon Populations in Lake Michigan
Relevance: Catch rates for Chinook salmon have been relatively high for the past nine years in Lake Michigan; however, size of mature salmon has varied from year to year. Years with very high catch rates, small salmon and slow growth rates indicate that there may be too many salmon and not enough prey. In order to gather this kind of information, fisheries biologists need assistance in collecting data in the field. Often, the voluntary participation of anglers is key.

Response: The Salmon Ambassadors program, developed by Michigan Sea Grant was launched to enlist anglers to gather specific data on Chinook salmon caught over the course of the year. This data will help biologists understand how stocked and wild fish contribute to fishing success at individual ports during the fishing season.
Results: The original goal was to include 4-5 anglers from one port for the 2013 pilot year; however, 13 anglers from 7 ports volunteered. Data was collected for 1,152 fish, leveraging mass marking efforts of the U.S. Fish and Wildlife Service and state agencies around the basin.

Anglers who regularly catch Chinook salmon are encouraged to participate by measuring fish carefully from the tip of the snout to tip of the tail, checking for an adipose fin clip that indicates a stocked fish, and recording length and clip information, along with date and location of catch. Feedback from anglers will help improve the ambassadors program for 2014, and plans are to expand it to other states and Lake Huron.

RECAP: The Salmon Ambassadors program, developed by MSG, enlisted anglers to gather information on Chinook salmon caught over the course of the year, helping biologists understand how stocked and

wild fish contribute to fishing success at individual ports during the fishing season. Back to Goals

19235 - Developing a Seafood Safety and Handling Video to Support the Michigan Catch and Cook Program
Relevance: To ensure safe food handling practices and to control chain-of-custody for freshly caught fish, handling guidelines are needed that protect consumers and participating restaurants from potential foodborne illnesses.

Response: The Michigan Department of Agriculture and Rural Development, Food and Dairy Division, determined specific food handling guidelines for charter services to participate in the Michigan Catch and Cook program. To help charter operations meet this requirement, Michigan Sea Grant developed a seafood safety and handling training video based upon the U.S. Food and Drug Administration's Hazard Analysis and Critical Control Points principles.

Results: During the 2013 Michigan Charter Boat Association Conference, MSG presented its training video Fish Handling Procedure to Ensure Produce Safety for the Michigan Catch & Cook Program. The video is accessible via the Michigan Catch and Cook website and functions as a food safety training requirement for the MDARD and the Michigan Restaurant Association.

RECAP: Restaurants preparing meals from catches taken during charter fishing excursions on the Great Lakes enhance angler enjoyment of fishing experiences. The food safety and handling training video developed for the Michigan Catch and Cook program is used by charter captains to understand safe food handling techniques and ensure quality seafood products for participating restaurants.
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19231 - Increasing Collaboration and Planning to Expand Michigan's Aquaculture Industry
Relevance: Although there is great demand for Michigan's wild caught Great Lakes seafood, there is relatively little commercial aquaculture production in the state. Given the availability of water, along with the agriculture and commercial fishing heritage of the state, aquaculture has great potential to contribute to Michigan's economy and employment.

Response: Michigan Sea Grant funded an assessment to study the challenges and opportunities for Michigan aquaculture and to help develop a strategic plan. The research team assembled an advisory group of industry and state resource agency representatives to guide the assessment. The project produced a suite of strategies and tools, including detailed enterprise budgets for operations suited for Michigan's climate and resources, as part of the strategic plan. The research team presented their plan at 6 meetings in 2013, including a state legislative committee hearing.

Results: Project advisory meetings and research products have generated new interest in aquaculture at the state capital. Researchers accomplished the following:
-Three state agencies signed a Memorandum of Understanding to work collaboratively to define roles and responsibilities for aquaculture development and formed a group to assist with new permit applications and regulatory issues;
-Two new bills were passed by the Michigan State Senate to provide tax breaks for new or expanded indoor aquaculture operations; and
-Eight new aquaculture facilities were licensed in the past year (a 14% increase) and two new applications for discharge permits were filed for commercial-scale aquaculture operations.

