Communications, Student Engagement, Extension and Education Outreach Work Plans for 2018-2021

University of Wisconsin Sea Grant Institute

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Introduction

ABOUT WISCONSIN SEA GRANT

The Wisconsin Sea Grant College Program was formed in 1968. It was the first Sea Grant program on the Great Lakes. In 1978, the UW System transferred responsibility for the management of the system-wide and state-wide program to UW-Madison. It now falls under the administration of the Vice Chancellor for Research and Graduate Education and housed in the Aquatic Sciences Center. The main office is in Goodnight Hall on the UW-Madison campus and there are field offices on UW System campuses in Superior, Green Bay, Manitowoc and Milwaukee. In its nearly 50 years, Wisconsin Sea Grant has funded more than $120 million worth of research projects. In that time, Wisconsin Sea Grant has also provided financial support for over 700 graduate students and hundreds of faculty and staff at public and private universities and colleges in Wisconsin, and the statewide UW-Extension system.

ABOUT THE WORK PLANS

The communications, student engagement and extension and education outreach work plans are inspired by the vision, goals, strategies and anticipated outcomes of the 2018-21 Strategic Plan for the University of Wisconsin Sea Grant College Program (http://go.wisc.edu/nj1965). The strategic plan was guided by extensive stakeholder engagement including a survey with nearly 300 responses, 14 facilitated discussions with stakeholders on key topics and the deliberations of a statewide advisory council.

Each individual work plan element follows a common template that provides context; lists proposed activities and impact; identifies partners and intended audience; and correlates to strategies, outcomes and performance measures in the strategic plan. While these elements are identified by the staff member leading the efforts, many involve synergistic activity of multiple staff. The elements are tied to the national focus areas of Healthy Coastal Ecosystems (HCE), Sustainable Fisheries and Aquaculture (SFA), Resilient Communities and Economies (RCE) and Environmental Literacy and Workforce Development (ELWD). Several work plan elements overlap two or more focus areas.

The work plans were reviewed by the Wisconsin Sea Grant Advisory Committee on Outreach and Education at a meeting in Green Bay on September 20, 2017. The committee consists of 20 people who:

- provide guidance related to the extension, communications, and education missions of Wisconsin Sea Grant;
- help Wisconsin Sea Grant fully engage Great Lakes stakeholders;
- give advice on the development of strategic and work plans; and,
- help staff more effectively communicate impacts of their work.

The committee serves in an ad-hoc manner. Members are appointed by the Assistant Director for Extension with advice from outreach specialists and concurrence from the management team and are identified in Table 1. Seven members attended the September meeting, affirmed the work plan and were impressed with the range of current and proposed staff activities.

The work plans were also reviewed by five Sea Grant extension program leaders during a period extending from September 14 to 27, 2017. A template for review included six sections and an overall rating. Mean scores on a scale of 1-5 with 1 represented as poor and 5 represented as excellent were as follows: relevance to strategic plans (4.6); context (3.8); planned activities (4.4); audience and partners (4.8); outcomes and measures (4.2); and impact (4.2). The mean overall rating was 4.4. The communications work plan was also separately reviewed by three Sea Grant communications managers.

Many comments from the advisory committee and the reviews have been addressed in this edition of the work plan.

Table 1. Wisconsin Sea Grant Advisory Committee on Outreach and Education

Carmen Aguilar	Associate Scientist, School of Freshwater Sciences, University of Wisconsin-Milwaukee, Milwaukee, WI
Kate Angel	Federal Consistency and Coastal Hazards Coordinator, Wisconsin Coastal Management Program, Madison, WI
Bill Brose	Principal, Smith Group JJR, Madison, WI
Brenda Coley	Co-Executive Director, Milwaukee Water Commons, Milwaukee, WI
Bart De Stasio *	Professor, Lawrence University, Appleton, WI
Matt Eitrem	GIS Coordinator, City of Ashland, Ashland, WI
Mary Erpenbach	President, Cherry Street Agency, Beloit, WI
Denny Fox	National Tournament Director, AIM Pro Walleye Series, Weyauwega, WI
Steve Galarneau	Director, Office of Great Waters, Wisconsin Department of Natural Resources, Madison, WI
Lee Haasch *	President/Captain, Haasch Guide Service, Algoma, WI
Vicky Harris *	Coordinator, Wisconsin Clean Marina Program, DePere, WI
Lynn Kurth *	7th/8th Grade Teacher, Prairie River Middle School, Merrill, WI
Edith Leoso	Tribal Historic Preservation Officer, Bad River Band of Lake Superior Chippewa, Odanah, WI
Marge Loch-Wouters *	Children's Librarian, retired and Consultant, Loch-Works Consulting, La Crescent, MN
Patrick Robinson	Interim Director, CNRED State Program, UW-Extension, Green Bay, WI
Victoria Rydberg	Environmental Education Consultant, Wisconsin Department of Public Instruction, Madison, WI
Jason Serck	Econ Dev/Planning/Port Director, City of Superior, Superior, WI
Aaron Thompson *	Assistant Professor and Land Use Specialist, Center for Land Use Education, UW-Stevens Point, Stevens Point, WI
Angie Tornes	Rivers, Trails, and Conservation Assistance Program, National Park Service, Milwaukee, WI
Pat Wilborn *	Aquaculture Farmer, PortFish, Ltd., Port Washington, WI

* attended advisory committee meeting in Green Bay on September 20, 2017

STAFF AND ACTIVITY BY FOCUS AREA

The communications work plan was coordinated by Moira Harrington, assistant director for communications. Harrington formulates communications strategy for Wisconsin Sea Grant and directs the activities of five professionals listed below. Drawing on her previous career working on communications and public policy for a Wisconsin lawmaker, she also assists with legislative engagement. Harrington holds a B.A. in journalism and a B.A. in political science from the University of Wisconsin-Madison.

- Aaron R. Conklin, Social Media Coordinator and Science Communicator
- Yael Gen, Graphic Designer
- John Karl, Video Producer
- Elizabeth White, Publications Editor
- Marie Zhuikov, Science Communicator

The student engagement work plan was coordinated by Jennifer Hauxwell, assistant director for research and student engagement. Hauxwell oversees the research enterprise at Wisconsin Sea Grant — from pre-proposal stage through final reporting. Her specialty is limnological research. She has mentored numerous students, so her efforts in student engagement are a good match between her skill set and our emerging focus on student engagement. She holds a Ph.D. in aquatic ecology from Boston University's Marine Program at the Woods Hole Marine Biological Laboratory.

The extension and education outreach work plan was coordinated by David Hart, assistant director for extension. Hart supervises all extension activities, which encompass the work of nine specialists listed below. His own specialty bridges geographic information science and urban and regional planning. He holds a Ph.D. in land resources from the University of Wisconsin-Madison.

- Fred Binkowski, Aquaculture Outreach Specialist
- Tim Campbell, Aquatic Invasive Species Outreach Specialist
- Gene Clark, Coastal Engineering and Ports, Harbors and Marinas Outreach Specialist
- Kathleen Schmitt Kline, Education Outreach Specialist
- Anne Moser, Senior Special Librarian and Education Outreach Specialist
- Julia Noordyk, Water Quality and Coastal Communities Outreach Specialist
- Deidre Peroff, Social Science Outreach Specialist
- Titus Seilheimer, Fisheries Outreach Specialist
- Emma Wiermaa, Aquaculture Outreach Specialist

The breakdown of communications, student engagement and extension and education outreach activities by focus area is as follows: healthy coastal ecosystems (25%), sustainable fisheries and aquaculture (30%), resilient communities and economies (28%), and environmental literacy and workforce development (17%). This was calculated by correlating Sea Grant-funded staff effort by the distribution of activities by focus area.

