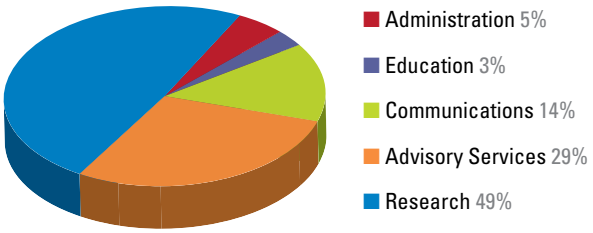
Introductory Page

Two goals are paramount in all Wisconsin Sea Grant (WISG) efforts. The first is supporting preeminent science for the sustainable use of the Great Lakes and its coastal areas. The second is ensuring WISG research, outreach and education results in appropriate socioeconomic and environmental impact based on investment.

A rigorous strategic planning process, which led to the formulation of WISG's 2010-14 Strategic Plan, guided the work in this review period. The plan is modeled on the NOAA-National Sea Grant vision to realize fully the value of the nation's oceans and coasts, and act to halt continuing degradation of those resources.

Resource allocation



WISG focus areas are Support Sustainable Fisheries and Aquaculture, Improve Great Lakes Ecosystem Health, and Enhance Coastal Community Sustainability and Resilience. WISG combined the national Sustainable Coastal Development and Hazard Resilience in Coastal Communities focus areas into a single one to better align with the needs of Wisconsin.

There is also no specific educational focus area in this reporting period. Those goals and outcomes are woven into each existing focus area. The 2014-18 WISG strategic plan does include the Environmental Literacy and Workforce Development focus area.

The 2010-14 plan drew on a broad situational analysis and needs assessment, which considered historical strengths, necessary talent, challenges and emerging issues. It reflects a great deal of collaboration and consultation. In preparing it, WISG demonstrated just the latest embodiment of its illustrious past. As part of a 2011 site review, it received four best-management practices. While the results of the most recent review, held in April 2015, are not yet finalized, WISG expects to receive another seven best-management practices.

Since its beginnings in 1968 and as the first Sea Grant program in the Great Lakes, WISG has awarded grants to researchers at 16 Wisconsin universities. Each year, on average, it supports 50 research and outreach projects. It has supported more than 700 graduate students and contributed to 1,000 peer-reviewed papers. Its research funding has led to local, regional, national and global impacts, including a U.S. patent on spawning yellow perch out of season, two pending patents on a non-lethal test for a devastating fish disease, World Health Organization adoption of toxicity standards for fish as a food source, lifesaving technology now deployed in Lake Superior, numerous models for ecosystem management and more.

WISCONSIN SEA GRANT PROGRAM SUMMARY REPORT

Sustainable Fisheries and Aquaculture

Research on aquaculture has demonstrated for the first time that mercury concentrations in farm-raised yellow perch and rainbow trout are well below health advisory limits.

The Wisconsin Sea Grant (WISG) 2010-14 Strategic Plan includes among its focus areas one termed "Support Sustainable Fisheries and Aquaculture," which aligns with the national program's Safe and Sustainable Seafood Supply Focus Area.

The strategic plan lays out Wisconsin needs and strategies in three categories, (1) fisheries, (2) aquaculture and, (3) education and outreach.

WISG has supported research that bridges two of the above categories—fish disease. Two pending patents have resulted from WISG research. At the University of Wisconsin-Madison, a team has come up with serological diagnostic tests for the viral hemorrhagic septicemia virus that are faster than current testing options. They have the added benefit of being non-lethal. Researchers are engaged in ongoing conversations to patent the tests, and in the meantime, the discoveries are generating income—and protecting fish—as the tests are performed for a fee.

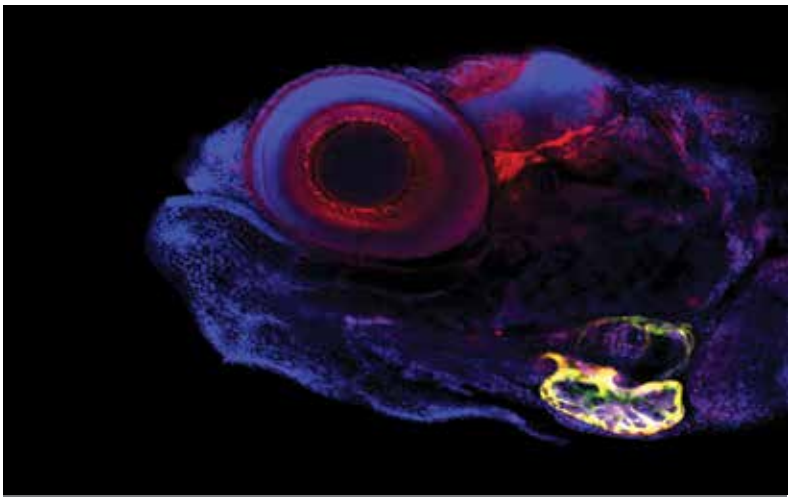
Other research involved columnaris, which can affect wild stocks and aquaculture operations. Its pathogenesis lies in the Flavobacterium columnare. Two scientists have spent years studying Flavobacterium, honing in on the revelation that its cells have a novel secretion system that transports proteins to the cell surface and beyond. Some of the secreted proteins are needed for the bacterium to attach to and move over surfaces. The WISG-funded research pair suspected these secreted proteins might allow the bacteria to cause disease in fish. This gave them a clear strategy to attack the bacterium by disrupting the secretion system so the cells would lose motility, attachment properties and virulence. Early indications are that this hypothesis is correct.

Fisheries

WISG researcher Dr. James Kitchell has left an important mark on international fisheries work and in 2010 was the recipient a lifetime achievement award from the American Society of Limnology and Oceanography. He was the first to integrate fish and fisheries ecology into an ecosystem context. WISG has funded numerous Kitchell projects since 1974, and in his emeritus status he is concluding an assessment of climate change impacts on the Lake Superior food web.

His PLOS One-published findings demonstrate that siscowet lake trout have lost about 20 percent of their historical habitat due to climate change, which has warmed the lake at a relatively fast rate. The research found warmer waters are, however, much more suitable to Chinook salmon, walleye and lean lake trout. These revelations **provide assessment models for sustainable management.**

Lake Superior is also the site of lake trout research that speaks directly to a strategic point in the WISG plan—assessing the success of lake trout rehabilitation efforts. A WISG researcher applied a meta-population model with sub-models for recruitment and growth. He determined a refuge shoal improves the viability of trout and shared the information so it could be incorporated into deliberations between the state of Wisconsin and Native-American tribes as part of treaty negotiations, which set quotas for various entities.



Wisconsin Sea Grant researcher James Kitchell is a towering figure in fisheries. The program also supports assessments of fish heart defects.

Still other researchers have examined blue-sac syndrome and can now provide hatchery managers and aquatic toxicologists with a framework to predict how organic contaminants enhance heart defects that can lead to the syndrome in feral fish populations.

Toxics are one threat to a sustainable fishery, as are aquatic invasive species (AIS). More than 180 nonnative species have been confirmed in the Great Lakes. The costs to the region are at least $200 million annually, and growing.

In this reporting period, WISG boat landing inspectors reached 40,122 people and checked 17,510 boats for AIS. In the case of at least one species, quagga mussels, this education has proven effective. To date, there have been no reported discoveries of quagga mussels on any of Wisconsin's 15,000 inland lakes.

Another high-impact AIS-education/action project was carried out in collaboration with fellow Great Lakes Sea Grant programs, the National Professional Anglers Association (NPAA), the Masters Walleye Circuit, the Bass Federation and Wildlife Forever. It was a multi year effort, begun in 2010, which targeted fishing tournaments and professional anglers as a vector in the spread of aquatic invasive species. It also capitalized on professional anglers' status as role models. They were enlisted to help spread AIS-fighting messages, including them as part of 66 clinics conducted in 11 states, most using WISG-developed AIS material.

Importantly, the professionals were deployed to youth fishing activities as part of the tournaments. At the spring WISG site review, the executive director of the National Professional Anglers Association praised WISG for providing his organization with what it needed to educate youth. He said that without WISG support, the NPAA would not have been able to give those future anglers the right AIS-fighting messages from the right ambassador, the professional angler.

At tournaments, more than 1,000 AIS pledges were collected from participants in 13 states. Of those who signed the pledge, a follow-up was posed: **"Has the pledge changed your behavior?" 75 percent of respondents indicated yes.**

In all, more than 4,500 recreational anglers were reached. The project also promoted a strong relationship with tournament organizers and ensured their adoption and implementation of AIS-prevention procedures into all tournament operations. The efforts will reduce AIS threats to fish communities.

Furthermore, WISG advisory services work benefits commercial and recreational fishers alike. Since 2000, the program's fisheries outreach specialist has chaired meetings of the Lake Michigan Fisheries Forum, an advisory body formed by the Wisconsin Department of Natural Resources to address issues related to Lake Michigan fisheries. Through the years, the forum has weighed in on the management of numerous species and on harvest practices, including whitefish harvested using trap nets. These trap nets can stretch for a quarter of a mile, catch prized whitefish and release other fish unharmed. Wisconsin commercial fishers may harvest up to 3 million pounds of whitefish annually. It's the state's top commercial fish.

Both commercial and recreational fishers may fish the same waters, and sport fishers' equipment can become entangled in the trap nets, causing expensive loss, and perhaps posing a safety risk. To **ensure collaboration and a Lake Michigan fishery for both** sport and commercial fishers, each year WISG conducts an information-sharing campaign about the location of trap nets through websites and distribution of maps at coastal community bait shops and boat landings.

Another source of conflict on the Great Lakes can be ghost nets—commercial and tribal fishing nets that break free and may snarl in recreational boats' motors, endangering safety. The nets can also continue catching, and wasting, resources. WISG is working with the Great Lakes Indian Fish and Wildlife Commission and the Lake Superior Sportfisherman's Association on a NOAA Marine Debris-funded project to raise awareness about ghost nets and reduce tensions between tribal and recreational parties. One of the tribal wardens at WISG's recent site review noted the longtime animosity and distrust between the two groups. He celebrated the significance of this partnership that wouldn't be happening without Sea Grant's role as an honest broker.

Aquaculture

Wisconsin aquaculture generates $21 million in annual economic activity and supports more than 400 jobs. WISG aquaculture work capitalizes on Wisconsin's resources for fish such as trout, salmon, whitefish, tilapia, ciscoes, Arctic char, walleye and yellow perch.

Yellow perch, in particular, has a storied history in the state and serves as the lynchpin species for WISG aquaculture research. Researchers secured a **U.S. patent** on a process to manipulate light and temperature to cause yellow perch to spawn out of season. Such husbandry aids an aquaculture industry striving to meet the demand for the tasty white fish. Wild stocks in the Great Lakes collapsed in the 1990s and there is limited commercial harvest.

Providing year-round availability is important for Wisconsin. The state has one of the nation's highest Catholic populations. That demographic initially drove the popularity of Friday-night fish fries, as religious devotees eschewed meat. Now, the Friday-night fish fry has become a cultural icon, quite apart from religious dietary practices. The Wisconsin Historical Society even documents "fish fry" in its Dictionary of Wisconsin History. Yellow perch is the favored fish on those Friday nights.

The city of Racine, along the shore of Lake Michigan, is lining up investors for a yellow perch grow-out facility that would produce 1 million pounds of fish a year, generating an estimated $13 million annually. The mayor of Racine has repeatedly stated that the workforce training in the nearby city of Milwaukee is crucial to the success of the operation. **WISG is involved in all aspects of advisement on the project, including student education at the University of Wisconsin-Milwaukee.**

Production also continues in an existing urban aquaculture operation, Growing Power. In Milwaukee, Will Allen, a MacArthur Genius Award-winner, relies on WISG advice and assistance for the aquaculture side of his nonprofit urban farm that employs more than 80 people and provides healthy options in what would otherwise be a food desert.

Allen is looking to expand to a second location in the city, which is situated in Wisconsin's poorest ZIP code. The operation would hatch yellow perch, employ up to 10 people and provide fingerlings to the operation in Racine for growth to market size.