RECAP: A Sea Grant assessment is effectively promoting aquaculture by providing new economic tools and a strategic plan, catalyzing productive collaboration among state agencies and industry, and elevating the importance of aquaculture development among state legislatures. Back to Goals

17938 - Life of the Lakes: The Story of the Great Lakes Fishery
Relevance: People like fish. With a keen understanding of this, Michigan Sea Grant recognized that fish can act as a gateway into learning more about the Great Lakes. Additionally, building a Great Lakes-literate population is one of the key missions of Michigan Sea Grant.

Response: Michigan Sea Grant revisited a classic publication, The Life of the Lakes, and produced a colorful, illustrated version of the book that explores the ecology, history, culture, resource management, sustainability and future of the Great Lakes through the lens of the fishery. The book offers updated information about recreational and commercial fishing, a complete overview of aquatic ecology, an in-depth history of people and challenges throughout the region, and the present and future state of the Great Lakes fishery. This project was supported in part through the NOAA Fisheries Extension Enhancement effort.

Results: The book has been featured in several articles via regional media and has been one of the top items ordered from the Michigan Sea Grant bookstore. More than 600 books have been distributed to date. The book is targeted for use in high-level high school or entry-level college courses. Cornerstone University in Grand Rapids is one such school that has adopted the book as a supplemental text and required reading for students.

RECAP: Michigan Sea Grant seized an opportunity to update and upgrade a classic textbook focusing on the Great Lakes fishery. The MSG communications team worked with fisheries specialists to create an easier-to-read, and more engaging version of The Life of the Lakes, as a vehicle to build Great Lakes

literacy throughout the region. Back to Goals

17930 - Michigan Sea Grant's Low-cost Training Provides Opportunities for Tribal Businesses

Relevance: Hazard Analysis Critical Control Plan (HACCP) training, while a necessity for seafood producers, can end up being costly for those in remote areas where classes and training are not regularly offered. The expense of attending training for fishermen and fish processors in the Upper Peninsula and northern Michigan can be cost-prohibitive, but their businesses depend upon it.

Response: Michigan Sea Grant Extension has hosted multiple training sessions for those in remote areas, specifically for Native Americans. For example, over the past few years, 18 of 21 HAACP workshops were hosted on Native American reservations within Michigan. In 2012, MSG held a three-day Seafood HACCP training at a reduced fee of $100 per participant at the Bay Mills Indian Community.

Results: In 2012, 33 participants (including tribal fishermen and processors and aquaculture producers/processors) participated in the training. Because of the reduced fee trainings held within the state, attendees are able to keep down business costs and develop a seafood HACCP plan specific to their respective fishing processing facilities to ensure a safe product to continue to grow their processing business.

RECAP: Michigan Sea Grant provides accessible Seafood HAACP training workshops, helping to keep small, tribal-run business current and in compliance while keeping costs of that training low.

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17929 - Catch and Cook: Michigan Sea Grant Facilitates Creation of Statewide Tourism Initiative

Relevance: Visitors to a region are often looking for ways to add value to their experiences. In Great Lakes coastal towns, charter fishing is a popular activity but is often seen as a day trip. Once the charter is complete, many visitors take their cleaned fish and go home. Michigan Sea Grant helped develop a way to link one tourism industry - charter fishing - to several others to both enhance visitor experiences and to keep tourism dollars in the coastal community.

Response: Launched in late May 2012, Michigan Catch & Cook brought together the recreational sport fishing and restaurant industries to provide charter fishing clients the opportunity to enjoy dining on their catch-of-the-day, prepared by a professional chef, only hours after coming off the water. MSG and project partners helped connect charter fishing operations to local restaurants and helped navigate health code regulations to take the idea from concept to reality. A website (http://www.micatchandcook.com) was developed to help the public find participating charter operations as well as restaurants.

Results: From its launch date through the end of the 2012 charter fishing season:
- The program registered 47 charter boat operators and 29 restaurants, representing 21 different Michigan ports in 17 different coastal counties.
- The website provides site visitors with a one-stop resource to identify participating charter boat operators by name or by geographic location, as well as participating restaurants affiliated with each charter captain.
- Partner agencies engaged in an aggressive public relations campaign from the program's launch and throughout the season to direct attention to the website.
- The site, maintained by Michigan Sea Grant Extension, experienced over 10,800 unique visits during the season.

RECAP: Michigan Catch & Cook promotes and encourages creative, yet safe, marketing of Michigan Great Lakes sport fishing and dining through unique partnerships between participating charter boat operators and restaurants. These partnerships support local economies in Michigan's coastal communities as charter fishing clients extend their stay and enjoy a unique dining experience.