Communications

Moira Harrington, Assistant Director for Communications

BACKGROUND

Wisconsin Sea Grant's communication's program—and work plan for 2018-21—relies on established principles. These include understanding the audience (s); shaping messages appropriate to those audiences; exploring and applying new communication tools and strategies, while maintaining past-proven ones; and conducting analysis on the effectiveness of communication.

In Wisconsin, a complementary federal-state-academic water research program, the University of Wisconsin Water Resources Institute, is managed by the Aquatic Sciences Center on the University of Wisconsin-Madison campus. The Aquatic Sciences Center is also the administrative home of Wisconsin Sea Grant. This operating structure allows for efficiencies in the communication program. Wisconsin Sea Grant communication staff are engaged with the Water Resources program. In addition, since the audiences, messaging, tools and communications platforms are similar, branding on one program can strengthen and support the other.

This work plan tracks along with Wisconsin Sea Grant's 2018-21 strategic plan and the National Sea Grant Office's four-year plan in its goals within the four focus areas of healthy coastal ecosystems, sustainable fisheries and aquaculture, resilient communities and economies, and environmental literacy and workforce development.

Each year, the Wisconsin communications program operates under a tailored strategic and tactical plan—with a breakdown of month-by-month activities—which is continually monitored to ensure it is responsive and effectively sharing research findings and extension projects that benefit Wisconsin's coastal communities.

The communications vehicles, platforms and tools used to carry Wisconsin Sea Grant messages are varied and laser-focused applied to intended audience(s). One method does not fit all audiences. It is critical to assess each audience and then select the best way or ways to reach those audiences with timely and relevant content. The vehicles, platforms and tools include *news releases, news conferences, news pitches, public events, curriculum kits, posters, photography, listservs, partner organizations, biennial reports, support for scientific publication reprints, project and people directories, postcards, a quarterly program newsletter, fact sheets, audio podcasts, handbooks/workbooks, research reports, websites, social media, videos, letters to the editor, op-eds and targeted pitches to traditional media outlets.*

Under the Approach/Planned Activities section of this work plan, a proposed month-by-month set of possible activities and triggers for activities is laid out.

OBJECTIVES

- A stronger brand that celebrates strength; builds awareness and then elicits a thought, a feeling or an action; provides a shortcut for audiences sorting through choices; and highlights a differentiated mission, and at the same time, provides a signal that Sea Grant is locally focused, familiar, trusted, grounded in science and academia and non-advocating.

- A greater comprehension of coastal research, processes and relevant issues among target audiences in each of the focus areas—healthy coastal ecosystems, resilient communities and economies, sustainable fisheries and aquaculture, and educational literacy and workforce development.
- An enhanced perception among target audiences so they recognize their roles and actions can make a difference in coastal communities. Determining priority audiences will be a factor of what research and extension projects are program priorities. For example, if Lake Superior education is a key extension project, educators in that market will be a priority audience. If an important research project in the portfolio involves an emerging wild fish disease, the priority audience will be recreational anglers, the commercial fishing industry, the charter fishing industry, and state and federal resource managers.
- Progress toward advancing behavior change based on Wisconsin Sea Grant's communication efforts.

APPROACH/PLANNED ACTIVITIES

- Ongoing development of key messages.
- Maintain constant awareness of the audiences receiving these messages, using language and graphics appropriate to audience educational levels.
- Build on Sea Grant's reputation using earned and appropriate paid media, and other targeted communication.
- Work with the director, researchers and extension staff to disseminate messages through the appropriate medium to reach intended audiences.
- Ensure the proper level of identification and attribution of Sea Grant contributions in collaborative communication efforts. In each instance, strive to have Sea Grant appear in the "final" story.
- Maintain flexibility. This allows a readiness to respond to external factors relative to Great Lakes, coastal and other water-related topics, e.g. local debates on water diversion or Great Lakes remediation efforts. The communications program can be flexible because it has seasoned professionals who remain current with trends and news, as well as those who are connected with program peers in specialized areas. The peers signal where attention could be focused.
- Use existing communication networks and maximize opportunities in Wisconsin, regionally and nationally.
- Attune to new channels, tools and techniques, assessing for possible application. Assessment for Wisconsin Sea Grant's possible use would involve professional networking with colleagues to gain their insights, as well as other research in professional publications or through the communication field's websites.
- Employment of measurement tools to assess the completed communication platforms, products and initiatives. This will be done through accepted evaluation tools such as focus groups, online surveys, social media metrics, web statistics and written surveys.
- Professional development of staff, which can include engagement with peer Sea Grant programs, professional organizations and published findings on communications theory and execution.
- Each month assess the following conditions, then on a monthly basis, assess possible activities and/or carry out activities based on communication pegs.

Standard considerations for all 12 months:

1. In an ongoing manner, ensure the currency of the program's Crisis Communication Plan, talking points and the contact list of third-party and supportive stakeholders, collaborators and partners who could speak on our behalf.
2. Assess the feasibility of using these mechanisms to promote Sea Grant.
    a. Monitor extension staff activities and assist in publicizing their activities to target audiences.

b. Monitor staff travel schedules and pitch to media in the cities where this is appropriate. In particular, this would be television appearances.
c. As appropriate, prepare and distribute news releases about staff hires and/or significant staff accomplishments for "hometown" newspapers.
d. As appropriate, set up and conduct editorial board meetings nationally, regionally and within Wisconsin.
e. Look for pitch opportunities to organizers of the Milwaukee Press Club Newsmakers Luncheon, Wisconsin Eye, wispolitics.com, Wisconsin Radio Network statewide programming, Wisconsin Public Radio and Wisconsin Public Television statewide programming, and/or UpFront With Mike Goshua.
f. Generate earned media on research findings and communicate with relevant audiences. These would be Wisconsin, regional and national efforts.
g. Assess all Sea Grant work for applicability to send to the National Sea Grant Office, the Great Lakes target communication vehicles and UW-specific outlets such as UW-Green Bay's Fourth Estate newspaper or UW-Madison's On Wisconsin Magazine.
h. Continuation of the speaker series in collaboration with the Lake Superior National Estuarine Research Reserve and Minnesota Sea Grant.
i. Respond to extension and administration requests for communications services.

<u>January projects and dates that may trigger activities for target audiences and/or general public:</u>

- In 2019 and 2021, distribute biennial reports for 2016-18 and 2018-20.
- Monthly installment of the River Talks, in partnership with the Lake Superior National Estuarine Research Reserve and Minnesota Sea Grant.
- The Lake Sturgeon Bowl happens in Milwaukee the first weekend in February. This month, prepare hometown media on the teams that will be participating.
- New Year's resolutions on reducing personal water usage/water stewardship; blog post or an op-ed.
- Op-ed about water in the winter. (In polar ice and groundwater, where's the surface water?)
- Start to prepare material for Capitol Hill visits.
- Consider entering competitions for PR, strategic communications, website, design, video awards.