At WISG's spring site review, Allen said, "We wouldn't be doing what we're doing if it weren't for Fred (WISG's aquaculture specialist)." The 6'7" former professional basketball player continued, "Fred is like an insurance policy. It's like when you get Lloyd's of London to insure your knees before you play."

The site review team conferred a best-management practice (informally, since the final report is pending) on WISG's aquaculture work, noting in particular its strong integration with private industry, municipalities and the educational system.

For pond aquaculturists, WISG has aided in the challenge of establishing yellow perch larval diets by demonstrating that inorganic fertilizer use promotes improved growth rates.

Another important species in Wisconsin is walleye. WISG adjusted its aquaculture focus in 2013 and 2014 to more fully support the University of Wisconsin-Stevens Point Northern Aquaculture Demonstration facility (UWSP-NADF) in its efforts to work with the industry, as well as students at all educational levels. **Researchers at the facility are partnering with private industry to develop the world's first commercially viable walleye fish farming operation.** WISG is providing support to broaden the reach of that work. UWSP-NADF is working with another

The Eat Wisconsin Fish campaign is making a splash, including at the 2015 NOAA Fish Fry.

private company in Wisconsin to refine rearing techniques for Arctic char. The market-size fish retails for roughly $20 so the locally produced fish also bring robust economic rewards. The company employs eight people and routinely sells all of its product in the top markets of Chicago and Milwaukee.

UWSP-NADF is also actively engaged with K-12 groups, hosting numerous school groups to demonstrate pond, recirculating and aquaponics systems, and traveling to three schools that have their own aquaculture courses as part of the curriculum. The payoff is when students enter the aquaculture field themselves, which has happened twice during this reporting period.

At the UW-Milwaukee School of Freshwater Sciences this path to jobs has also been lain with a Certificate in Applied Urban Aquaculture developed by WISG's aquaculture outreach specialist. The certificate is awarded when students complete courses in a $53-million newly expanded school with labs and resources that also maintains close ties to a regional trade group that's positioning the area as the world's freshwater hub. These educational facilities would not exist if it hadn't been for WISG's long-term investment in aquaculture education at the school.

Further WISG research on aquaculture has demonstrated for the first time that mercury concentrations in farm-raised yellow perch and rainbow trout are well below health advisory limits. Measurement was matched against the U.S. Department of Agriculture recommendation of "four meals a week" or "unrestricted."

One final tool WISG has had a hand in developing is a geographic information system-based predictive website related to the specific conditions in Wisconsin contributing to a successful aquaculture operation. The recently launched site aggregates factors such as land cover, soil types, elevation, water quality and source, and proximity to infrastructure and potential markets.

Education and Outreach

Education and outreach strategies are employed in all ongoing research projects. One to highlight illustrates the importance of informing public and private decision making to lead to a sustainable supply of safe seafood long into the future, as is enunciated in the WISG strategic plan.

In Wisconsin, the local food movement is thriving. More and more people want to know the source of their food and many are willing to pay higher prices to purchase food that supports

local producers. However, despite this heightened interest in local food, WISG identified an information gap in consumers' knowledge of eating local fish.

In response, **WISG developed the Eat Wisconsin Fish campaign,** which includes an informational website, eatwisconsinfish.org, and events and cooking demonstrations. The campaign is forging stronger ties among producers, commercial harvesters, restauranteurs, retailers and consumers. It's paying off. In a 2014 WISG survey, one popular Milwaukee restaurant said it plans to purchase more than $100,000 in Wisconsin fish in the coming five years.

For the first time ever, Great Lakes fish were on the minds of those Washington, D.C., powerbrokers who attend the NOAA Fish Fry at the Department of Commerce building near the National Mall. Although outside of this reporting window, WISG brought its Eat Wisconsin Fish campaign to the 40th annual event in June and created quite a buzz by serving Lake Michigan whitefish and farm-raised rainbow trout.

Another **educational tool is a free downloadable Wisconsin fish identification app for smartphones and tablets.** The material is also available through a standard website. In whatever format, fishers can search by fish name, similar fish in the family or physical features—shape, distinctive features, pattern and type of fins, mouth, scales, spine, tail or coloring. Each entry depicts the fish, sometimes from several photographic angles, and offers a short write-up about fish features. The app became available in 2013 and has been downloaded more than 12,500 times.

A final educational tool is a 14-part podcasting series on aquaculture. It traces the origins of aquaculture, examines its historical and modern advantages and challenges, and provides some primers on how to set up an aquaculture operation. The podcast is one of the most popular features on the seagrant.wisc.edu website. It consistently ranks in the top three of search areas to the site. In this reporting period, there were 236,800 visitors to the podcast pages.

PIER PRP Program Focus Area Report

University of Wisconsin Sea Grant Institute

Safe and Sustainable Seafood Supply

Program Focus Area: Support Sustainable Fisheries and Aquaculture

Program Goals

1. A sustainable supply of safe seafood to meet public demand.
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 consumption, and who understand how to evaluate the safety of the seafood products they buy.

JUMP TO REPORT SECTION

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.**
   Impact(s)
   - 20207 - Wisconsin Sea Grant Influences Fishing/AIS Spread Attitudes and Behavior Among Professional Anglers
   - 20199 - Wakeboard Boats and AIS: Wisconsin Sea Grant Hits Many Fronts and Catalyzes Action
   - 20198 - Eat Wisconsin Fish Campaign Taking Hold, Paying Off for Wisconsin Fisheries/Aquaculturists
   - 18632 - Wisconsin Sea Grant Research Reveals Effect of Climate Change on Lake Superior Fish
   - 18458 - Stopping It at the Source: Great Lakes Boat Landing Conversations on Spreading Aquatic Invasive Species
   - 18437 - Research Will Assist in 2014-15 Lake Superior State-Tribal Fishing Negotiations
   - 18436 - Wisconsin Sea Grant Research Modeled Waves to Prevent Kayaker Deaths and Improve Lake Trout Survival
   - 18417 - Lake Superior Fish Took the Spotlight in Successful Cook-off/Tasting Event
   - 18416 - Wisconsin Sea Grant Chairs Statewide Fisheries Forum
   - 18410 - Yellow Perch Production Fuels a Multimillion-Dollar Company in Great Lakes Region
   - 18407 - Hard-to-Sample Great Lakes Rocky Habitats Now Can Be Accessed With New Electroshocking Tool
   - 18401 - Wisconsin Sea Grant Facilitates Balance of Lake Michigan Angler Safety and Profitable Whitefish Harvest
   - 16689 - Test Discovered for Deadly Fish Disease, Patent Pending
   - 16681 - GIS Data Mapping Future Successes for Aquaculture Industry
   - 16677 - Sea Grant Builds Central-City Food Security With Aquaculture
   - 16672 - Sea Grant Inspires Educator to Get Grant to Start a School Aquaponics Operation
   - 16663 - High School With Only a 65% Graduation Rate Getting Job-Worthy Aquaculture Training Compliments of Sea Grant
   - 16661 - Aquaculture Information Going Far and Wide
   - 15497 - Fish Research Could Lead to ID'ing Potential Heart Birth Defects in Humans
   - 15495 - Sea Grant is Feeding Friday Night Fish Fry Tradition in Wisconsin
   - 6765 - Reducing the Level of Bio-Contaminants in Fish-Based Foods
   - 6758 - World Health Organization Adopts Sea Grant Model on Fish Toxicity

   Accomplishment(s)
   - 18479 - Wisconsin Sea Grant Funding Research Into Bacterium That Causes Deadly Fish Diseases
   - 18475 - Wisconsin Sea Grant Lays Groundwork to Award Aquaculture Certificates to Grad and Undergrad Students
   - 15567 - Dangerous Blue-Green Algae Blooms Better Monitored Thanks to Sea Grant
   - 15554 - Sea Grant Working With Triathletes to Raise Awareness on Aquatic Invasive Species

2. **Program Goal: A healthy domestic seafood industry that harvests, produces, processes, and markets seafood responsibly and efficiently.**
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- 6765 - Reducing the Level of Bio-Contaminants in Fish-Based Foods
- 6762 - Sea Grant Reserchers Set the Table for Yellow Perch
- 6761 - Sea Grant Provides First Direct Evidence of Mercury-Free Safety of Farm-Raised Fish

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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 consumption, and who understand how to evaluate the safety of the seafood products they buy.**

Impact(s)

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- 20198 - Eat Wisconsin Fish Campaign Taking Hold, Paying Off for Wisconsin Fisheries/Aquaculturists
- 18417 - Lake Superior Fish Took the Spotlight in Successful Cook-off/Tasting Event
- 18415 - Attack Packs Spread Across Great Lakes Region and Spread Invasive Species Messages
- 18407 - Hard-to-Sample Great Lakes Rocky Habitats Now Can Be Accessed With New Electroshocking Tool
- 18401 - Wisconsin Sea Grant Facilitates Balance of Lake Michigan Angler Safety and Profitable Whitefish Harvest
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- 15567 - Dangerous Blue-Green Algae Blooms Better Monitored Thanks to Sea Grant
- 15554 - Sea Grant Working With Triathletes to Raise Awareness on Aquatic Invasive Species

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Full Text of Impacts and Accomplishments

20207 - Wisconsin Sea Grant Influences Fishing/AIS Spread Attitudes and Behavior Among Professional Anglers

Relevance: Fishing tournaments and tournament anglers often attract the attention of local residents and lakeshore owners. The events draw crowds to a water body and dollars to a local economy. But fishing tournaments and tournament anglers are often pointed to, deservedly or not, as a vector for the spread of aquatic invasive species (AIS). That attention can be used to an advantage, however,

when the competitive anglers act as role models for other anglers by championing AIS-fighting messages.

Response: Wisconsin Sea Grant (WISG) has been a part of an innovative and collaborative approach to the challenge of AIS proliferating in Great Lakes waters. Working with the other Great Lakes Sea Grant programs, the National Professional Anglers Association, the Masters Walleye Circuit, the Bass Federation and Wildlife Forever, the program is targeting fishing tournaments and professional anglers as a vector in the spread of aquatic invasive species, and capitalizing on their status as role models for other anglers when they spread AIS-fighting messages.

Results: This project was completed during this reporting period. However, its legacy will endure through achieved objectives: developed strong relationship with the tournament organizers and ensured their adoption and implementation of AIS-prevention procedures into all tournament operations; ensured tournament pros' participation as role models, including the 66 clinics they conducted in 11 states, most using WISG-developed AIS material as part of their talks; trained tournament support groups to inspect and wash tournament boats quickly and effectively with little to no disruption to the events, and this included an average of 20 percent participation by individual boat-owners; and developed training materials for widespread distribution at 46 tournaments and beyond. One project partner, Wildlife Forever, reported more than 465,000 views of an AIS training video produced by WISG. A final outcome was informed and engaged tournament participants, including youth. More than 1K AIS pledges were collected from participants in 13 states. Of those who signed the pledge, a follow-up was posed: "Has the pledge changed your behavior?" 75 percent of respondents indicated yes. Another question probed how much they had shared their AIS knowledge. 32 percent of respondents said they spoke with others two to three times a year on the topic. This material is updated from previous reports.

RECAP: Wisconsin Sea Grant, in partnership with all the Great Lakes Sea Grant programs, enlisted the forces of fishing tournament organizers and professionals to help fight the spread of aquatic invasive species in Great Lakes waterways, resulting in attitude and behavior changes. Back to Goals

20199 - Wakeboard Boats and AIS: Wisconsin Sea Grant Hits Many Fronts and Catalyzes Action

Relevance: Wakeboard boats employ ballast systems to generate large wakes that recreational enthusiasts use to accentuate their water sports tricks and enhance their experience as they jump from side to side. The boats are popular, having led the recreational boating sector in growth for 2013, the most recent year for available figures. Even after the bilge pumps indicate the ballast system is empty, ballast can be left behind. This residual water can be a vector for transporting aquatic invasive species (AIS). Wisconsin Sea Grant (WISG) found the boats hold significantly more residual water than other recreational watercraft. Additionally, there can be living organisms in the water for at least a week from the last launch.