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17928 - Sea Grant Research Sparks New Investment and Guides Business Decisions for Aquaculture

Relevance: Although Michigan has the natural resources to be a leader in freshwater aquaculture, the industry has been relatively stagnant and has received little support from state agencies and private investors.

Response: In 2012, Michigan Sea Grant began supporting an Integrated Assessment to evaluate the challenges and opportunities for aquaculture in Michigan. Led by a researcher from Michigan State University, the project has a diverse advisory committee that includes representatives from several state agencies, environmental groups, foundations and aquaculture businesses. The advisory committee has been meeting regularly to guide an analysis of potential seafood products and business models for aquaculture facilities.

Results: This collaborative research project has increased interest and established a solid working relationship among economic development, agriculture and environmental agencies in Michigan, which is already leading to new initiatives. For example, the project's advisory committee has initiated a project to re-purpose unused industrial buildings for aquaculture in downtown Saginaw, Michigan. Sea Grant research results are helping this group select the most suitable fish species and aquaculture

system, and to develop a robust business and marketing plan. With advice from Sea Grant extension educators and researchers, a community foundation and the Michigan Economic Development Corporation have made financial investments to help three new aquaculture facilities begin operations in Saginaw by 2015.

RECAP: Michigan Sea Grant research is guiding business decisions and sparking new investments in aquaculture that could help revitalize urban areas. Three new facilities have financial backing and are in the works to begin operations in 2015 in an economically depressed region. Back to Goals

16023 - Michigan Sea Grant Townhall Meetings on Asian Carp Educate Legislators, Business Owners and the Public
Relevance: Michigan Sea Grant's expertise in aquatic invasive species outreach and education is well respected by state agencies and elected officials. The public and legislators have questions about the potentially invasive Asian carp species that have been found near the Great Lakes. They were seeking science-based information on the issue.

Response: MSG facilitated multiple town hall meetings for five elected state officials to meet with constituents of coastal-dependent businesses. Meetings took place in Linwood, Alpena, Traverse City and Muskegon, Michigan. Tours of coastal-dependent businesses were also arranged so legislators would gain a greater understanding the impact invasive species can have upon these businesses.

Results: Through these listening-and-learning experiences, legislators began to construct a framework for Michigan's response to the potential introduction of Asian carp in Michigan waters, as well as the impact other invasive species are having on the Great Lakes ecosystem. Natural resource experts shared additional information about Asian carp including means of identifying the fish, and the potential danger their existence raises to the Great Lakes and Michigan's tributary rivers.
RECAP: Michigan Sea Grant brought legislators and coastal business owners together to understand the impact invasive species do and could have on the Great Lakes system. Back to Goals

15835 - Michigan Sea Grant Helps Facilitate Change in Fishery Management
Relevance: The ecology of Lake Huron has changed dramatically since 2004, resulting in major declines in prey fish and Chinook salmon. Traditionally, salmon populations have depended on hatcheries and stocking. However, these programs have not helped this popular and economically important sport fish recover.

Response: To help anglers respond to the changing fishery, MSG has been organizing annual workshops in different locations around Lake Huron since 2004. In recent years, these workshops have attracted 300 people annually, giving anglers a chance to learn from and interact directly with researchers and state fishery managers. Attendees return from year to year, building an engaged and educated culture of anglers. Sea Grant educators provide a safe, neutral place for discussion and use electronic polling to let participants voice their opinions on controversial issues. In addition, many anglers have provided fish stomachs for a diet analysis partially funded by MSG.

Results: Workshop presentations about fish diets and other studies have helped managers and anglers recognize that the current prey base cannot support Chinook salmon at historic levels. Despite the fish's popularity, anglers reflected on knowledge gained during workshops and communicated during polling that they want the state to refocus money that is spent on salmon stocking. Michigan will reduce Chinook stocking for a third time in 2012, to levels seven times lower than peak periods, and eliminate plantings at nine of 12 sites on Lake Huron. Current salmon populations largely reproduce naturally and are better aligned with food available, and anglers have seen a moderate improvement in salmon fishing.