<u>February projects and dates that may trigger activities for target audiences and/or general public:</u>

- Op-ed about water in the winter. (In polar ice and groundwater, where's the surface water?)
- Conduct a survey of the effectiveness of the People and Project Directory and/or the Biennial report among intended audiences.
- Sturgeon spearing season on the Lake Winnebago system. Feb. 8 is an approximate date.
- Any follow-up work related to the Lake Sturgeon Bowl?
- News release on mercury? Cold weather – think about mercury uses in home heating. Possible blog or op-ed. Maybe with the angle on Director Jim Hurley's fingerprinting research. Although mercury in the environment is a well document problem, there is this new tool to id and remediate trouble related to mercury and that could be newsworthy.
- February is official start of a Knauss Fellowship year.
- Feb. 2 is World Wetlands Day. Angle for a blog or op-ed or column?
- Annual meeting of the American Association for the Advancement of Science.
- Monthly installment of the 2016-17 River Talks, in partnership with the Lake Superior National Estuarine Research Reserve and Minnesota Sea Grant.
- Ash Wednesday—promote fish recipes.
- Consider entering competitions for PR, strategic communication, website, design, video awards.

March projects and dates that may trigger activities for target audiences and/or general public:

- In 2018 and 2020, prepare and distribute Project and People Directory for the two-year cycle.
- Lent, Ash Wednesday. Promote Wisconsin's aquaculture industry and commercial fishing.
- Early March is Sea Grant Association meeting/Capitol Hill visits.
- Distribute Volume 1 of the ASC Chronicle.
- National Invasive Species Awareness Week is in March.
- Groundwater Awareness Week is in March.
- March 22 is World Water Day.
- The last Saturday in March is Earth Hour (earthhour.org).
- This month is typically a matching workshop on NOAA Coastal Fellows. Any Wisconsin students involved in the match?
- Monthly installment of the 2016-17 River Talks, in partnership with the Lake Superior Research Reserve and Minnesota Sea Grant.
- Consider a mailing of the fish identification downloadable app postcards to fishing stores ahead of the May fishing opener-concentrate on northern Wisconsin.
- Consider entering competitions for PR, strategic communications, website, design, video awards.

April projects and dates that may trigger activities for target audiences and/or general public:

- Explore the use of http://www.google.com/insights/consumersurveys/home to do a website survey.
- Consider a mailing of postcards on the shipwrecks website to dive shops, libraries offer to Harbor Towns and the state tourism department.
- Selection of a Great Lakes Commission fellow.
- UW-Madison Science Expeditions with possible Sea Grant participation.
- April 22 is Earth Day.
- Trap net publicize, through Wisconsin Sea Grant channels, target and possible localized earned media.
- New hires for boat landing inspections, plus numbers from prior years success, news release, possible hometowns and through other channels.
- Possibly do a postcard mailing on the wave-alert system at the Apostle Islands sea caves.
- Monthly installment of the 2016-17 River Talks, in partnership with the Lake Superior National Estuarine Research Reserve and Minnesota Sea Grant.
- Spring flooding? Perhaps with the green infrastructure angle on managing stormwater. Or relevant research projects?
- Consider entering competitions for PR, strategic communication, website, design, video awards.
- Possible advertising buy at Austin Straubel airport—2019 and 2021.

May projects and dates that may trigger activities for target audiences and/or general public:

- Rip current/Coastal Storms project – Milwaukee, Port Washington and Duluth.
- IAGLR meeting.
- National Ocean Sciences Bowl.
- Consider advertising in Badger Sportsman magazine for the April/May issue regarding the fish identification website, mobile website and app. OR the topic could be the fish poster – great Father's Day gift.
- Weston Scholarship? Publicize winner through our channels, hometown (s) if appropriate.
- Spring fishing opener. Highlight the fish ID app, and/or the fishing lures color fact sheet.

- Any Knauss Fellow (s) from Wisconsin selected? This will come in late May or early June.
- Memorial Day news hook. Summer is starting.
- Monthly installment of the 2016-17 River Talks, in partnership with the Lake Superior National Estuarine Research Reserve and Minnesota Sea Grant.
- Beach Safety Awareness Week as designated by the Council of The Great Lakes Governors and the Premiers of Ontario and Québec.
- Fellows convocation event.
- In 2018, possible Great Lakes informational installation at the Dane County Regional Airport.

June projects and dates that may trigger activities for target audiences and/or general public:

- Great Lakes Network Meeting in alternating years.
- NOAA Fish Fry event.
- Invasive Species Awareness Month.
- Consider a mailing to public libraries of the "be safe in the Great Lakes" postcard.
- Distribute Volume 2 of the Chronicle.
- Any NOAA fisheries fellows selected from Wisconsin?
- Rip Current Awareness Week is always the first full week in June.
- Start of employment for possible Great Lakes Commission-Sea Grant Fellow.
- June 21 is the first day of summer; summer solstice.
- Lots of storms in the summer? Highlight climate change work. Do an explainer and/or infographic. Maybe thunderstorms and meteotsunami angle. http://www.weather.gov/grb/WI_tornado_stats July also has a lot of thunderstorms.
- Possible Great Lakes informational installation at Mitchell International Airport.

July projects and dates that may trigger activities for target audiences and/or general public:

- Grandparents University.
- July 20 Aquaculture Day.
- July 4th.
- Lake Superior Day, generally third weekend in July.
- July is Shark Week. After it's done, for example, "Now that Shark Week is over, let's learn something about the creatures that live in the Great Lakes; perhaps five facts about lake sturgeon."

August projects and dates that may trigger activities for target audiences and/or general public:

- Blue-green algae blooms research findings.
- Mail Great Lakes postcards to both school counselors and teachers.
- Start of school year, publicize the Attack Packs. Perhaps the STEM kits. The library website and its resources such as the Attack Packs and STEM kits.

September projects and dates that may trigger activities for target audiences and/or general public:

- Share around the email signature of Coastal Awareness Month to our staff and the Coastal Management program.
- Explore the use of http://www.google.com/insights/consumersurveys/home to do a website survey.
- Distribute Volume 3 of the Chronicle.
- Water Safety Expo on Park Point, Lake Superior (Minnesota).
- Outdoor Writers Association of America annual meeting.
- Labor Day, end of summer.

- Last Saturday of September is National Estuaries Day. And, there is a whole week of it starting with the week prior to the last Saturday in September.
- Wisconsin Alumni Research Foundation holds a public science event and it is an opportunity to do an exploration station.
- Sept. 24 National Public Lands Day.
- Week of approximately Sept 24 is Take a Child Outside Week (takeachildoutside.org).

<u>October projects and dates that may trigger activities for target audiences and/or general public:</u>
- The Society of Environmental Science Journalists holds an annual national meeting.
- Sturgeon Fest, booth, Thiensville, early October.
- Consider applying for an award in the AVA Digital Awards (avaawards.com), due date will be early December.
- Promotional work tied to Seafood Awareness Month, including sharing the email signature.

<u>November projects and dates that may trigger activities for target audiences and/or general public:</u>
- GIS Day (gisday.com/).
- Prepare a flyer about fellowship opportunities.
- Thanksgiving for water/Great Lakes news release, blog or op-ed.

<u>December projects and dates that may trigger activities for target audiences and/or general public:</u>
- Holiday gift giving; highlight publications website offerings.
- Distribution of Volume 4 issue of the ASC Chronicle.
- Consider entering competitions for PR, strategic communications, website, design, video awards.