Response: An initiative to assess wakeboard boat ballast water as an AIS vector is an offshoot of WISG's longstanding work related to decontaminating boats. WISG teamed up with a private vendor to conduct a baseline study of ballast systems involving wakeboard boats. In this reporting period, WISG offered three presentations on this topic-to the Aquatic Nuisance Species Task Force, to the Upper Midwest Invasive Species Council and at the American Boat and Yacht Council Aquatic Invasive Species Summit.

Results: WISG catalyzed action to prevent the spread of AIS at each of three presentations. The Aquatic Nuisance Species Task Force will now use the WISG data to better define the AIS risk from wakeboard boats. At the Upper Midwest Invasive Species Council, a researcher with the Minnesota Department of Natural Resources was able to get data for his soon-to-be published work on residual water in watercraft. Until WISG reached out, that state was missing wakeboard boat data. Finally, the American Boat and Yacht Council has now formed AIS work teams, which will include a WISG staff person contributing to the efforts of this nationally influential private industry trade group. This is updated material from a previous report.

RECAP: Wisconsin Sea Grant catalyzed regional and national action on the role that popular wakeboard boats (the boats led the recreational boating sector in growth as evidenced by the most-recent figures available) play in the spread of aquatic invasive species. Back to Goals

20198 - Eat Wisconsin Fish Campaign Taking Hold, Paying Off for Wisconsin Fisheries/Aquaculturists

Relevance: In Wisconsin, the local food movement is thriving. More and more people want to know the source of their food and many are willing to pay higher prices to purchase food that supports local producers. However, despite this high interest in local food, Wisconsin Sea Grant (WISG) identified an information gap in consumers' knowledge of eating local fish. In general, eating any type of seafood can be a complicated topic for consumers wanting to understand risks and benefits, so promoting local fish requires addressing unique concerns that aren't relevant to promoting other local agricultural products. That means educating consumers about the risks and benefits of eating wild Great Lakes fish and Wisconsin farm-raised fish.

Response: WISG coordinated an all-Wisconsin fish takeover for the menu of a popular Milwaukee

restaurant. This was supported by an overall Eat Wisconsin Fish campaign. It includes eatwisconsinfish.org-a website offering rich resources, background on the industries, the fish themselves, recipes, campaign events and health information.

Results: The Milwaukee event exposed more than 150 people to the local offerings from Wisconsin's commercial fishers and aquaculturists. This particular restaurant has embraced locally sourcing Wisconsin fish and has projected out five years what it would purchase--$112,000 for species such as walleye, perch, trout and farm-raised Arctic char. Other Eat Wisconsin Fish events at grocery stores and public festivals drew another 200-plus people in this reporting period. This is updated material from a previous report.

RECAP: Wisconsin Sea Grant has motivated a popular Milwaukee restaurant's plans to purchase more than $100K in Wisconsin fish in the coming five years as part of a larger Eat Wisconsin Fish campaign that includes events, recipes, health information and a website. Back to Goals

18632 - Wisconsin Sea Grant Research Reveals Effect of Climate Change on Lake Superior Fish

Relevance: Lake Superior's fishery consists of important game fish like trout and salmon. The lake supports eight commercial fishing operations (the 2011 dockside value was $1.8 million) and about 40 charter fishing businesses on the U.S. side of the border. The lake is also deeply affected by climate change. The waters are warming at a relatively fast rate-2.5 degrees Celsius for surface water from 1979 to 2006. In fact, one researcher has said Lake Superior is warming at one of the fastest rates of any other lake observed on Earth. That change is affecting the fish.

Response: Wisconsin Sea Grant (WISG) funded a researcher to measure the impact of a warming Lake Superior on the fish of the lake. Researchers are also contributing findings for collaborative synthesis and sharing with resources managers through www.globalgreatlakes.org.

Results: In a 2013 study published in PLoS One, researchers outlined lake conditions more favorable for Chinook salmon, walleye and lean lake trout. Habitat is not favorable for siscowet lake trout, which prefer colder water and have lost about 20 percent of their historical habitat. The findings are valuable for long-term lake management and have implications for the commercial and recreational fishing industry in the face of one example of habitat loss under climate change.

RECAP: Wisconsin Sea Grant research provides evidence that climate change has contributed to habitat loss for one type of Lake Superior fish, while favoring three other sport fish. The 2011 dockside value of Lake Superior fish was $1.8 million. The lake is one of the fastest warming lakes of the Earth's measurable bodies of water. The findings can inform long-term lake management and may affect the viability of Lake Superior's commercial and recreational fishing industry. In fact, findings from this work are sythnesized and shared through www.globalgreatlakes.org.This is updated material from a previous reporting period. Back to Goals

18479 - Wisconsin Sea Grant Funding Research Into Bacterium That Causes Deadly Fish Diseases

Relevance: Flavobacterium columnare is a common fish pathogen that causes columnaris disease in wild and farmed freshwater fishes. Most, if not all, species of freshwater fish are susceptible to columnaris disease. F. columnare infections may result in skin lesions, fin erosion and gill necrosis, with a high degree of mortality. The disease has been recognized for nearly 100 years, but the mechanisms of pathogenesis of the bacterium are not known. Lack of genetic tools to manipulate the bacterium has hampered studies to identify the molecular mechanisms of pathogenesis.

Response: Wisconsin Sea Grant (WISG) is funding researchers who developed robust genetic tools and procedures for a closely related bacterium (Flavobacterium johnsoniae) present in soil and freshwater. They demonstrated that some of these genetic tools function in F. columnare. They are adapting those tools to more deeply examine F. columnare. They anticipate being able to develop a vaccine against the disease.

Results: The researchers made what they term "significant" progress toward developing genetic techniques for F. columnare, securing two wild-type strains of the disease. This reporting period represents the first year of the grant.

RECAP: Wisconsin Sea Grant is funding researchers who anticipate being able to develop a vaccine against columnaris disease in wild and farmed freshwater fishes. Most, if not all, species of freshwater fish are susceptible to columnaris disease. F. columnare infections may result in skin lesions, fin erosion and gill necrosis, with a high degree of mortality. The first year of the grant has seen significant progress. Back to Goals

18475 - Wisconsin Sea Grant Lays Groundwork to Award Aquaculture Certificates to Grad and Undergrad Students

Relevance: In order for the Wisconsin aquaculture industry to continue its success and to expand, it's essential to have a trained workforce. Having students trained in the necessary science and technical skills means the industry will be more attractive to investors who have the capital to invest in large-scale aquaculture. Likewise, those already in the business may require continuing education.

Response: Wisconsin Sea Grant's (WISG) aquaculture specialist began laying the groundwork in this reporting period to establish an aquaculture certificate program for graduate and undergraduate students at the University of Wisconsin-Milwaukee, as well as continuing education curriculum.

Results: The certificate will be offered beginning in the fall 2014 semester. Certification will take place in a building that just underwent a $53-million expansion, including state-of-the-art labs and training facilities. The newly remodeled School of Freshwater Sciences at the University of Wisconsin-Milwaukee will open in late summer 2014. The effort is also in line with the goals of the Milwaukee Water Council, a trade group that aims to make Milwaukee the world's largest hub of freshwater, linking academia and private industry. The first certification to be offered will be on aquaculture and WISG staff also hopes to offer an aquaponics certificate in spring 2015. In the fall 2015, he also hopes to begin offering a continuing education certificate.

RECAP: Wisconsin Sea Grant is helping build a trained workforce in aquaculture by laying groundwork to establish an aquaculture certificate program for graduate and undergraduate students in the University of Wisconsin-Milwaukee's $53-million expanded School of Freshwater Sciences. The program has close ties to a regional trade group to solidify educational/business connections. Back to Goals

18458 - Stopping It at the Source: Great Lakes Boat Landing Conversations on Spreading Aquatic Invasive Species

Relevance: A plant or animal that moves from its traditional habitat to a different one, and flourishes, could be displacing an existing native organism. In Wisconsin, some problematic non-native species are the sea lamprey, round goby and Eurasian watermilfoil. However,a notorious species, the quagga mussel, has not moved from Lake Michigan to inland lakes. That kind of control is what resource managers like to see.

Response: In an ongoing program, Wisconsin Sea Grant (WISG) conducts seasonal boat landing conversations with boaters to raise awareness about aquatic invasive species. Inspectors also demonstrate cleaning techniques. Additionally, WISG is working with the Wisconsin Department of Natural Resources to refine the tool used for inspector interactions to generate higher-quality data collection. That tool could be in use as soon as the summer of 2014.

Results: In this reporting period, WISG contacted 10,577 people at Great Lakes boating ramps. There were 10 inspectors, with three working in the Lake Superior basin and seven in the Lake Michigan basin. WISG inspectors also contacted an additional 2,326 people at inland ramps near the Great Lakes. The inspectors reached 4,693 watercraft at Great Lakes ramps and 1,122 watercraft inland ramps. Additionally, WISG participated in a 4th of July Landing Blitz, involving 288 Wisconsin lakes and rivers that reached 40,539 people. The blitz was possible due to the participation of citizen volunteers and staff from dozens of lake associations and lake districts, local, county, and tribal governments, non-profit groups, scout troops and businesses. This education has proven effective. To date, there have been no reported discoveries of quagga mussels on any inland Wisconsin lake.

RECAP: Wisconsin Sea Grant helped reach 53,442 anglers and recreational boaters at landings in the summer of 2013. Inspectors teach ways to prevent the spread of aquatic invasive species. It's effective in the case of at least one species. Quagga mussels have not been found in inland Wisconsin lakes. This is updated material from a previous reporting period. Back to Goals

18437 - Research Will Assist in 2014-15 Lake Superior State-Tribal Fishing Negotiations

Relevance: According to 2011 harvest figures (the most recent available) Lake Superior lake trout were valued at nearly $20,000. The harvest is at a reduced level due to an overall lake population plunge from the effect of parasitic sea lamprey and exploitation. In 1976, resource managers instituted a lake trout refuge in the Apostle Islands region to prevent depletion of a remnant lake trout stock. Further, the state-tribal fishing agreement that regulates commercial and recreational fishing in the Apostle Islands region will be renegotiated in late 2014 and early 2015.

Response: Wisconsin Sea Grant (WISG) funded researchers at the University of Wisconsin-Stevens Point to provide an objective evaluation of the effectiveness and role of the Gull Island Refuge in fishery management that will be critical for future negotiations. Researchers completed two lines of investigation. The first simulated future population status with and without the refuge. The second compared life history characteristics of lake trout that resided within and outside the refuge during the period of stock collapse and recovery.

Results: State and tribal negotiators for the fishery management agreement in Wisconsin waters of Lake Superior will be provided with the outcome of the research as they enter negotiations for the next fishing agreement. Study results suggest the refuge dramatically reduces the risk of stock collapse.

RECAP: In the latter half of the last century, an important Lake Superior predator fish, the lake trout, was hard-hit by exploitation and parasitic sea lamprey. Wisconsin Sea Grant-funded research evaluated the efficacy of a 38-year-old lake trout refuge in bringing back the stock, as well as modeled future population size under refuge and non-refuge conditions. The findings will be shared with state and tribal negotiators for the fishery management agreement in Wisconsin waters of Lake Superior set to get underway in late 2014 and into 2015. This is updated material from a previous reporting period.

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18436 - Wisconsin Sea Grant Research Modeled Waves to Prevent Kayaker Deaths and Improve Lake Trout Survival

Relevance: The northern tip of Bayfield County, Wisconsin, is an extremely important region in terms of historical and natural resource features. This vast stretch of land and water contains the Lake Superior Apostle Islands National Lakeshore, the Red Cliff Indian Reservation and hundreds of square miles of scenic wilderness. Due to these natural treasures, it is a popular tourist destination. Most recent figures available (2012) indicate that the national lakeshore drew 163,000 visitors who spent more than $24 million. Unique natural rock formations along the western mainland and several of the islands attract thousands of visitors. These features, called sea caves, are eroded in soft sandstone near the water's edge. Due to their relatively remote locations, sea caves are often visited by kayakers paddling long distances. Nevertheless, no real-time information of the water environment (wave, temperature or current) is available to kayakers. Several fatalities have occurred in the vicinity of the sea caves, which may have been prevented with adequate wave condition reports and forecasts. The area's islands are also critical habitats for lake trout. To date, there has been minimal research aimed at resolving the threshold of turbulence in the water environment that provides optimal survival rates for lake trout eggs.