RECAP: Sea Grant research and outreach efforts helped fishery managers and anglers work together to implement a potentially controversial change in fishery policy. Back to Goals

6292 - Sea Grant Helps Whitefish Cooperative Develop New Products and Expand Markets
Relevance: The Whitefish fishery is Michigan's largest commercial fishery. However, lake whitefish from outside the region is priced well below the level at which regional producers could provide it. As a result, communities with fishing enterprises especially tribal communities and others in Michigan's Upper Peninsula are threatened with declining profits.
Response: In 2004, Michigan Sea Grant began working with commercial whitefish producers to establish a cooperative and to explore value-added whitefish products and new marketing opportunities. Fisheries Extension Enhancement grants helped whitefish harvesters and processors engage MSU food scientists and supply chain specialists. Working with a market research firm, the cooperative analyzed the industry and its untapped market. They capitalized on the buy local movement, and promoted the freshness of their signature product, a flash-frozen filet. MSG also helped cooperative members develop food safety plans for potential new products.
Results: In 2010, the Legends of the Lakes cooperative launched two new two products: smoked lake whitefish spread and whitefish cakes. This represents a major shift for producers who have traditionally focused on catching and selling whitefish independently, but are now earning more profits by working together and selling higher-value products. Cooperative members have begun cultivating new markets through e-newsletters, farmer's markets and community-supported fish programs.

RECAP: Michigan Sea Grant helped Michigans flagging whitefish industry by supporting development of a cooperative that shifted focus from a single commodity to value-added products and increased their earnings. Back to Goals

6290 - Sea Grant helps Whitefish Processors Turn Byproducts into Profits
In the Great Lakes, commercial whitefish producers have struggled to stay in business due to limited opportunities to expand harvest and low dockside prices for fish. In 2009, one tribal fishing operation was fined for improperly disposing of their fish waste, creating an additional economic burden. In response, Michigan Sea Grant began working with fish producers and processors to develop new strategies for managing their waste. In early 2010, MSG organized a workshop on fish waste composting and repurposing unused parts of the fish. MSG developed a protocol for handling and selling unused fish parts for kosher products, such as gefilte fish, and helped Michigan fish producers establish a business relationship with an out-of-state seafood processing company. Beginning in fall of 2010, Michigan whitefish producers began selling fish frames, pin bone meat, and small fish for use in kosher products, as well as fish heads for lobster bait. The large seafood processing company covers transportation costs and pays $12,000 per truckload, allowing Michigan fishers to make a profit from waste they had previously been paying to store and landfill.
RECAP: Whitefish commercial fish processors now realize an income rather than an expense in responsibly repurposed fish wastes for kosher and other products. Back to Goals

6289 - Sea Grant Project Helps State Agency Develop Innovative Public Health Solutions
A legacy of industrial pollution results in ongoing fish consumption advisories in the Detroit River. The problem involves public health, wildlife and environmental agencies at multiple levels of government in two countries, and historically no single agency took the lead. In 2007, Michigan Sea Grant funded a research team to engage a wide range of stakeholders and prepare a comprehensive assessment of fish contaminants and human health risks for the Detroit River. In the final 395-page report, the team used contaminant models to predict PCB levels in species not tested by the state, and reported that official fish advisories were not reaching important minority audiences.
The assessment was initiated in partnership with the EPA. However, the Michigan Department of Community Health (MDCH) became a leading partner to the research team and continues to implement ideas generated by the project. Sue Manente (MDCH) said she definitely saw new partnerships develop and these working relationships continue. For example, as the project was ending, MDCH collaborated with Sea Grant researchers to successfully secure additional grants totaling over $800,000 to overhaul the State of Michigan fish advisory and develop new, targeted outreach efforts. It was a new approach to tailor fish consumption information to specific audiences and water bodies, said Rose Ellison (EPA) about signs Sea Grant designed based on the Detroit River assessment. Now this idea is spreading across the state.
RECAP: Sea Grant research inspired a lasting university-agency partnership that is catalyzing creative improvements to fish advisories across Michigan. Back to Goals

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Program Performance Measures (2010 - 2013)