WISG PERSONNEL
- Aaron Conklin, 80%, social media coordinator and science communicator, six years with Sea Grant. Is a full-time employee with the Aquatic Sciences Center.
- Yael Gen, 80%, graphic designer, five years with Sea Grant. Is a 60% employee with the Aquatic Sciences Center.
- Moira Harrington, 80% assistant director for communications, seven years with Sea Grant. Is a full-time employee with the Aquatic Sciences Center.
- John Karl, 80%, video producer, 19 years with Sea Grant. Is a full-time employee with the Aquatic Sciences Center.
- Elizabeth White, 80%, publications editor, 19 years with Sea Grant. Is a 50% employee with the Aquatic Sciences Center.
- Marie Zhuikov, 80%, science communicator, five years with Sea Grant. Is a full-time employee with the Aquatic Sciences Center.
- Deidre Peroff, 1%, social scientists, 1 year with Sea Grant. Is a full-time employee with the Aquatic Sciences Center.
- James Grandt, 1%, information system engineer, 20 years with Sea Grant. Is a full-time employee with the Aquatic Sciences Center.
- Tom Xiong, 1 %, web developer, 1 ½ years with Sea Grant. Is a full-time employee with the Aquatic Sciences Center.

INTENDED AUDIENCES

- Researchers, for whom the communications efforts explain and highlight new research avenues or research that validates prior findings. Sea Grant to add to the body of water-science knowledge and actively share that information.
- Policy makers, decision makers and resource managers, for whom communications efforts provide information leading to science-based policies and decisions benefitting communities and economic endeavors.
- Students, for whom communications efforts encourage and foster careers in water and coastal science fields. It also includes K-12 students.
- The general public, for whom communications efforts build water and coastal literacy, which in turn, leads to understanding and stewardship of Wisconsin's water assets. This includes lifelong learners.
- Policy makers and opinion-leaders within the University of Wisconsin System and those holding elective positions at all levels of government.
- Funders at the federal and state levels, as well as those at appropriate private organizations.

WISCONSIN STRATEGIES

The communications staff will support these strategies from the University of Wisconsin Sea Grant College Program 2018-21 Strategic Plan.

<u>In the Healthy Coastal Ecosystems Focus Area:</u>

- Support research and outreach that bridges natural sciences, social sciences and policy studies to support more holistic management and restoration of Green Bay and its watershed.
- Support research and outreach to understand the environmental and socioeconomic effects of current and emerging challenges on Great Lakes ecosystem and human health including, but not limited to, contaminants, aquatic invasive species, harmful algal blooms, bacterial outbreaks, physical processes, climate change and changes to biodiversity and ecosystem structure.
- Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- Support research and outreach to develop dynamic and interoperable information systems to support adaptive management of Great Lakes ecosystems.
- Help residents, resource managers, businesses, industries and the agricultural sector understand the effects of human activities and environmental changes on coastal resources.
- Help managers incorporate public input in natural resource decision-making processes.

<u>In the Sustainable Fisheries and Aquaculture Focus Area:</u>

- Support research and outreach to better understand our Great Lakes fisheries, including status and trends, measurement and modeling techniques, future scenarios, and socioeconomic costs and benefits under different management approaches and environmental conditions.
- Support research and outreach to advance an environmentally sustainable and robust recreational, commercial and subsistence Great Lakes fishery.
- Better understand threats to Great Lakes fisheries, including, but not limited to, nutrient enrichment, invasive species, food web changes, genetics and climate change as well as effective responses.

- Identify and better understand the barriers to expansion of the aquaculture industry in Wisconsin and implement innovative partnerships to address scientific, business, economic, policy and legal challenges.
- Support research that leads to a better understanding of the benefits and risks of consuming Wisconsin-produced fish.
- Support research and outreach that encourages the application of behavioral and consumer sciences toward consumer perception and preferences, food safety, labeling and certifications, seafood demand studies and promotion of local seafood.
- Support research and outreach to develop and improve economically viable and environmentally sustainable aquaponics operations, with an emphasis on business planning, risks and socioeconomics.
- Support research to develop and improve commercially viable and environmentally sustainable aquaculture practices and techniques, including nutritional value of feeds, broodstock selection, water supply and quality, husbandry, and disease and pathogen prevention and diagnosis.
- Support the development of environmental and economically sustainable aquaculture through workforce development and trainings, K-12 education and technical assistance.
- Support development of urban aquaculture in new markets and provide knowledge resources to existing operations.

<u>In the Resilient Communities and Economies Focus Area:</u>

- Support research and outreach that will lead to a better understanding of how the sediment supply from coastal bluffs influences beach and nearshore sediment transport in order to guide sound shore protection and bluff stabilization choices and build more resilient coastal communities and economies.
- Support research and outreach to promote the development and implementation of green infrastructure practices.
- Develop and apply innovative geodesign methods to promote resilient coastal communities and understand the consequences of alternative development scenarios.
- Work with management and regulatory agencies, tribal entities and vulnerable and at-risk communities to reduce vulnerability to fluctuating water levels, storm impacts and a changing climate.
- Support research and outreach to understand the value of and opportunities for subsistence, tourism, and commercial and recreation-related activities in coastal communities.
- Support research and outreach that documents and preserves cultural and historical resources in coastal and marine areas, including those within or adjacent to the proposed marine sanctuary.
- Support research and outreach to develop or enhance community planning and visualization tools that demonstrate the benefits, risks and impacts of land use on the coastal environment.
- Support research that evaluates the impacts of increased climate variability and change on coastal communities.
- Support research and outreach to assess and share the impacts of human activities on Great Lakes water quality and supply, as well as coastal and nearshore habitats.
- Support environmental and socioeconomic research to protect the supply and quality of fresh water.
- Support research to document the socioeconomic contributions of water-dependent industries.
- Promote research and outreach for sustainable and resilient ports, harbors and marinas, including beneficial use of dredged materials and science-based decision-making related to the timing of dredging to minimize impacts on critical fish spawning habitat.

- Support research and outreach on nature-based shore protection along Great Lakes coasts.

In the Environmental Literacy and Workforce Development Area:

- Support research that will provide robust data about the current level of Great Lakes and water literacy in Wisconsin students to serve as a foundation for future education efforts in the state.
- Work with education partners to promote Great Lakes literacy principles within formal and informal learning environments.
- Develop Pre-K-12 resources that address the Great Lakes literacy principles and support state and national educational standards.
- Support education projects that incorporate innovative technologies or practices in Great Lakes education.
- Support a graduate student and post-graduate fellows program to provide emerging professionals with opportunities to practice stakeholder engagement and actionable science and to connect them with the full range of Sea Grant activities and Great Lakes-related employment opportunities.
- Support research projects that engage and train graduate and undergraduate students and lifelong learners about Great Lakes and marine resources.
- Promote the intersection of the arts, sciences and humanities to inspire a science-informed society.
- Promote place-based learning as a way to engage citizens in local stewardship. Identify and promote Great Lakes-related career pathways in Wisconsin.

WISCONSIN OUTCOMES

Because the communications staff will support the above plan's strategies, it can expect the following outcomes.

In the Healthy Coastal Ecosystems Focus Area:

- Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.
- Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal entities.
- Declining biodiversity, habitats and ecosystem functions and services are restored and sustained in Wisconsin.
- Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- Citizen science initiatives are engaged and contribute to improving our knowledge with respect to coastal communities and ecosystems.
- Wisconsin communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
- Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.