Response: With Wisconsin Sea Grant (WISG) support, a University of Wisconsin-Madison researcher modeled wave conditions using acoustic Doppler current profiler, pressure sensors and a stereo imaging camera system. The researcher also developed a website to provide nowcasting and forecasting models offering real-time conditions of the route to the to sea caves. In terms of measuring turbidity as it affects lake trout spawning habitat, the acoustic Doppler sensors and a turbulence model are adding to the body of knowledge of the area and are being shared with resource managers.

Results: The researcher has analyzed 35-year wave climate data in the area to provide extreme waves statistics and trends due to a changing climate. Other modelling is now in place to measure upwelling and down welling as it affects trout habitat, and other conditions in the region. Data are available at http://infosapostles.cee.wisc.edu. Finally, a Real-Time Wave Kiosk has been designed, built and installed at Meyers Beach, where most kayakers and boaters enter Lake Superior. No fatalities have occurred at the sea caves since the website and kiosk began operation. Park service staff and local kayak outfitters regularly check the site before embarking on a trip to the caves. The system was a prominent part of a recent U.S. Department of Interior safety award the Apostle Islands National Lakeshore received.

RECAP: The water temperature of Lake Superior year-round hovers at the freezing mark and can often be characterized by extensive wave action. Despite such conditions, the area around Bayfield County, Wis., is rich in natural beauty and is the site of the Apostle Islands National Lakeshore, attracting 163,000 visitors each year who spend upwards of $20 million. Many come for the chance to kayak the sea caves, but fatalities have occurred due to conditions. A Wisconsin Sea Grant researcher modeled waves and is providing real-time information on conditions to prevent tragedies through a beach-installed information kiosk. Park service staff and local kayak outfitters regularly check the website before embarking to the caves. The modeling is also an aid to the vulnerable lake trout population, which benefits from the ideal spawning habitat in the region. That habitat information, and more, is available at http://infosapostles.cee.wisc.edu.

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18417 - Lake Superior Fish Took the Spotlight in Successful Cook-off/Tasting Event

Relevance: Lake Superior supports a strong whitefish fishery, on average harvesting 750,000 pounds annually.

Response: In partnership with Minnesota Sea Grant, Wisconsin Sea Grant (WISG) staged an event featuring Lake Superior bounty and geared at the general public to raise the profile of sustainably managed lake whitefish. The event featured a cross-border chef cook-off. Minnesota chefs cooked lake herring and Wisconsin chefs prepared whitefish. Fisheries managers from the two state's respective management agencies made presentations. Numerous print pieces on Lake Superior topics were distributed. Two local fishing companies participated. Minnesota Sea Grant secured sponsorships from the Duluth Seaway Port Authority, a local power company and Lake Superior Magazine.

Results: Messages about the event reached an estimated 3.5 million people through traditional media channels-TV, print and radio. The event sold out (300 tickets were sold) and 285 people attended. An evaluation survey showed that 86 percent of respondents learned more about sustainable fisheries, and attendees expressed a strong desire to eat Lake Superior fish. They rated the event an average of 1.6, with one being excellent and two being very good. The event was so successful that one of the sponsors will take it over and stage it in 2014.

RECAP: A chef cooking competition and public tasting event drew 285 people. Another estimated 3.5 million people received messages about the event, as well as messages about sustainably managed Lake Superior whitefish and lake herring fisheries. An evaluation survey showed 86 percent of respondents learned more about sustainable fisheries, and attendees express a strong desire to eat Lake Superior fish. Wisconsin Sea Grant partnered with Minnesota Sea Grant and drew sponsorships from the private sector. Extensive print materials were also distributed at the event on the Sea Grant mission and projects.

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18416 - Wisconsin Sea Grant Chairs Statewide Fisheries Forum
Relevance: The Wisconsin waters of Lake Michigan support roughly 65 commercial fishers and a thriving charter industry. Numerous recreational anglers also hit the shores and travel in personal watercrafts to enjoy the bounty of the world's fifth largest lake.

Response: At the request of the Wisconsin Department of Natural Resources (DNR), Wisconsin Sea Grant (WISG) chairs the Lake Michigan Fisheries Forum. The forum address issues related to Lake Michigan fisheries. It advises the Lake Michigan Fisheries Team of the Wisconsin DNR, facilitates exchange between the department and interested groups and individuals, develops consensus among diverse interests on matters of common concern and develops public advocacy for policies of general interest.

Results: In this reporting period, WISG conducted the forum two times. The forum addressed topics such as the management of chub, perch, smelt, walleye and chinook salmon; trap net placement; and cormorant control.

RECAP: The Wisconsin Department of Natural Resources (DNR) has requested that Wisconsin Sea Grant (WISG) chair the Lake Michigan Fisheries Forum, which regularly convenes groups of commercial, charter and recreational fisherfolk, management entities and researchers. It advises the DNR Lake Michigan Fisheries team. It is an ideal role for WISG as an honest broker of information.

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18415 - Attack Packs Spread Across Great Lakes Region and Spread Invasive Species Messages
Relevance: Lake Michigan is a different ecosystem today than it was 20 years ago due to the invasion of Dreissenid mussels. That's just one example of the effect of aquatic invasive species on Wisconsin waters. K-12 students can help counter the effect of these species if they are educated about the issues.

Response: Wisconsin Sea Grant (WISG), using funding from the Great Lakes Restoration Initiative and in partnership with the Great Lakes Sea Grant Network, led development and distribution of the Aquatic Invaders Attack Pack. It's a rucksack filled with materials to teach students and other groups about Great Lakes aquatic invasive species (AIS), problems they cause and what can be done.

Results: Local museums, WISG outreach staff used the attack packs and made five available for free loan to state residents through Wisconsin's Water Library. The pack can be requested online and is then delivered and returned to a local library via Wisconsin's Library Delivery Network. The packs were completed in September 2013, and the loan program has reached more than 2,000 Wisconsin students. Additionally, each Great Lakes Sea Grant program received 10 packs to distribute. One educator said, "I liked that the pack was easy to use and that I could show off examples of various species to the kids...It made them real for the students in a way that showing them pictures on the Internet wouldn't have."

RECAP: Wisconsin Sea Grant, using funding from the Great Lakes Restoration Initiative and in partnership with the Great Lakes Sea Grant Network, led development and distribution of the Aquatic Invaders Attack Pack. It's a rucksack filled with materials to teach students and other groups about Great Lakes AIS, problems they cause and what can be done. In five months, the packs reached 2,000 students. Others in the Great Lakes Sea Grant Network got packs, as did museums. Back to Goals

18410 - Yellow Perch Production Fuels a Multimillion-Dollar Company in Great Lakes Region
Relevance: Yellow perch is a popular Great Lakes fish for consumers. However, due to pollution and aquatic invasive species, there is only one remaining yellow perch commercial harvest area left in the lakes.

Response: Bell Aquaculture in Redkey, Ind., is the nation's largest aquaculture producer of yellow perch. Wisconsin Sea Grant (WISG) provides support to this Great Lakes regional company, and other aquaculture operations. In the case of Bell, it employs 42 people and by one estimate (manta.com) has annual revenues in the range of $2.5 to 5 million. WISG advises Bell on water chemistry, fish health and infrastructure operations.

Results: In this reporting period, WISG's aquaculture outreach agent reports that yellow perch processing waste is being converted into a fertilizer. Bell Aquaculture is exploring an expansion of the sales region for the fertilizer, enhancing the business model and expanding a potential profit center in the yellow perch production chain.

RECAP: In this reporting period, Wisconsin Sea Grant's aquaculture outreach agent reports that a byproduct of Bell Aquaculture's yellow perch processing is being converted into a fertilizer. Bell is exploring an expansion of the sales region for the fertilizer. Such a move would expand a profit center for the company now worth between $2.5 and 5 million and employing 42 people. Sea Grant has been instrumental in the yellow perch production, now leading to this valuable byproduct. This is updated material from previous reporting periods. Back to Goals

18407 - Hard-to-Sample Great Lakes Rocky Habitats Now Can Be Accessed With New Electroshocking Tool

Relevance: Resource managers have traditionally faced a challenge in sampling rocky habitats. Mysid shrimp, which are abundant in important whitefish spawning reefs and other such rocky areas, are a key food source that supports the whitefish, native lake trout and introduced sport fish. Measuring the shrimp numbers, which provide an indicator for the possibility of a healthy fishery, has been difficult.

Response: Wisconsin Sea Grant (WISG) funded a researcher to develop an efficacious sampler that draws out species from crevices and under stones.

Results: WISG researchers have successfully constructed two types of electroshocking, suction-sampling, remotely operated vehicles. The devices have been used in Lake Michigan, on the Wisconsin side of the lake and along with the Michigan Department of Natural Resources on the other side of the lake. The graduate student on the project is preparing an article for publication. And, the project will be presented at the 2014 meeting of the International Association for Great Lakes Research.

RECAP: Aquatic ecologists seeking to quantify the population of the benthic zone in rocky areas face a sampling challenge. Wisconsin Sea Grant research led to the successful development and deployment of two models of electroshocking, suction-sampling, remotely operated vehicles. The devices have been used in Lake Michigan, on the Wisconsin side of the lake and along with the Michigan Department of Natural Resources to sample for mysid shrimp, which is abundant in important whitefish spawning reefs. This is updated material from a previous reporting period. Back to Goals

18401 - Wisconsin Sea Grant Facilitates Balance of Lake Michigan Angler Safety and Profitable Whitefish Harvest

Relevance: The Great Lakes Fisheries Commissions defines Lake Michigan's whitefish as the most valuable commercial species in the waters. Recent harsh winters have pushed the dockside value of the fish to $3 a pound. A recent commission report estimates that 65 percent of the harvest is due to trap nets. Trap nets stretch for miles across the lake bottom and there can be overlap fishing by commercial interests and recreational anglers. This can pose a risk for each party if sportfishers' equipment becomes entangled in the trap nets. In fact, the sportfisherman can also face a safety hazard if he becomes so entangled in the trap nets and is pulled into the water or perhaps capsizes.

Response: Wisconsin Sea Grant (WISG) provides maps of trap net locations in the form of waterproof paper copies at boat launches and through two online sources.

Results: In this reporting period, WISG provided 850 maps at Two Rivers-Manitowoc, Wis., boat ramps and 300 maps at Sheboygan, Wis., bait shops and marinas. The maps were posted to the Lake Link fishing forum (http://www.lake-link.com/forums/Great-Lake-Fishing/) and was viewed 3,360 times for Two Rivers-Manitowoc and 1,917 times for Sheboygan. Trap net maps on the Sea Grant website (http://seagrant.wisc.edu/Home/Topics/FishandFisheries/Details.aspx?PostID=396) were downloaded 1,001 times in the case of the Two Rivers-Manitowoc map and 271 in the case of the Sheboygan map. The maps prove effective at promoting a balance use of the waters by both commercial interests and the sportfishermen. In 2013, there was only one report of lost gear to the trap nets.

RECAP: Wisconsin Sea Grant maps of trap net locations resulted in just one instance of lost equipment to the commercial nets in 2013. The program distributed 1,150 waterproof maps at bait shops, marinas and boat landings. Plus, the online maps were accessed 5,277 times. All this education ensures a balanced used of Lake Michigan waters-sportfishermen enjoy their pursuits and commercial interests harvest whitefish, what the Great Lakes Fisheries Commission determines as the most valuable species in the lake. This is updated from previous reporting periods. Back to Goals

16689 - Test Discovered for Deadly Fish Disease, Patent Pending

Relevance: There are 28 species of fish that can be affected by viral hemorrhagic septicemia (VHS), which causes them to sicken and bleed to death. Some fish will display the virus's effects and others will not, so testing is required to determine if a fish is infected. VHS leads to high mortality and severe economic consequences. It has been present in the Great Lakes, which support a $7 billion annual fishery, since 2003. The U.S. Department of Agriculture terms VHS the most serious viral disease of salmonids reared in freshwater environments in Europe. Further, the federal agency characterizes VHS as an emerging disease of freshwater fish in the Great Lakes region.