Program Performance Measure	Program Plan Target (2010-2013)	Reported	Program Comments
Number of whitefish products developed and marketed by the Legends of the Lake cooperative.	1	4	2010 - spread and fish cakes 2013 - Since 2009, the Legends of the Lake whitefish cooperative has expanded the number of products offered from 1 to 5 whitefish products, including a smoked whitefish spread and fish cakes.
Number businesses that participate in Sea Grant sponsored HACCP workshops and consultations.	80	208	2013 - Number businesses that participate in Sea Grant sponsored HACCP workshops and consultations.
Number of aquaculture facilities that	20	99	2013 - Since 2009, an experienced MSG extension specialist has helped 99 aquaculture facilities develop bio-security plans to minimize the spread of fish disease and invasive

develop bio-security plans.			species. Trainings were held within and outside of Michigan in collaboration with the North Central Regional Aquaculture Center.
Number of new and revised HACCP plans.	20	54	2013 - Since 2009, MSG has helped 54 facilities develop or re-vamp their HACCP plans. MSG specialists conduct on-site consultations and help facilities prepare their HACCP documentation in advance of FDA review.
Number of participants in Sea Grant-led workshops (SSSS).	3,600	8,580	2013 - MSG provided outreach and education opportunities in such areas as growing Michiganâ€™s aquaculture industry, aquaculture biosecurity principles, marketing of Michiganâ€™s commercial fishing industry, facilitating the development of the Legends of the Lakes whitefish cooperative, fisheries management and restoration, fish handling/fish waste management, and developing communication tools for fish consumption guidelines to stakeholders in Michiganâ€™s coastal communities.
Proportional growth in average number of visitors to the Great Lakes Whitefish website each month.	0	624	2010 - 2.5 x growth 2011 - Monthly average to site = 2895 unique visitors, up 362% since 2008 2012 - 10% more per month in 2012. 2013 - The Great Lakes Whitefish website enjoyed stable growth during the first two years. In early 2012, administration of the site was transferred to the Legends of the Lakes Cooperative, as planned. From that point, obtaining site traffic reports stopped however, anecdotally it is reported that the site continues to enjoy growth with new visitors.
Proportional growth of stores featuring Legends of the Lakes whitefish.	2	4	2010 - 2 new stores in 2010. 2011 - 2 new stores in 2011 2012 - Very hard to track number of stores now that chains and farmers markets have begun distributing Legends of the Lake products. 2013 - In 2009 6 stores featured the Legends of Lake whitefish products. Currently more than 12 stores feature the products. As the price of whitefish has increased four fold, most of the whitefish produced by cooperative members as whole fish is sold dockside as well as in local markets - particularly local farmer markets and directly to local restaurants.
Proportional growth of whitefish fishing operations who join the Legends of the Lake cooperative.	0	25	2010 - 1 new member, 25% growh in cooprative 2011 - No new members in 2011. Already achieved target 2012 - No additions in 2012. 2013 - Since the 2009, the whitefish cooperative has grown by 25% from a group of 4 to a group of 5 dedicated commercial fishermen. During this time, the price of whitefish has increased four fold, limiting the need to market whitefish under this label.

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Program Objectives (2010 - 2013)

Program Objective	Achieved (yes/no)	Program Comments
By 2011, culturally appropriate signage and web content will inform anglers about fish consumption advisories for the Detroit River.	Yes	2010 - www.miseagrant.umich.edu/fisheries/detroit-river-fish-consumption-advisory 2011 - www.miseagrant.umich.edu/fisheries/detroit-river-fish-consumption-advisory 2012 - www.miseagrant.umich.edu/fisheries/detroit-river-fish-consumption-advisory 2013 - An MSG supported project researched and helped develop new signage for the most at risk anglers along the Detroit River. New signs have been posted all along the river.
By 2011, Legends of the Lakes cooperative will introduce at least one new product, expand	Yes	2010 - Two new products - smoked whitefish spread, whitefish cakes. One new member. Retailers expanding - on target for end of 2011. 2011 - Two new products - smoked whitefish spread,