In the Sustainable Fisheries and Aquaculture Focus Area:

- Increased understanding and technological solutions aid Wisconsin aquaculture management and production.

- Partnerships enable the Wisconsin aquaculture industry to adapt and acquire innovative technologies.
- Freshwater resource industries employ technologies and reinforce strategies to ensure safe and sustainable Great Lakes fisheries and products.
- Consumers understand the health benefits of Great Lakes fish and purchase safe and sustainable products.
- Freshwater resource industries employ strategies that balance economic, community and conservation goals.
- Commercial and recreational fishers and aquaculturists in Wisconsin are knowledgeable about efficient, sustainable and responsible tools, techniques and uses of coastal and freshwater resources.
- Innovative solutions that increase understanding of climate impacts on state and regional fisheries and aquaculture are available and accessible to resource managers and fishing and aquaculture communities.
- Resource managers and fishing and aquaculture communities have access to science and tools to increase Wisconsin-based capacity to adapt to future resource-management needs.

<u>In the Resilient Communities and Economies Focus Area:</u>

- Members of the community, including the underserved, are aware of and understand changing conditions and hazards and the implications to their Wisconsin communities and are prepared to respond and adapt.
- Existing and innovative training programs improve community leaders' understanding of changing conditions in their Wisconsin communities and implement adaptive strategies.
- Wisconsin communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- Wisconsin communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.
- Members of the community, including the underserved, have access to information needed to understand how Wisconsin coastal economic activities and trends will impact environmental and community well-being.
- Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- Leaders in Wisconsin's coastal economic sectors understand how they can become more resilient through diversification and through conservation of ecosystem services.
- Community members throughout Wisconsin understand watershed functions and the services those watersheds provide to support communities and economies.
- Community members understand how actions will impact water quantity and quality and are able to make informed decisions.
- Wisconsin communities have access to sound science, data, tools and services to understand and anticipate changes in water quantity and quality.
- Wisconsin communities have diverse, sustainable economies and industries that support existing and emerging water-resource needs.
- Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

In the Environmental Literacy and Workforce Development Area:

- Wisconsin communities are knowledgeable and equipped with the best available science and technology in order to contribute to adaptive management planning processes and stewardship.
- Teachers and students are better informed in science, technology, engineering and mathematics fields and can employ their knowledge to support sustainable practices within their communities throughout Wisconsin.
- Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources. Communities implement sustainable strategies when managing Wisconsin's natural resources and make decisions based on information acquired through informal science education.
- All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain the state's coastal communities and ecosystems.
- College-level courses, internships and fellowships provide increased literacy, experience and preparedness in all areas of watershed, coastal and freshwater ecosystems for all students, with a particular focus on those from under-represented groups.
- Undergraduate and graduate students, particularly those from under-represented groups, are supported and have access to formal and experiential learning, training and research experiences.
- Employment in all sectors of the U.S. marine and freshwater resources enterprise expands and diversifies.
- The existing and future workforce is able to adapt and thrive in changing environmental, social and economic conditions.

PERFORMANCE MEASURES AND METRICS

- Number of websites whose content is reviewed and refreshed and the architecture is redesigned and relaunched. 2
- Number of program-information publications produced and disseminated. 4
- Number of program newsletters produced and disseminated. 16
- Number of new subscribers to program newsletter. 200
- Number of materials, which could include fact sheets, handbooks or brochures, produced to support extension and education efforts. 42
- The number of products, which could be videos, stories or social media material, developed by Wisconsin Sea Grant PIs with Wisconsin Sea Grant outreach staff to communicate effectively their research projects to Great Lakes stakeholders. 42
- Number of new videos produced. 24
- Number of webinars or other types of training provided to extension staff to enrich communications skills. 8
- Number of additional followers on the two leading social media platforms Facebook and Twitter. 800
- Number of social media mentions of Wisconsin Sea Grant by other organizations. 10
- Number of mentions of Wisconsin Sea Grant in traditional media outlets. 450
- Number of public outreach events staffed by communications staff. 16
- Number of visitors to Wisconsin Sea Grant web-based material to build environmental literacy. 1 million

Student Engagement

Jennifer Hauxwell, Assistant Director for Research and Student Engagement

Over our history, funding from Wisconsin Sea Grant has supported over 700 students. In a few cases, the program's relationship with students is direct, where our staff hire or mentor a student as a project assistant or volunteer. But, in the majority of cases, our relationship is indirect, where funding is provided to a faculty researcher who then passes funds to a student to conduct work on a research project. In these cases, our connection to students is through the annual and final reporting by the investigator, with our program adding the name of that student to the list of those we have supported over the years. We seek to develop a more supportive role for Sea Grant-connected students. After hosting listening sessions at UW-Madison and UW-Milwaukee, we chose to focus on developing programming that will encourage Sea Grant-funded students to practice community-engaged science and to provide them with professional development opportunities, niches that students suggested as important growth opportunities for them. We developed a series of web-based and in-person tools and experiences for students and plan to build upon this framework over the 2018-20 omnibus. The details can be found below.

BACKGROUND
Wisconsin Sea Grant's student engagement program and work plan for 2018-21 focuses on 2 key areas – encouraging Sea Grant-funded students to practice community-engaged science and providing students with professional development opportunities.

OBJECTIVES
- Empower students to become effective researchers, conducting science in a way that addresses the needs and priorities of end users. Because students are funded via research projects across HCE, SFA and RCE, this objective can also help achieve additional stated objectives in those respective focus areas.
- Provide students with skills and opportunities to land future positions that best match their passions and abilities.

APPROACH/PLANNED ACTIVITIES
- Maintain and build upon web resources developed for students, including pages on "Actionable Science" and "Actionable Science Toolkit," Wisconsin Sea Grant student alumni map, student biographies, scholarship and fellowship opportunities, career resources including job boards and listings, and Actionable Science student opportunities.
- Continue the Wisconsin Sea Grant-Coastal Management J. Philip Keillor Science-Policy Fellowship which places a recent post-graduate in the Coastal Management Program office in Madison for 1 year.
- Provide webinars for Wisconsin Sea Grant-supported students to encourage professional development
- Provide Sea Grant students with opportunities to attend the Sea Grant Community-Engaged Research Institute, a 4-day workshop for students and faculty developed by Michigan Sea Grant in partnership with Wisconsin Sea Grant
- Provide students with travel funds to attend scientific conferences
- Provide students with funding to assist education and outreach staff in events with various audiences

WISG PERSONNEL
Jennifer Hauxwell, 10%, assistant director for research and student engagement

WISCONSIN STRATEGIES
The student engagement program will support these strategies from the University of Wisconsin Sea Grant College Program 2018-21 Strategic Plan.
In the Environmental Literacy and Workforce Development Area:

- Support a graduate student and post-graduate fellows program to provide emerging professionals with opportunities to practice stakeholder engagement and actionable science and to connect them with the full range of Sea Grant activities and Great Lakes-related employment opportunities.
- Support research projects that engage and train graduate and undergraduate students and lifelong learners about Great Lakes and marine resources.
- Identify and promote Great Lakes-related career pathways in Wisconsin.