Response: Wisconsin Sea Grant has supported an internationally preeminent epidemiologist whose prior work has been on, among other things, the West Nile virus. Working collaboratively with the Wisconsin Department of Natural Resources, his research team searched for a faster and cheaper way to test for the presence of VHS, and one that does not require killing sample fish.

Results: During the reporting period, researchers collaborated with the Wisconsin Department of Natural Resources to sample fish as follows: 125 Freshwater Drum fish collected in May 2012 from three locations on Lake Winnebago. In October 2012, 125 Freshwater Drum were collected from various locations on Lake Winnebago. From each sample collection, serum and seven different tissues were collected from each fish for diagnostic testing. In addition, each serum sample was tested in a virus neutralization assay to detect neutralizing antibodies to VHS. The virus neutralization assay is a significant step forward in developing a non-lethal test for VHS. Results of these analyses identified several serologically positive fish, and one fish that was positive on PCR. This is a significant finding because it demonstrates conclusively that VHS can persist in Wisconsin fish populations between

outbreaks. Resource managers have been informed of this critical finding. A commercially available monoclonal antibody directed against the nucleocapsid of the virus was used in the development of a competitive VHS ELISA assay, which is now fully functional. A U.S. patenting process is underway.

RECAP: Researchers have developed a non-lethal antibody test that lets resource managers know whether the VHS virus had been present in a fish population. A U.S. patent on the test is pending. Additionally, researchers have demonstrated conclusively that VHS can persist in Wisconsin fish populations between outbreaks. Resource managers have been informed of this critical finding.

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16681 - GIS Data Mapping Future Successes for Aquaculture Industry

Relevance: The 80-percent seafood-import deficit in the U.S. is well documented; yet entering into an aquaculture business to try to counter that deficit requires a careful economic analysis for any potential domestic businessperson. That is why a Wisconsin Sea Grant investigator looked at critical factors in the success of fish farms in Wisconsin-location characteristics that could predict a site that leads to a flourishing aquaculture establishment.

Response: Wisconsin Sea Grant researchers acquired data from the Wisconsin Department of Natural Resources, U. S. Department of Agriculture, and 71 of 72 Wisconsin county offices. Fish farm data locations were attained from the Wisconsin Department of Agriculture, Trade and Consumer Protection. There were 352 commercial fish farm locations evaluated for the study, grouped into three longevity classes based on the years in operation. The first class, short longevity, contained fish farms that were open one to three years. The second, medium longevity, consisted of continuous operation of four to six years. The last, high longevity, had annual operation for seven or more years. Forty-three farm locations were randomly removed (within a stratified grouping) before evaluation to obtain a test sample for sensitivity analysis and for determining the predictive power of the finished model. Consequently, 309 fish farms were used for evaluating the landscape location characteristics using ArcGIS with a multi-criteria approach. The main characteristics examined were land cover, soil quality (pH, texture, compaction, permeability and other construction factors), slope and water quality (alkalinity, hardness, and pH).

Results: Researchers were able to pinpoint two specific regions in Wisconsin that could indicate a higher success rate for an operation. Based on these results, the formulated model can provide a useful tool for entrepreneurs, businesses, regulatory agencies and planning groups to aid in the future planning of fish farm operations in Wisconsin. Furthermore, the model can likely be improved with greater state standardization of geographic data so that particular data layers can encompass the whole state.

RECAP: The Midwest consumes more than 1 billion pounds of seafood products per year but less than 4 percent comes from aquaculture operations in the region. Wisconsin's aquaculture industry contributes $21 million in annual economic activity and more than 400 jobs to the state. Wisconsin Sea Grant has promoted the sustainability of the state's aquaculture industry through an innovative use of geographic information systems analysis.

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16677 - Sea Grant Builds Central-City Food Security With Aquaculture

Relevance: A Wisconsin tradition is the Friday night fish fry. The fish of choice at such cultural events is yellow perch. This species is no longer commercially fished from Lake Michigan and there is a strong local market for aquaculturally raised yellow perch.

Response: A Wisconsin Sea Grant researcher earned a U.S. patent on out-of-season yellow perch spawning, which provides a year-round source of the fish. He has extensive experience in recirculating aquaculture systems, balancing the water chemistry, fish biology and engineering. He has also collaborated on the construction of natural and hybridized aquaponic systems at the Growing Power headquarters in Milwaukee. Further, the researcher is overseeing two emerging projects that are linked in their ability to expand the supply of yellow perch in the most populous area of Wisconsin, the southeastern corner on the Lake Michigan coast.

Results: Growing Power was founded and is currently managed by food-security pioneer Will Allen. Allen's 23 urban farms in Milwaukee, as well as Chicago and Madison, Wis., employ 110 (employees and interns) and provide fresh, wholesome foods-vegetables and fish-to impoverished central-city neighborhoods. Growing Power is a nonprofit. At the Milwaukee site, natural and hybridized aquaponics comparison projects started two years ago and as of October 2012 are now fully online. The work is providing data in two areas: improving the productivity and profitability of aquaponic systems through the implementation of filters to improve the nitrification and solids collection in the systems, and the economics of the full system, from design to construction, operation and harvest of market-size fish and vegetables. Allen and the Sea Grant researcher are now looking at that data to develop economic models to share with prospective aquaponic system entrepreneurs and investors. Furthermore, Allen is taking his Sea Grant-enhanced knowledge and will open the for-profit Will Allen Farms LLC in a former commercial laundromat in an economically depressed area of southeastern Wisconsin. He plans to open the business in 2013, employ more than 40 people and raise yellow perch fingerlings using the knowledge of UW Sea Grant's researcher. Allen's initial projections are to hatch 1 million fingerlings a year, eventually increasing production to 4 million annually. Talks are underway with the city of Racine, Wis., to buy yellow perch fingerlings and raise them to market size. The travel distance between these two operations is roughly 45 minutes. The city's venture is projected to employ roughly 15 people and

also may launch later in 2013.

RECAP: WISG has been integral to a progression of yellow perch production models in populous southeastern Wisconsin. From an urban farm supplying much-needed healthy food to an impoverished Milwaukee neighborhood, to the founding of two new businesses-one for-profit and one a project of a larger Wisconsin municipality-will meet the demand for yellow perch, which can no longer be commercially harvested from Lake Michigan waters. Further, research into various aquaponics models is yielding data that will be the basis for emerging models to share with others in the industry.

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16672 - Sea Grant Inspires Educator to Get Grant to Start a School Aquaponics Operation

Relevance: Each spring, a consortium of University of Wisconsin-Madison researchers, staff members and volunteers organize a four-hour public science outreach event known as Science Expeditions. Wisconsin Sea Grant is a longtime participant in this event that is aimed at lay audiences, with a focus on K-5 youth and their families. It attracts roughly 5,000 people, mainly from the Madison, Wis., area.

Response: At the 2012 event, Wisconsin Sea Grant displayed an aquaponics setup. Staff interacted with hundreds of interested visitors. One visitor to the display traveled more than 200 miles, roundtrip, to learn more about this seafood production system that yields fish, along with salad greens. She is a 4th-grade teacher from Neenah, Wis., who wanted to teach her students about sustainable food production, and the biology, chemistry and engineering skills an aquaponics system requires.

Results: Inspired by Wisconsin Sea Grant, this teacher wrote for a privately funded grant and was awarded the maximum amount of $500. She installed an aquaponics system in her elementary school. She is also coordinating her efforts with a business in her community to broaden the impact-teaching others about sustainable aquaculture systems. Additionally, this woman enrolled in a spring 2013 course at the University of Wisconsin-Stevens Point to enhance her knowledge of aquaponics and to share it with the students throughout her school.

RECAP: Neenah, Wis., 4th-grade teacher KarieAnn Zeinert said she specifically wanted to visit Wisconsin Sea Grant's aquaponics display last spring at an event called Science Expeditions. She further valued Sea Grant's inspiration. She said, "It was the (aquaponics) display that brought me down from the Fox Valley. I saw the excitement and wonder in the children's eyes that I would hope to see in my classroom. I would appreciate the opportunity to pilot a program that could help us grow more of our school lunch program's fruits, vegetables and fish." Zeinert secured a private grant to start this pilot program in spring 2013; additionally, in January 2013, she enrolled in an aquaculture course at the University of Wisconsin-Stevens Point to broaden her sustainability and aquaculture skills, and knowledge and to share those attributes.

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16663 - High School With Only a 65% Graduation Rate Getting Job-Worthy Aquaculture Training Compliments of Sea Grant

Relevance: With 69% of its students receiving free or reduced lunch, Wisconsin's Vincent High School ranks 4th in the state in terms of a disadvantaged population. The school's 65% graduation rate is lower than the Wisconsin state average of 94%. Although located in a metropolitan setting, the school sits on 93 acres. When it was constructed in the 1970s, planners intended that it focus on agricultural instruction. Since its founding, that focus on agriculture, including aquaculture, had fallen off-until about two years ago when the school's principal and the larger Milwaukee school district renewed that focus and instituted a curriculum that includes growing crops, tending an apiary and learning aquaculture techniques, both through a traditional raceway and an aquaponics operation.

Response: Wisconsin Sea Grant's aquaculture advisory services specialist was integral to the renewed focus on agriculture-the aquaculture section in particular. He helped design and set up the recirculating system and the infrastructure to grow fish and plants together. On a regular basis, he advises on water chemistry and fish biology. He provided yellow perch to the school. The Vincent science faculty drew on the knowledge, experience and curriculum of the 20-plus-year aquaculture program at Freedom High School in northeastern Wisconsin. Sea Grant had been integral to creation of that curriculum and the eventual success of the program, which has graduated nearly 1,000 students since it began in 2005, many going on to aquaculture careers.

Results: In each semester, roughly 300 students enroll in Vincent High School agricultural courses. At this point, there is no dedicated course on aquaculture but teachers say its principles are woven throughout the curriculum. That could likely change in the future. One teacher stressed that past work and a future course would not be possible without UW Sea Grant's involvement. He was enthusiastic about an aquaculture course that encompasses the tenets of biology, engineering and chemistry, along with offering pathways to good jobs in the food industry. In fact, Vincent High School's administrators have partnered with Milwaukee Area Technical College, the University of Wisconsin-Milwaukee, University of Wisconsin-Madison and University of Wisconsin-River Falls to streamline the transition from high school to college for Vincent's agricultural sciences students by offering more programs directly linked to the disciplines students are learning. A private southeastern Wisconsin economic development trade association is also working with the high school to foster this emerging skilled workforce.

RECAP: Severely disadvantaged high school students in Milwaukee are being shown a pathway to careers in aquaculture thanks to the leadership of Wisconsin Sea Grant. The program provided yellow

perch and aquaculture curriculum, which has been fashioned to meet Vincent High School's specific needs. Back to Goals

16661 - Aquaculture Information Going Far and Wide
Relevance: Sea Grant's parent agency, the U.S. Department of Commerce, reports that America is the third largest consumer of seafood products in the world, importing 84 percent of the commodity. Of those imports, 50 percent are products of aquaculture. This results in a trade deficit of $9 billion annually.

Response: Wisconsin Sea Grant is working with aspiring and existing aquaculturists to address this trade deficit. Not all of the work is hands-on, some consists of providing materials that are generally rare, out of print and/or inaccessible to those in the industry. Wisconsin Sea Grant has curated this material in what it calls a traveling aquaculture resources library. Sea Grant has also developed and marketed a free, downloadable 14-part aquaculture audio podcast series.

Results: The library has been made available to about 1,350 users in this reporting period, including high school educators with agriculture programs in their schools, which ensures access to young people who could be inspired to adopt an aquaculture career path. The podcast series was made widely available in late August 2012. From that point until the end of this reporting period, there were 45,594 downloads, with users spending an average of 40 minutes with the series.