membership by 25%, and double the number of stores featuring its products.*		whitefish cakes. One new member. Retailers expanding - on target for end of 2011. 2012 - Two new products - smoked whitefish spread, whitefish cakes. One new member. Retailers expanding - on target for end of 2011. 2013 - Since the 2009, the whitefish cooperative has grown by 25% from a group of 4 to a group of 5 dedicated commercial fishermen. During this time, the price of whitefish has increased four fold, limiting the need to market whitefish under this label. Fishermen and processors have moved product into local markets and farmers markets to develop increased sales.
By 2011, Michigan Sea Grant will work with the Michigan Aquaculture Association to facilitate the development of a strategic plan outlining a comprehensive vision for an aquaculture industry in Michigan.	Yes	2011 - Funding has been secured and work will begin in 2012. 2012 - Funded project in 2012 to revise strategic plan. Work is underway. 2013 - In 2013, an MSG supported Integrated Assessment produced a strategic plan for the Michigan Aquaculture Industry, which is being peer reviewed and finalized in 2014.
By 2011, Sea Grant will help complete a feasibility assessment for using siscowet to produce nutraceutical-grade fish oil.	Yes	2012 - Hosted three different meetings on the results of the feasibility study with economic developers, tribes and others and its application to MI. 2013 - MSG conducted a feasibility study of fish oil extraction in collaboration with a scientist from the University of Minnesota and found that siscowet lake trout and several other cold water Great Lakes species contain high levels of omega-3 fatty acids, which might have commercial value. Results were published in 2012.
By 2011, the number of web visitors to Legends of the Lakes website will have grown by 50 percent.	Yes	2012 - Website is no longer managed by MSG but by cooperative. 2013 - The Great Lakes Whitefish website enjoyed stable growth among new and returning visitors to meet its growth objective. In early 2012, administration of the site was transferred to the Legends of the Lakes Cooperative, as planned. From that point, obtaining site traffic reports stopped however, the Cooperative reports that the site continues to enjoy growth with new visitors.
By 2013, approximately 80 businesses will participate in Sea Grant sponsored HACCP activities resulting in 20 new and revised HACCP plans.	Yes	2013 - Over the past 4 years, 208 peopled participated in MSG sponsored HACCP trainings, resulting in 54 new or revised HACCP plans for their seafood facility.
By 2013, consumers will be able to download or request a print copy of updated publications about purchasing, preparing and preserving Great Lakes Fish in order to maximize nutritional value and minimize health risks.	Yes	2010 - http://www.miseagrant.com/Whitefish_Cookbook_p/michu-10-502.htm 2011 - http://www.miseagrant.com/Whitefish_Cookbook_p/michu-10-502.htm 2012 - http://www.miseagrant.com/Whitefish_Cookbook_p/michu-10-502.htm Great Lakes Whitefish Cookbook: Wild Caught and Close to Home 2013 - As part of a public outreach campaign to consumers, MSG produced the Great Lakes Whitefish Cookbook: Wild Caught and Close to Home. This was used by fish producers, chefs and many fish retail outlets to promote the sale of whitefish in Michigan.
By 2013, host a conference on state of the art technology and production of nutraceutical-grade fish oil and its application to	Yes	2013 - MSG co-hosted three workshops in June 2012 with the Great Lakes Indian Fish and Wildlife Commission that reviewed the findings of the Siscowet Lake Trout Oil Rendering Study. Topics included the extraction and rendering process for fish oil, feasibility of producing fish oil from siscowet lake trout and the development of fish

the state of Michigan.		processing byproducts into fish meal and fish protein.
By 2013, Sea Grant will produce a suite of educational materials about fish habitat restoration in partnership with Huron Erie Corridor Initiative partners.	Yes	2013 - MSG worked with NOAA, USGS, EPA and others to develop educational materials about fish habitat, including videos, maps, fact sheets and K-12 lessons, see: www.miseagrant.umich.edu/restoration
By 2013, twenty aquaculture facilities will have bio-security plans in place.	Yes	2012 - 4 in 2011, 68 in 2012 2013 - Since 2009, an experienced MSG extension specialist has helped 99 aquaculture facilities develop bio-security plans to minimize the spread of fish disease and invasive species. Trainings were held within and outside of Michigan in collaboration with the North Central Regional Aquaculture Center.
Through 2013, Michigan Sea Grant will offer at least three workshops a year for recreational and commercial anglers, focusing on current issues, sustainable fishing practices and effective marketing strategies.	Yes	2010 - www.miseagrant.umich.edu/fisheries/fishery-workshop.html 2011 - www.miseagrant.umich.edu/fisheries/fishery-workshop.html 2012 - www.miseagrant.umich.edu/fisheries/fishery-workshop.html 2013 - Since 2005, MSG has hosted a annual series of fisheries workshops at different locations along Lake Huron to bring together anglers, managers and researchers. These workshops help coastal communities' better understand the lake's ecological changes and current fishing activity. They also allow citizens to get involved in fisheries research and management discussions.