WISCONSIN OUTCOMES
Because the communications staff will support the above plan's strategies, it can expect the following outcomes.
In the Environmental Literacy and Workforce Development Area:

- Wisconsin communities are knowledgeable and equipped with the best available science and technology in order to contribute to adaptive management planning processes and stewardship.
- Teachers and students are better informed in science, technology, engineering and mathematics fields and can employ their knowledge to support sustainable practices within their communities throughout Wisconsin.
- Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources. Communities implement sustainable strategies when managing Wisconsin's natural resources and make decisions based on information acquired through informal science education.
- All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain the state's coastal communities and ecosystems.
- College-level courses, internships and fellowships provide increased literacy, experience and preparedness in all areas of watershed, coastal and freshwater ecosystems for all students, with a particular focus on those from under-represented groups.
- Undergraduate and graduate students, particularly those from under-represented groups, are supported and have access to formal and experiential learning, training and research experiences.
- Employment in all sectors of the U.S. marine and freshwater resources enterprise expands and diversifies.
- The existing and future workforce is able to adapt and thrive in changing environmental, social and economic conditions.

PERFORMANCE MEASURES AND METRICS

National Performance Measures and Metrics

- Number of Sea Grant-supported graduates who become employed in a job related to their degree within two years of graduation. 25
- Number of Postsecondary Students Financially Supported by Sea Grant in Higher Education Programs (Undergraduate, Graduate)

- Undergraduate Students (# of new Students). 60
- Undergraduate Students (# of Continuing Students). 60
- MS/MA Students (# of new Students). 40
- MS/MA Students # of Continuing Students). 40
- PhD Students (# of new Students). 20
- PhD Students (# of Continuing Students). 20

Number of Postsecondary Degrees Financially Supported by Sea Grant in Higher Education Programs (Undergraduate, Graduate)

- Undergraduate Degrees. 30
- MS/MA Graduate Degrees. 20
- PhD Graduate Degrees. 10

Wisconsin Metrics

Environmental Literacy and Workforce Development

The number of Wisconsin Sea Grant graduate fellows who actively participate in Wisconsin Sea Grant educational outreach activities. **Our goal is 4 fellows for the 2018-21 time period.**

Gene Clark – Coastal Engineering Outreach Specialist and Superior Field Office

Clark 1 - Coastal Engineering Outreach, Project Assistance, Grant Proposal Review, & Permit Assistance

BACKGROUND

Great Lakes shoreline and coastal regions continue to receive increasing levels of pressures from both the occasional weekend vacationer and especially new, year round property owners and developments. Record levels of waterfront activities as well as the high demands for coastal property have created increased levels of human pressures on the fragile shoreline areas. Wisconsin's coastal areas are no exception. From the many new redevelopments along the Lake Michigan shoreline to the new developments along many regions of the Lake Superior shorelines, there have been increasing numbers of individuals accessing the regions resources with little or no experience with the many natural coastal hazards that exist. As the demands continue to increase, so do the possibilities for increased loss of valuable coastal property, habitat and life.

Because of the ever increasing demands to our Great Lakes coastal resources and the greater potential for loss of valuable property and lives (especially during the recent higher Great Lakes water levels), there continues to be a critical need to provide Great Lakes property owners, resource managers, lenders, insurers, engineers, realtors and local, regional and state-wide agencies (WCMP, WI DNR and WI DOT) with natural coastal hazard awareness, permit review assistance, grant proposal reviews, coastal engineering guidance, education opportunities and shoreline management tools. Sound coastal engineering information on coastal erosion, coastal structures, coastal processes, waves, rip and structure currents, changing water levels, flooding potentials, bluff instability and shoreline best management practices are all needed. In additional to general Great Lakes coastal engineering guidance for property owners and coastal communities, special emphasis this work plan period will continue to be directed towards the WI DNR, WCMP and the WI DOT Harbors Assistance Program. These stakeholders are easily approachable specific user groups for the information and are able to incorporate the materials directly into their permit application reviews and guidance or grant proposal reviews.

OBJECTIVES

- WI DNR will have increased awareness of the potential effects shoreline structures can have on Great Lakes coastal shorelines, bluffs and habitats.
- WI DNR will incorporate info from UW Sea Grant into their coastal construction permit application reviews.
- WCMP & the WI DOT Harbor Assistance Program will incorporate info from UW Sea Grant into their annual grant proposal reviews.
- Coastal Engineering specialty activities will provide increased awareness and understanding by Great Lakes shoreline property owners, residents and visitors about coastal erosion, bluff failure, coastal structures, coastal processes, and water safety issues (rip and structure currents, and hypothermia).
- Residents, coastal communities and visitors will have greater awareness and exercise utilizing information from UW Sea Grant about shoreline erosion, bluff instability, coastal structures, and water safety issues.
- UW Sea Grant research and/or outreach on methods to rehabilitate and prolong Great Lakes ports, harbors and marina infrastructure will be conducted by UW Sea Grant.

APPROACH/PLANNED ACTIVITIES

- UW Sea Grant will conduct research, public awareness education and outreach to increase understanding for coastal hazards including shoreline erosion, bluff instability and failure, coastal structures, and water safety (rip and structure currents, & hypothermia).
- UW Sea Grant will provide significant coordination to coastal communities about shoreline and bluff erosion/failure research, coastal structures and their effects on coastal processes, and BMPs for shoreline property owners.
- UW Sea Grant will provide significant assistance to WI Great Lakes permitting agency reviews (WI DNR).
- UW Sea Grant will provide significant assistance to WI Great Lakes agency grant proposal reviews (WCMP & WI DOT).
- Continue to mentor the Wisconsin Sea Grant/Wisconsin Coastal Management Program Keillor Fellow.

WISG PERSONNEL

- Gene Clark (30%)
- Communications Staff (Marie Zhuikov/Elizabeth White/Yael Gen -5%)
- Tom Xiong (web development services as needed -1%)

EXTERNAL PARTNERS

- Wisconsin Coastal Management Program
- Wisconsin Department of Natural Resources
- Wisconsin Department of Transportation – Harbor Assistance Program
- National Park Service (Apostle Islands National Lakeshore)
- Great Lakes Commission
- Great Lakes Dredging Team
- US Army Corps of Engineers
- Coastal municipalities, Counties and Regional Planning Commissions

INTENDED AUDIENCE

- Wisconsin Coastal Management
- Wisconsin Department of Natural Resources
- Wisconsin Department of Transportation – Harbor Assistance Program
- National Park Service (Apostle Islands National Lakeshore)
- US Army Corps of Engineers
- Great Lakes Ports/Harbors/Marinas
- WI Coastal Communities & Coastal Property Owners
- Coastal Engineering Consultant Firms

PROJECT DURATION

48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)

- Healthy Coastal Ecosystems (HCE)
- Resilient Communities and Economies (RCE)

WISCONSIN STRATEGIES

- HCE. Support research and outreach to improve Great Lakes ecosystem health through innovations in measurement, predictive modeling and potential treatment or management approaches.
- HCE. Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- HCE. Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- HCE. Help residents, resource managers, businesses, industries and the agricultural sector understand the effects of human activities and environmental changes on coastal resources.
- RCE. Support research and outreach that will lead to a better understanding of how the sediment supply from coastal bluffs influences beach and nearshore sediment transport in order to guide sound shore protection and bluff stabilization choices and build more resilient coastal communities and economies.
- RCE. Work with management and regulatory agencies, tribal entities and vulnerable and at-risk communities to reduce vulnerability to fluctuating water levels, storm impacts and a changing climate.
- RCE. Support research that evaluates the impacts of increased climate variability and change on coastal shoreline properties and communities.
- RCE. Support research and outreach to assess and share the impacts of human activities on Great Lakes water quality and supply, as well as coastal and nearshore habitats.