RECAP: Wisconsin Sea Grant is working with aspiring and existing aquaculturists to address the $9 billion annual U.S. seafood trade deficit. One method of solving this challenge is providing aquaculture materials that are rare and usually inaccessible to those in the industry. Wisconsin Sea Grant has curated this material in what it calls a traveling aquaculture resources library. The library has been made available to about 1,350 users in this reporting period, including high school educators. Additionally, a 14-part aquaculture audio podcast series has been downloaded 45,594 times from August 2012 - January 2013. Back to Goals

15567 - Dangerous Blue-Green Algae Blooms Better Monitored Thanks to Sea Grant
Relevance: Harmful algal blooms (HAB) can kill fish, are dangerous to other aquatic life, and can be dangerous to humans. Resource managers would benefit from an earlier and more reliable way to detect the HABs and provide public health warnings.

Response: A Wisconsin Sea Grant researcher is exploring a method to rapidly and quantitatively detect HABs in freshwater.

Results: The Sea Grant researcher has conducted extensive sampling in freshwater lakes, and compared findings with historical data. Early results point to a previously unrecognized important role of seasonal nitrogen limitation. Nitrogen-fixing cyanobacteria, in this case Aphanizomenon, has preceded large Microcysitis blooms. The researcher suggests that "new N" delivered to the ecosystem through fixation is supporting the potentially toxic blooms. This has important implications for nutrient-loading management in freshwater lakes since most efforts are usually focused on phosphorus instead of nitrogen.

RECAP: Harmful cyanobacterial blooms degrade water quality in freshwater lakes, threatening human and animal health during intense bloom events. A Wisconsin Sea Grant researcher is looking into the occurrence and characteristics of blooms to develop an early-warning system or predictor of such harmful activity. Preliminary research is pointing toward the previously unexplored role of nitrogen in the process. Back to Goals

15554 - Sea Grant Working With Triathletes to Raise Awareness on Aquatic Invasive Species
Relevance: Aquatic invasive species (AIS) have been exponentially increasing in the Great Lakes, particularly since the opening of the St. Lawrence Seaway that has now led to more than a third of species proliferating in the last 50 years. Those sea-introduced invasive species can also spread to inland lakes, which are often a location for triathlons. Wet suits used in triathlons are a vector for the spread of aquatic invasive species. The course markers and safety watercraft used at triathlons also move between events and water bodies.

Response: A Wisconsin Sea Grant advisory services specialist is working with triathlon organizers to raise awareness about steps to prevent the spread of invasive plants, animals and viruses.

Results: This is a new and innovative approach to prevention. Contacts have been made with tournament organizers and further work is pending, including adding AIS-prevention best-management practices to the 2013 USA Triathlon race directors' guide.

RECAP: Wisconsin Sea Grant is working to raise awareness, which is then followed by taking action, among triathlon organizers and triathletes to follow best-management practices to prevent the spread of AIS. Back to Goals

15497 - Fish Research Could Lead to ID'ing Potential Heart Birth Defects in Humans
Relevance: Hatchery managers and aquatic toxicologists who encounter blue sac disease in stocks want a better understanding of and the ability to evaluate the impacts of chemical exposure, dioxin in

particular, on feral populations. Ultimately, chemicals determined to cause hypoplastic heart failure in zebrafish may be useful in identifying heart teratogens women may be exposed to during pregnancy that threaten the life of a fetus.

Response: Wisconsin Sea Grant researchers tested the hypothesis that the underlying cause of blue sac syndrome in zebrafish larvae is a birth defect involving the heart called "hypoplastic heart failure," triggered by dioxin.

Results: Researchers discovered three things: 1) dioxin at low concentrations prevents the formation of the epicardial layer of the heart; the loss of this basic structure leads to edema and heart failure, 2) dioxin reduced the expression of sox9b in the heart and that loss is sufficient to halt the formation of the epicardium and 3) dioxin and the sox9b expression reduce cardiac output.

RECAP: Hatchery managers and aquatic toxicologists now have a framework to predict heart defects that can lead to blue sac syndrome in feral populations. Next, researchers will be able to develop biomarkers and assays that will allow assessment of environmental conditions connected with fish health. Importantly, the work may also lead to the identification of heart teratogens women may be exposed to during pregnancy that threaten the life of a fetus. Back to Goals

15495 - Sea Grant is Feeding Friday Night Fish Fry Tradition in Wisconsin
Relevance: Yellow perch is a prized finfish whose natural stocks in the Great Lakes have declined.

Response: A Wisconsin Sea Grant researcher has found a way to get yellow perch-a consumer favorite-to spawn out of season. The process has been successfully adopted by a private company, Bell Aquaculture of Albany, Ind., as part of its recirculating aquaculture system.

Results: The United States Patent Office has awarded a Wisconsin Sea Grant researcher a patent on the process of out-of-cycle spawning for yellow perch. Bell Aquaculture is the nation's largest yellow perch producer, shipping 1 million pounds in 2011 for a potential market value of more than $12 million wholesale and $20 million retail. In late 2011, the company began operations in an expanded $5-million production facility. Plans are underway for another production-facility expansion in late 2012.

RECAP: A Sea Grant researcher has been awarded a U.S. patent for a process that manipulates light and water temperature to cause yellow perch to spawn out of season. Now, year-round consumer demand is more easily met and aquaculture operations producing the fish can increase their efficiency and profits. Back to Goals

6765 - Reducing the Level of Bio-Contaminants in Fish-Based Foods
Relevance: Consumers seeking healthy food alternatives can turn to fish. The quality and contaminant-free nature of the fish is also a key consideration for consumers.

Response: Wisconsin Sea Grant funded research to determine the location of mercury in fish tissues, and whether certain processing steps could be used to lower mercury levels in the resulting food product, specifically, manipulation of the traditional acid and alkali processes.

Results: The knowledge gained from this project should lead to methods for not only removing mercury from fish-based products but also to produce products that do not suffer from off-flavor formation during transport and storage.

RECAP: A Wisconsin Sea Grant project laid the foundation for future work on reducing the level of bio-contaminants in fish-based food, such as surimi, an imitation crabmeat. Back to Goals

6762 - Sea Grant Reserchers Set the Table for Yellow Perch
Relevance: Yellow perch is a prized finfish whose natural stocks in the Great Lakes have declined. The aquaculture industry is addressing that shortfall by raising the fish in pond systems, where devising an appropriate larval diet has been a challenge.

Response: Wisconsin Sea Grant funded research on conditions under which larval yellow perch succeed.

Results: Researchers have shown the use of inorganic fertilizer in larval yellow perch culture ponds could result in better growth. At least seven pond culturists including the state's largest yellow perch aquaculture operation, are using results from this research to adopt the use of inorganic fertilizer exclusively in their ponds. Two yellow perch production economics models delineating production costs of raising yellow perch have also been developed.

RECAP: Aquaculturists in Wisconsin have identified a need for more guidelines on larval yellow perch diet. Wisconsin Sea Grant has responded with a method that indicates better growth rates. The fish are difficult to feed train and the industry suffers significant losses. Back to Goals

6761 - Sea Grant Provides First Direct Evidence of Mercury-Free Safety of Farm-Raised Fish
Relevance: Wisconsin's aquaculture industry contributes $21 million in annual economic activity and

more than 400 jobs to the state. The safety of that industry's product destined for human consumption should be guaranteed free of contaminants to encourage product loyalty and continued use.

Response: Wisconsin Sea Grant funded research to assess mercury levels in farm-raised yellow perch and rainbow trout through six cohorts raised under contrasting systems groundwater flow-through pond, recirculating tank, recirculating aquaponic and groundwater flow-through.

Results: This project provided the first direct evidence that mercury concentrations in farm-raised yellow perch and rainbow trout are well below health advisory limits. (Measurement was matched against the USDA recommendation of four meals a week or unrestricted). Both aquaculture-raised species, yellow perch and rainbow trout, are good alternatives for consumers seeking the benefits of eating fish without the harmful effects of mercury. In addition, aquaculturists can market their product as a healthy alternative and increase the market share for sustainable fisheries without incurring additional production costs to address mercury concentration.

RECAP: The first direct evidence that mercury concentrations in farm-raised yellow perch and rainbow trout are well below health advisory limits provides strong selling point for those in the aquaculture industry. Aquaculturists can also improve profit margins by keeping production processes as they are, assured that processes are not leading to high levels of mercury concentration. Back to Goals

6758 - World Health Organization Adopts Sea Grant Model on Fish Toxicity
Relevance: There are thousands of toxic compounds in the environment. Because of costs and logistical difficulties, only a fraction of these compounds have undergone rigorous toxicity testing.

Response: Wisconsin Sea Grant researchers developed a risk-assessment model of the toxicity of the full spectrum of dioxin-like compounds on wild fish populations. The research gauged the risk of early-life-stage mortality and morbidity caused by contamination of fish eggs with chlorinated planar aromatic hydrocarbons, including PCDDs (polychlorinated dibenzo-dioxins), PCDFs (polychlorinated dibenzo-furans) and PCBs (polychlorinated biphenyls).

Results: For the first time, the World Health Organization adopted a set of toxicity equivalency factors this Wisconsin Sea Grant model to track what the outcome from exposure to dioxin-like toxicity on wild populations could be.

RECAP: The world's fresh-fish consumers are better protected from toxic chemicals because Wisconsin Sea Grant developed a model, adopted by the World Health Organization, to flag the impact of dioxin-like toxicity on wild fish populations. Back to Goals

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Program Performance Measures (2010 - 2013)

Program Performance Measure	Program Plan Target (2010-2013)	Reported	Program Comments
Percentage reduction in the number of anglers calling Wisconsin Sea Grant to report gear lost in trap nets.	50	299	2010 - We anticipate being able to reach this goal at the conclusion of our workplan timeframe. 2012 - This goal has been achieved. There have been no calls reporting lost gear in trap nets. Because we have exceeded our target in this performance measure, we are not indicating any anticipated work for the coming reporting period. We may in fact add to our accrued figures but prefer to focus our work plan on further priorities now that this target has been achieved. 2013 - There was one call reporting lost gear in trap nets
The number of downloads of trapnet maps from the Wisconsin Sea Grant website.	4,000	12,302	2012 - Over the entire period of the workplan, UW Sea Grant has exceeded its goal of 4,000 2013 - Trap net maps on the Sea Grant website were downloaded 1,272 times. The maps were also shared with the private-sector Lake Link fishing forum site where they were viewed 5,277 times.
The number of Lake Michigan trap net maps distributed in the Two Rivers-	1,600	3,600	2012 - In 2011-12, 1,000 maps were distributed so within this overall reporting period of 2010-14, we have exceeded the goal. Additionally, another 100 waterproof maps were distributed in the Sheboygan area of Wisconsin, also on Lake Michigan. This continues to be