OUTCOMES

- HCE. Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- HCE. Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.
- HCE. Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal entities.
- HCE. Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- HCE. Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- HCE. Wisconsin communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
- HCE. Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.
- RCE. Members of the community, including the underserved, are aware of and understand changing conditions and hazards and the implications to their Wisconsin communities and are prepared to respond and adapt.
- RCE. Wisconsin communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- RCE. Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- RCE. Leaders in Wisconsin's coastal economic sectors understand how they can become more resilient through diversification and through conservation of ecosystem services.

- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACTS

- WI DNR permit reviewers and the WI Harbors Assistance program will incorporate coastal engineering principles to approve shoreline erosion control construction permits and award Harbor Assistance program dollars to projects resulting in less failed Great Lakes shore protection structures, less economic losses, less negative impacts to neighboring properties by completed projects and successful Wisconsin ports and harbor improvement projects.
- Wisconsin Great Lakes communities and shoreline property owners will incorporate coastal engineering principles in their shoreline protection projects and bluff stability actions resulting in successful shoreline erosion control structures and less coastal bluff failures.
- Great Lakes property owners and visitors will have a greater knowledge of Great Lakes water safety issues (rip and structure currents, dangerous waves and hypothermia) resulting in a reduction in unsafe water behaviors and fatalities.

PERFORMANCE MEASURES AND METRICS

National

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities [75 managers]
- Number of communities that adopt/implement sustainable economic and environmental development practices and policies as a result of Sea Grant activities [3 communities]
- Number of communities that adopt/implement hazard resiliency practices to prepare for and respond to/minimize coastal hazardous events as a result of Sea Grant activities.
    - Number of communities [5 communities]
    - Number of hazard resiliency training/technical assistance provided [5]
    - Community hazard resiliency improved [3]
- Number of people engaged in Sea Grant-supported informal education programs [75]
- Economic and societal impacts derived from Sea Grant activities (market and non-market; jobs and businesses created or sustained) [As result of WHAP assistance}
    - Jobs Created [10]
    - Jobs Sustained [25]
    - Businesses Created [4]
    - Businesses Sustained [5]
- Number of peer-reviewed publications produced by Sea Grant [1]
    - Resiliency Grant Products:
        - Sea Grant Fact Sheet and information included into grant product concerning coastal bluff vegetation BMPs and wise specie choices for property owners.
- Number of Volunteer Hours [40]
- Number of Sea Grant-Sponsored/Organized Events [4]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [100]
- Number of Public or Professional Presentations [50]
- Number of Attendees at Public or Professional Presentations [1250]

Wisconsin

- The number of Wisconsin partners that, as a result of Wisconsin Sea Grant research and outreach, design, modify an initial design, permit and/or provide grant assistance to a project. [50 partners]

- The number of Great Lakes coastline erosion control, shoreline bluff stabilization or ports and harbor infrastructure projects that are completed utilizing significant Wisconsin Sea Grant coastal engineering research results, outreach and/or design assistance. [5]
- Complete the Coastal Processes Manual (Edition #3).

Clark 2 - Great Lakes Nature-Based (green) Coastal Shoreline Protection Coastal Engineering Outreach and Promotion of Appropriate Use in Great Lakes Applications

BACKGROUND

Since the early 1900's, traditional Great Lakes shoreline erosion control and port and harbor entrance structures were built with large stone, concrete, steel or various combinations of them. These types of infrastructure is often called "grey infrastructure" due to the use of concrete, steel and stone with no living plants involved. During the 1980-90's resource agencies, project managers and private property owners began to incorporate "bio-engineering" principles using willow bundles and coconut "logs" in place of harder materials. This effort worked fine for small stream and lake erosion but never held up to the significant wave energies often experienced by the Great Lakes exposed shorelines.

As this "greying" or hardening of the Great Lakes shorelines continued, there has been a consistent loss of natural habitat and wetlands. In the decade of 2010, the US Army Corps of Engineers established their "Engineering with Nature" program and NOAA initiated their "Living Shorelines" initiative. Both programs have also been referred to as "Nature-Based, Living or Green Shorelines" initiatives. There have been several completed demonstration projects in the Great Lakes, some successful and others not.

Nature-based (green) coastal shoreline protection attempts to use a range of nature-based stabilization techniques combined with the traditional "grey" methods to provide a proven and cost-effective alternative to purely "grey" solutions. The key in their success have been a wise choice of location and material/design selections for those locations. Typically, open coast Great Lakes shorelines are exposed to very high wave energy, which preclude the use of most "green" material.

This task will continue the Wisconsin Sea Grant efforts to partner with other stakeholders to learn from successful Nature-based demonstration projects, identify where they can or should not be used and the provide Sea Grant outreach of proper Great Lakes selection of regions and designs that would be most likely to succeed.

OBJECTIVES

- Coastal Engineering specialty activities will provide increased awareness and understanding by Great Lakes shoreline property owners, communities and permitting agencies about what Nature-based coastal shoreline protection could be and under the conditions it may be an appropriate alternative to convention "grey" shoreline protection.
- Promote and support the demonstration of Great Lakes Nature-based coastal shoreline protection projects, especially in the western Great Lakes region where few examples currently exist.
- Expand access to Great Lakes Nature-based coastal shoreline protection information especially to contractors and consultants through a western Great Lakes location workshop and new UW Sea Grant fact sheet describing how the structures can be hazard resilient yet eco-system friendly.
- Assemble a single source list of constructed Great Lakes Nature-based coastal shoreline protection project examples utilizing our Great Lakes Sea Grant partners for project information and results.

APPROACH/PLANNED ACTIVITIES

- Seek funding opportunities for the design and construction of Nature-Based Shoreline Protection demonstration projects in the western Great Lakes states.

- Conduct workshop in the western Great Lakes states on Nature-Based Shoreline Protection patterned after the previous two workshops UW Sea Grant co-organized with New York Sea Grant (2015) and Coastal Zone Canada (2016).
- Collaborate with the Sea Grant Great Lakes network in reporting on Nature-Based Coastal Shoreline Protection demonstration projects in each Great Lakes state.
- Continue active participation in promoting bi-national appropriate Great Lakes Nature-Based Coastal Shoreline Protection with Coastal Zone Canada partner.
- Prepare at least two technical presentation/papers on Great Lakes Nature-Based Coastal Shoreline Protection projects.
- Develop a UW Sea Grant fact sheet on Great Lakes Nature-Based Coastal Shoreline Protection.
- Develop a UW Sea Grant Web page on Great Lakes Nature-Based Coastal Shoreline Protection.