Manitowoc area of Wisconsin.			an important effort for us but we did indicate zero in the anticipated column just to be certain to signal other priorities are pushing toward the front for us since we have exceeded this performance measure. 2013 - 850 trap net maps were distributed to the Two Rivers-Manitowoc, Wis., area.
Economic (market and non-market) benefits ($) derived from the application of urban aquaculture and large-scale recirculating aquaculture system technology as a result of Wisconsin Sea Grant aquaculture research and regional outreach activities.	100,000	120,194,055	2012 - In previous reporting periods, the figures have been approximately $55M in 2010-11 and $60M in 2011. This reporting period, the figures are reflective, mainly, of a major employer and producer in Indiana, Bell Aquaculture, and one in Port Washington, Wis., where the owner has just expanded construction a former feed mill. Anticipated figures are reflective of two startups, one in Milwaukee and one in Racine, Wis.
Number of Great Lakes residents of subsistence communities and seafood sales managers that show increased knowledge of the health benefits and risks of seafood consumption and the impacts of seafood choices on fisheries sustainability.	40	16	2010 - We are on track to hit this target within the timeframe of our workplan. 2012 - Wisconsin Sea Grant recently added a social scientist to its team. She is refining surveys and analyzing results from those more than 200 consumer surveys to shape a pilot effort regarding health benefits and risks of seafood consumption to share with various audiences, including subsistence communities and seafood sales managers. Work toward the goal of 40 will be ongoing in 2013-14. 2013 - Several Wisconsin Sea Grant staff members have formed a work group to determine information and outreach needs for relevant communities and seafood sales managers. The ultimate aim is to increase the sale of Wisconsin fish. Staff expect to contact more than 100 seafood sales managers. They are also planning to determine a performance metric to evaluate the results of that outreach work.
Number of new regional aquaculture businesses that will be started as a result of Wisconsin Sea Grant research aquaculture outreach.	2	8	2012 - In two previous reporting cycles, Wisconsin Sea Grant reported a total of eight, six beyond its goal. Because we have exceeded our target in this performance measure, we are not indicating any anticipated work for the coming reporting period. We may in fact add to our accrued figures but prefer to focus our work plan on further priorities now that this target has been achieved. 2013 - A new urban aquaculture operation, The Farmshed, is currently in the process of refurbishing a large greenhouse facility in downtown Stevens Point, WI. Wisconsin Sea Grant has provided aquaculture advice and assistance to the business. Sea Grant staff met with the owners in November 2013 and January 2014 about raising of yellow perch in a traditional aquaculture setting as well as through aquaponics. The business expects to be operational by the spring of 2015. A second new business will be established before 2014 closes and this represents a partnership between Bell Aquaculture and Will Allen Farms and the FishRich product that Bell Aquaculture produces. Will Allen Farms, in cooperation with Growing Power of Milwaukee will be the primary distributor for the Bell Aquaculture FishRich

			product. This product represents a $1.5 million retail value. This new business, the distribution and sales of the FishRich product is anticipated to create three to five new jobs, which include marketing and sales specialists. Wisconsin Sea Grant is a longtime advisor on aquaculture and fish husbandry to both entities.
Number of new, large-scale, urban aquaculture facilities marketing products in the Midwest as a result of Wisconsin Sea Grant research and regional outreach.	1	0	2010 - We are on track to hit this target within the timeframe of our workplan. 2012 - Wisconsin Sea Grant expects that before 2013 closes, two new operations will be underway in southeastern Wisconsin. 2013 - Wisconsin Sea Grant expects that before 2014 closes, one new operation (Will Allen Farms) will be underway in Milwaukee. This will be a pilot project on 10th and North Avenue. Also, a second business will be established before 2014 closes and this represents a partnership between Bell Aquaculture and Will Allen Farms and the FishRich product that Bell Aquaculture produces. Will Allen Farms, in cooperation with Growing Power of Milwaukee, will be the primary distributor for the Bell Aquaculture FishRich product. This product represents a $1.5 million retail value. This new business, the distribution and sales of the FishRich product is anticipated to create three to five new jobs, which include marketing and sales specialists. Wisconsin Sea Grant will provide critical aquaculture advice and assistance to the successful functioning of these businesses.
Number of seafood consumers reached through workshops and outreach at supermarket sample stations.	500	885	2010 - We are on track to hit this target within the timeframe of our workplan. 2012 - Because this project has a significant social science element, it was placed on hold when the decision was made to hire a social scientist outreach specialist for Wisconsin Sea Grantâ€™s Milwaukee field office. Now, the project is moving forward based on findings from more than 200 consumer surveys. Workshop and outreach messaging will be informed by the surveys. In 2013-14, Wisconsin Sea Grant will work toward achieving the 500-person goal confident in its social-science-validated efforts. 2013 - By 2014-15, supermarket sample stations, in-store materials and community presentations will provide information on seafood risks and benefits to 1,000 consumers. In 2013-14, 213 grocery store shoppers were surveyed, along with offered samples, to determine their knowledge and perceptions of Wisconsin seafood. Focus groups were also conducted, which included sample stations, with 16 grocery store shoppers to test outreach materials and get recommendations on how best to disseminate information among consumers. The focus groups led Wisconsin Sea Grant to shift outreach materials from a focus on safety to a focus on locally sourced. Consumers care that their food comes from Wisconsin. By telling them the fish was safe, it actually raised more questions. The focus groups indicated that magnets, brochures and interactive fun outreach activities would be best. â€œEat Wisconsin Fishâ€ aprons will be distributed and community outreach presentations are being organized to engage the public in at least six locations around the state. Some presentations will be held at restaurants where Wisconsin seafood and beer pairings will be served.
Number of stores that increase sales of fish from the Great Lakes or regional aquaculture	1	0	2010 - We are on track to hit this target within the timeframe of our workplan. 2012 - Because this project has a significant social science element, it was placed on hold when the decision was made to hire a social scientist outreach specialist for Wisconsin Sea Grantâ€™s Milwaukee field office. Now, the project is moving forward based on

facilities by at least 10%.			findings from more than 200 consumer surveys. Staff will work with one grocery store to pilot communication products on the sustainability and health risks and benefits of Great Lakes and Wisconsin farm-raised fish. Wisconsin Sea Grant will then refine the products and distribute them statewide. Such actions, the program believes, will ensure this goal is met. 2013 - Although this goal was not met by the end of the 2013 reporting period, it was met by the conclusion of March 2014. After hiring a social scientist, this project moved forward during 2013 with the design of an educational campaign for grocery store customers based on findings from 213 surveys conducted in grocery stores and input from the Wisconsin Department of Natural Resources, Wisconsin Department of Health Services, Wisconsin Aquaculture Association, and several commercial fishermen. Led by Wisconsin Sea Grantâ€™s social scientist, educational materials were then tested with several focus groups. Staff believe the feedback received from these focus groups was well worth delaying the project slightly. After revising the materials based on the focus group comments, a campaign called â€œEat Wisconsin Fishâ€ launched in March 2014 in two Madison-area grocery stores to increase awareness of purchasing and eating wild Great Lakes fish and Wisconsin farm-raised fish. The Sea Grant social scientist will further devise valid tracking methods to analyze the success of the effort.
The jobs created derived from the application of urban aquaculture and large-scale recirculating aquaculture system technology as a result of Wisconsin Sea Grant aquaculture research and regional outreach activities.	5	328	2012 - Again, this is related mainly to Bell Aquaculture. In this reporting period, as in past ones, Wisconsin Sea Grant has exceeded its goal of 5. Additionally, Bell Aquaculture reports 243 jobs indirectly related to its operations in this 2012-13 reporting period. 2013 - In this reporting period, Bell Aquaculture of Redkey, Ind., reports that it retained a total of 42 employees 38 full-time employees and four part-time employees. Growing Power employed 80 workers combined total at their Milwaukee and Chicago-based urban agricultural sites 46 full-time and 34 part-time employees. PortFish, Ltd. (Port Washington, Wis.), as a result of their relocation and expanded construction in the last reporting period, has two full-time employees currently. By 2015, with the expected start-up of Will Allen Farms, the number of jobs in this category is expected to increase. Sea Grant anticipates that many jobs will be created in areas of design and construction of the facility, in addition to the jobs that will be required for daily operation of the fingerling production facility. The 10th and North Avenue commercial-scale community-based operation represents $1.5 million investment and will create eight to10 new jobs. The second Will Allen Farms initiative consists of an urban-commercial scale yellow perch production facility only. The target for year one operations would be 1 million pounds of yellow perch. Sea Grant anticipates that this commercial operation will create 15-20 new jobs. The anticipated investment for this commercial scale operation is 20 million dollars. In all instances, Wisconsin Sea Grant provides critical aquaculture advice and assistance to the successful functioning of these businesses.

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Program Objectives (2010 - 2013)

Program Objective	Achieved (yes/no)	Program Comments
By 2014,	No	2012 - Because this project has a significant social science element, it

Supermarket sample stations disseminate information on seafood risks and benefits to 1,000 consumers.		was placed on hold when the decision was made to hire a social scientist outreach specialist for Wisconsin Sea Grant's Milwaukee field office. After this specialist was hired, two additional grocery stores were surveyed (total of 213 surveys collected). The new social scientist reviewed the data collected in the surveys and the project is moving forward based on the survey findings. Staff will work with one grocery store to pilot communication products on the sustainability and health risks and benefits of Great Lakes and Wisconsin farm-raised fish. Wisconsin Sea Grant will then refine the products and distribute them statewide. 2013 - By 2014-15, supermarket sample stations, in-store materials and community presentations will provide information on seafood risks and benefits to 1,000 consumers. In 2013-14, 213 grocery store shoppers were surveyed to determine their knowledge and perceptions of Wisconsin seafood. Focus groups were also conducted with 16 grocery store shoppers to test outreach materials and get recommendations on how best to disseminate information among consumers. The focus groups led Wisconsin Sea Grant to shift outreach materials from a focus on safety to a focus on locally sourced. Consumers care that their food comes from Wisconsin. By telling them the fish was safe, it actually raised more questions. The focus groups indicated that magnets, brochures and interactive fun outreach activities would be best. "Eat Wisconsin Fish" aprons will be distributed and community outreach presentations are being organized to engage the public. Some presentations will be held at restaurants where Wisconsin seafood and beer pairings will be served. A new fact sheet, "Lake Superior Whitefish" is available at three Lake Superior fish markets.
By 2014, At least one seafood store will increase its sales of Great Lakes fish or fish from regional aquaculture facilities by at least 10% as a result of Sea Grant outreach.	No	2013 - This goal was met just outside of the reporting period-in March 2014. After hiring a social scientist, this project moved forward during 2013 with the design of an educational campaign for grocery store customers based on findings from 213 surveys conducted in grocery stores and input from the Wisconsin Department of Natural Resources, Wisconsin Department of Health Services, Wisconsin Aquaculture Association, and several commercial fishermen. Led by Wisconsin Sea Grant's social scientist, educational materials were then tested with several focus groups. Sea Grant staff believe the feedback received from these focus groups was well worth delaying the project slightly. After revising the materials based on the focus group comments, a campaign called "Eat Wisconsin Fish" did launch in March 2014 in two Madison-area grocery stores to increase awareness of purchasing and eating wild Great Lakes fish and Wisconsin farm-raised fish. While the campaign could have been launched in late 2013, it was decided that March would be preferable because it coincides with the season of Lent when many people in Wisconsin increase their seafood consumption. Wisconsin has one the nation's highest Catholic populations. Sea Grant publicized the campaign in the grocery store newsletter (it is a food cooperative with two locations) that reaches 30,000 households, and sponsored sample stations and special events throughout the month, including a special fish and beer pairing dinner at a local brewery. Local fish had special signage in the seafood displays.
By 2014, Four Wisconsin Sea Grant aquaculture workshops are conducted, resulting in Great Lakes region fish farmers adopting two new techniques to improve yellow perch culture.	Yes	2012 - One workshop was held in 2012 one in January. Another five are planned for 2013. 2013 - Six workshops were conducted for the reporting period, one per month from February through June 2013 and one in January 2014. These were held at Growing Power-Milwaukee. Approximately 25 attendees per month were instructed on aquaponics and aquaculture systems technology, water chemistry and fin fish husbandry (broodstock development and management, intensive aquaculture technology and rearing methods for raising fingerling to market-size fish.) By January 2015, six workshops will be held at Growing Power-Milwaukee for participants in Growing Power's three-day Aquaponics Workshop. Sea Grant's aquaculture specialist will have presented six one-day workshops on design and construction of natural and hybridized aquaponic systems, water chemistry, aquatic microbiology, and aquaponic and aquaculture systems technology. Sea Grant staff will also advise the Growing Power staff regarding hands-on training principles of aquaponics technology and plant selection. In the next reporting period, Sea Grant will partner with Growing Power to

		organize and present an aquaponics workshop-Growing Power's 3rd Annual National and International Urban Small Farm Conference. In years past, this conference has attracted 1,500 to 2,000 participants.
By 2014, outreach at grocery stores and six workshops will be conducted to increase consumer awareness about the human health benefits and risks of various seafood items.	No	2012 - Six workshops may not be necessary depending on the location of the producers and stores with whom we work. Strategic population densities and target audiences can be grouped geographically and we may be able to reach a large population with fewer workshops. 2013 - One workshop was held in October 2013, when Wisconsin Sea Grant partnered with Minnesota Sea Grant to hold the Lake Superior Fish Classic, a chef cooking competition and public tasting event where more than 285 people enjoyed sampling Lake Superior whitefish and lake herring (cisco). A UW Sea Grant lake whitefish fact sheet, which highlights the health benefits and potential risks of eating whitefish, was distributed during the event. By 2014-15, additional supermarket sample stations, in-store materials and community presentations (the goal is for at least six presentations) will provide information on seafood risks and benefits to 1,000 consumers. In 2013-14, 213 grocery store shoppers were surveyed to determine their knowledge and perceptions of Wisconsin seafood. Focus groups were also conducted with 16 grocery store shoppers to test outreach materials and get recommendations on how best to disseminate information among consumers. The focus groups led Wisconsin Sea Grant to shift outreach materials from a focus on safety to a focus on locally sourced. Consumers care that their food comes from Wisconsin. By telling them the fish was safe, it actually raised more questions. The focus groups indicated that magnets, brochures and interactive fun outreach activities would be best. "Eat Wisconsin Fish" aprons will be distributed and community outreach presentations are being organized to engage the public. Some presentations will be held at restaurants where Wisconsin seafood and beer pairings will be served. Other presentations will feature talks by commercial fishermen, Sea Grant outreach specialists, fish farmers and chefs.
By 2014, Sea Grant-UW System-USDA partnerships are strengthened.	Yes	2012 - This relationship is linked to the genetically improved yellow perch broodstock research that is related to the award of a U.S. Patent. Initial research was funded by Sea Grant. The USDA has also supported it. Currently, funding stands at about $500K annually. 2013 - Due to continued Sea Grant work with the genetically improved yellow perch broodstock research with USDA, performance trials have produced the F3 generation during this reporting period. This generation represents the most domesticated and advanced genetically improved yellow perch broodstock to be used for intensive aquaculture in recirculating aquaculture systems. A six-month experiment was conducted at a private fish farm in Black Creek, Wis., as part of a cooperative research agreement project with USDA. The study documented the growth of yellow perch (monthly sampling) that were fed different diets of fishmeal versus non-fishmeal. In 2013, Sea Grant staff based at the University of Wisconsin-Milwaukee School of Freshwater Sciences, USDA/Agricultural Research Service (Wisconsin and Montana), and U.S. Fish and Wildlife worked on formulation and evaluation of optimized mineral supplementation. By 2015, cooperative research projects between Sea Grant, USDA and Blue Iris Fish Farm-the Black Creek, Wis. operation-will continue. Sea Grant expects to expand research efforts with other stakeholders in the region involving, for example, diet experiments with Bell Aquaculture of Redkey, Ind., out-of-cycle spawning with the Milwaukee Fish Co., and improved intensive aquaculture technology practices with Will Allen Farms of Milwaukee.
By 2014, Supermarket sample stations disseminate information on seafood sustainability to 1,000 consumers.	No	2012 - This project relies heavily on social science and Wisconsin Sea Grant only recently hired a social scientist. This project is now greatly benefitting from her expertise and is on track to reach this goal. 2013 - By 2014-15, supermarket sample stations, in-store materials and community presentations will provide information on seafood risks and benefits to 1,000 consumers. In 2013-14, 213 grocery store shoppers were surveyed to determine their knowledge and perceptions of Wisconsin seafood. Focus groups were also conducted with 16 grocery store shoppers to test outreach materials and get recommendations on how best to disseminate information among consumers. The focus groups led Wisconsin Sea Grant to shift outreach materials from a focus on safety to a focus on locally sourced.

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By 2014, the number of anglers who call Wisconsin Sea Grant to report lost gear in trap nets declines by 50%, and the number of boaters who become entangled in trap nets is reduced.	Yes	2012 - In 2012-13 no one called about lost gear. 2013 - In 2013-14 there was one call about lost gear.
By 2014, Wisconsin Sea Grant and partners demonstrate 2 new yellow perch production methods to fish farmers.	Yes	2012 - Sea Grant will work with Will Allen Farms LLC on the methods to incubate, hatch and raise to fingerling-size yellow perch. The goal in late 2013 or early 2014 is to begin production of 1 million fingerlings. The second method is working with the city of Racine on a for-profit undertaking to raise 1 million fingerlings in an aquaculture setting to market size. 2013 - As of January 2014, Will Allen Farms LLC and the city of Racine are in the process of looking for investors for their yellow perch production facilities. The goal of Will Allen Farms is to have a two-fold operation in Milwaukee: a 1 million fingerling production facility, which will supply yellow perch fingerlings to aquaculture businesses, and a grow-out facility for the sale of market-size yellow perch. Sea Grant will work with Will Allen Farms LLC on the methods to incubate, hatch and raise to fingerling-size yellow perch. Sea Grant will also demonstrate techniques used to raise yellow perch from fingerlings to grow-out. By 2015, the goal is that work will continue on the fingerling production and grow-out facilities for Will Allen Farms. Using technology-transfer practices, the Milwaukee Fish Co. and the City of Racine Aquaculture Initiative will adopt these technology practices for their commercial operations. By 2015, Sea Grant anticipates having three urban commercial operations for yellow perch located in southeastern Wisconsin.
By 2014, Wisconsin Sea Grant assists in the start-up of two new urban aquaculture operations and one large-scale aquaculture facility in the region.	Yes	2012 - Will Allen Farms LLC is located in Milwaukee and the City of Racine fingerling to market-size operation is also in an urban setting. It's expected that operations in both will begin in late 2013 or in early 2014. 2013 - As of January 2014, Will Allen Farms LLC and the city of Racine are in the process of looking for investors for their yellow perch production facilities. It is expected that operations for Will Allen Farms will begin in late 2014 or in early 2015. Will Allen Farms consists of two initiatives. The 10th and North Avenue location represents a commercial-scale community-based agriculture/aquaculture initiative. This business would create eight to 10 new jobs. The second Will Allen Farms initiative consists of an urban commercial-scale yellow perch production facility only. The target for year one operations would be 1 million pounds of yellow perch. Will Allen Farms and Sea Grant anticipate that this commercial operation will create 15-20 new jobs. It's also anticipated that construction of the City of Racine Aquaculture Initiative will begin in early 2015. A new urban aquaculture operation, The Farmshed, is currently in the process of refurbishing a large greenhouse facility in downtown Stevens Point, Wis. Sea Grant staff met with the owners in November 2013 and January 2014 to provide technical advice on aquaponic and aquaculture systems and the raising of yellow perch in these systems. The Farmshed is expecting to come

		online in the spring of 2015.
By 2014, Wisconsin Sea Grant outreach on seafood purchases and sustainable fisheries will contact 50% of Wisconsin fish producers, buyers and store managers.	No	2012 - Wisconsin Sea Grant had undergone numerous personnel changes in this reporting period that affected this project now, the project is fully staffed and this 50% goal should be attainable. One important aspect to note is the contribution from Wisconsin Sea Grant's newly hired social scientist. She will be able to help define needs and understandings related to purchases and sustainable fisheries to then more effectively contact fish producers, buyers and store managers. 2013 - By 2014-15, a questionnaire will be sent by survey or delivered in person to 50 percent of Wisconsin fish producers, distributors and store managers. That information will be used to create outreach materials, if need, for these three groups. The material would be to primarily inform Wisconsin Sea Grant's ongoing "Eat Wisconsin Fish" campaign. Issues like supply bottlenecks and the use of a consistent Wisconsin marketing logo would be addressed.
By 2014, Wisconsin Sea Grant research results in ways to improve yellow perch production in recirculating aquaculture facilities.	Yes	2012 - A patent has been awarded on a method to raise yellow perch year round. 2013 - A patent has been awarded on a Wisconsin Sea Grant-developed method to raise yellow perch year round.
By 2014, Wisconsin Sea Grant will provide outreach to grocery stores and conduct six workshops that will increase consumer awareness about the effects of consumer choices on fisheries sustainability.	No	2012 - Six workshops may not be necessary depending on the location of the producers and stores with whom we work. Strategic population densities and target audiences can be grouped geographically and we may be able to reach a large population with fewer workshops. 2013 - By 2014-15, supermarket sample stations, in-store materials and community presentations will provide information on seafood risks and benefits to 1,000 consumers. In 2013-14, 213 grocery store shoppers were surveyed to determine their knowledge and perceptions of Wisconsin seafood. Focus groups were also conducted with 16 grocery store shoppers to test outreach materials and get recommendations on how best to disseminate information among consumers. The focus groups led Wisconsin Sea Grant to shift outreach materials from a focus on safety to a focus on locally sourced. Consumers care that their food comes from Wisconsin. By telling them the fish was safe, it actually raised more questions. The focus groups indicated that magnets, brochures and interactive fun outreach activities would be best. "Eat Wisconsin Fish" aprons will be distributed and community outreach presentations are being organized to engage the public. The plan is to conduct at least six presentations. Some presentations will be held at restaurants where Wisconsin seafood and beer pairings will be served. Others will feature talks by commercial fishermen, Sea Grant outreach specialists, fish farmers and chefs.
By 2014, Wisconsin Sea Grant will support aquaculture research to improve yellow perch farming.	Yes	2012 - In previous reporting periods, we have achieved this, notably with the award of U.S. Patent on out-of-season breeding techniques. One prime example on target for 2013 is a method that will be explored by partnering with Bell Aquaculture in Redkey, Ind. The business has infrastructure in place to use genetically improved yellow perch broodstock to increase from egg to market size yellow perch growth and development. Millions of eggs will be incubated in a flow-through system and then transferred to a recirculating system. 2013 - By 2014-15, supermarket sample stations, in-store materials and community presentations will provide information on seafood risks and benefits to 1,000 consumers. In 2013-14, 213 grocery store shoppers were surveyed to determine their knowledge and perceptions of Wisconsin seafood. Focus groups were also conducted with 16 grocery store shoppers to test outreach materials and get recommendations on how best to disseminate information among consumers. The focus groups led Wisconsin Sea Grant to shift outreach materials from a focus on safety to a focus on locally sourced. Consumers care that their food comes from Wisconsin. By telling them

		the fish was safe, it actually raised more questions. The focus groups indicated that magnets, brochures and interactive fun outreach activities would be best. "Eat Wisconsin Fish" aprons will be distributed and community outreach presentations are being organized to engage the public. The plan is to conduct at least six presentations. Some presentations will be held at restaurants where Wisconsin seafood and beer pairings will be served. Others will feature talks by commercial fishermen, Sea Grant outreach specialists, fish farmers and chefs.
Each year, Wisconsin Sea Grant will update and distribute about 1,500 maps of the locations of trap nets in the Manitowoc-Two Rivers area, and it will make the annually update map available for download free of charge from the Wisconsin Sea Grant Web site.	Yes	2010 - A note about the wording in this objective -- the maps are updated weekly, not annually. 2011 - A note about the wording in this objective -- the online maps are updated weekly, not annually. 2012 - In 2012-13, 850 maps were distributed and the locations were uploaded, and regularly updated, on the Internet. There were nearly 2,000 visits to the online trap net material in this reporting year. 2013 - Wisconsin Sea Grant provides trap net maps in the form of waterproof paper copies at boat launches and through multiple online sources. In this reporting period, Wisconsin Sea Grant provided 850 maps at Two Rivers-Manitowoc, Wis., boat ramps and 300 maps at Sheboygan, Wis., bait shops and marinas. The maps were posted to the Lake Link fishing forum (http://www.lake-link.com/forums/Great-Lake-Fishing/) and was viewed 3,360 times for Two Rivers-Manitowoc and 1,917 times for Sheboygan. Trap net maps on the Sea Grant website (http://seagrant.wisc.edu/Home/Topics/FishandFisheries/Details.aspx?PostID=396) were downloaded 1,001 times in the case of the Two Rivers-Manitowoc map and 271 in the case of the Sheboygan map.