WISG PERSONNEL
- Gene Clark (15%)
- Communications Staff (Marie Zhuikov/Elizabeth White/Yael Gen -5%)
- Tom Xiong (web development services as needed -1%)

EXTERNAL PARTNERS
- Wisconsin Coastal Management Program
- Wisconsin Department of Natural Resources
- Great Lakes Dredging Team
- US Army Corps of Engineers
- Coastal Zone Canada
- Pew Charitable Trusts
- Great Lakes (bi-national) Coastal municipalities, Counties and Regional Planning Commissions

INTENDED AUDIENCE
- Wisconsin Coastal Management
- Wisconsin Department of Natural Resources
- US Army Corps of Engineers
- WI Coastal Communities & Coastal Property Owners
- Coastal Engineering Consultant Firms

PROJECT DURATION
48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)
- Healthy Coastal Ecosystems (HCE)
- Resilient Communities and Economies (RCE)

WISCONSIN STRATEGIES
- HCE. Support research and outreach to improve Great Lakes ecosystem health through innovations in measurement, predictive modeling and potential treatment or management approaches.
- HCE. Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- HCE. Support research and outreach to develop dynamic and interoperable information systems to support adaptive management of Great Lakes ecosystems.

- RCE. Support research and outreach that will lead to a better understanding of how the sediment supply from coastal bluffs influences beach and nearshore sediment transport in order to guide sound shore protection and bluff stabilization choices and build more resilient coastal communities and economies.
- RCE. Support research and outreach to promote the development and implementation of green infrastructure practices.
- RCE. Develop and apply innovative geodesign methods to promote resilient coastal communities and understand the consequences of alternative development scenarios.
- RCE. Support research and outreach on nature-based shore protection along Great Lakes coasts

OUTCOMES

- HCE. Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- HCE. Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.
- HCE. Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal entities.
- HCE. Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- HCE. Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- RCE. Wisconsin communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.
- RCE. Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- RCE. Leaders in Wisconsin's coastal economic sectors understand how they can become more resilient through diversification and through conservation of ecosystem services.
- RCE. Community members understand how actions will impact water quantity and quality and are able to make informed decisions.
- RCE. Wisconsin communities have access to sound science, data, tools and services to understand and anticipate changes in water quantity and quality.
- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACT

- Great Lakes shoreline property owners, communities and permitting agencies will understand what Nature-based coastal shoreline protection is and under the conditions it may be an appropriate alternative to convention "grey" shoreline protection.
- Great Lakes communities and shoreline property owners will incorporate Nature-based coastal shoreline protection coastal engineering principles in their shoreline protection projects when applicable to lessen costs and protect and/or increase natural habitat features.
- Increased promotion and support for the demonstration of properly designed Great Lakes Nature-based coastal shoreline protection projects, especially in the western Great Lakes region where few successful examples currently exist.
- Expanded access to Great Lakes Nature-based coastal shoreline protection information especially to contractors and consultants through a western Great Lakes location workshop and new UW Sea Grant fact sheet describing how the structures can be hazard resilient yet eco-system friendly.

PERFORMANCE MEASURES AND METRICS

National

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities [5 managers]
- Number of people engaged in Sea Grant-supported informal education programs [20]
- Number of peer-reviewed publications produced by Sea Grant [1]
    - Resiliency Grant Products:
        - Sea Grant Fact Sheet and information included into grant product concerning Nature-based Shoreline Protection applicable to Great Lakes property owners.
- Number of Sea Grant-Sponsored/Organized Events [2]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [60]
- Number of Public or Professional Presentations [2]
- Number of Attendees at Public or Professional Presentations [50]

Wisconsin

- There were no specific Wisconsin performance measures or metrics included in our WI 2018-2021 Strategic plan. However, these are appropriate metrics to reach for:
    - The number Nature-based (green) shoreline protection projects that, because of Wisconsin Sea Grant research and outreach; were designed, modified in an initial design, permitted and/or provided grant assistance to a completed project. [5 demonstration projects]
    - WI Sea Grant Fact Sheet concerning Nature-based Shoreline Protection applicable to Great Lakes property owners.

Clark 3 - Harbor Dredging Beneficial Use of Dredged Material Outreach & Project Assistance

BACKGROUND

Maritime transportation in the Great Lakes, both commercial and recreational, relies on the maintenance of adequate water depth in harbors and connecting channels for navigation. Maintaining that depth where there is natural accumulation of sediments requires periodic dredging. Each year, navigation dredging in the Great Lakes produces 2 – 3 million cubic yards of sediment from the dredging of numerous federal Great Lakes commercial ports, recreational harbors, and connecting channels maintained by the U.S. Army Corps of Engineers (Corps). Slightly more than half of the dredged sediment is typically disposed in specifically designed "Confined Disposal Facilities," or CDFs but they are quickly reaching their design capacity. The 20 CDFs currently active in the Great Lakes are 80 percent full. Prohibitive construction costs, a cost share requirement for non-federal partners of 35 percent and reduced site availability make construction of any new CDFs increasingly difficult. Clean sandy material is often used for beach nourishment, and much uncontaminated sediment dredged from Great Lakes harbors has historically been placed in the open lakes where states allow it, although that practice can face certain challenges at both the state and local levels.

Among U.S. federal agencies, Great Lakes states and individual communities, there is an increasing awareness that much of the material dredged in the Great Lakes for navigation is clean enough to be managed not as a burden—and in some states, a solid waste—but as a sustainable resource: a commodity with value. Recognizing that value, and identifying ways to maximize it, is the concept behind "beneficial use" as an environmentally sound, practical and sustainable approach to dredged material management in the Great Lakes.

In addition to the obvious wisdom of sustainably recycling a commodity with potential value, a more urgent motivation to promote beneficial use is the diminishing availability of other dredged material management alternatives. Theoretically, CDF life could be lengthened indefinitely, assuming enough beneficial reuse projects of sufficient size are found to accommodate the sediment recycling concept.

OBJECTIVES

- Ports, harbors and marinas will have an increased awareness and understanding about how to cope with varying Great Lakes water levels, especially due to the effects of climate change and the low water levels (increased dredging), and will use information from UW Sea Grant to plan for potential extreme water level changes and the associated increased dredged material disposal problems.
- State agencies, law makers, and resources planners will have an increased awareness of the importance of the sustainable beneficial re-use of dredged material.
- Great Lakes states will promote and conduct several beneficial re-use of dredged material projects incorporating information from UW Sea Grant efforts into their plans.
- Great Lakes ports and harbors will look for sustainable methods to beneficially utilize their navigation channel and slip dredged material.
- Promote the regional sediment management of soil in the port and harbors watersheds so that this material remains on the land and is kept from entering the port and harbor tributaries (directly lessening the amount of material that would be needed to be dredged and disposed of).

APPROACH/PLANNED ACTIVITIES

- UW Sea Grant will continue education and outreach campaigns to increase understanding and promote the regional sediment management of watershed soils and the beneficial re-use of dredged material.
- UW Sea Grant will continue to serve as a WI representative on the Great Lakes Dredging Team.
- UW Sea Grant will continue to serve on the Duluth/Superior harbor dredging sub-committee which is working on beneficial use of the harbor's dredged material.
- UW Sea Grant will continue to serve on the Great Lakes Dredging Team's Technical Committee which has the beneficial use of dredged material as one of its major Great Lakes-wide priorities.
- UW Sea Grant will provide significant coordination of efforts to promote the beneficial uses of dredged material to Great Lakes ports and harbors.
- UW Sea Grant will work with the US Army Corps of Engineers and local watershed agencies to lessen the sediment loads into the Nemadji River (major tributary to the Duluth/Superior harbor).
- UW Sea Grant will prepare at least two technical presentation/papers on Great Lakes dredging and the beneficial re-use of dredged material.

WISG PERSONNEL

- Gene Clark (30%)
- Communications Staff (Marie Zhuikov -2%)

EXTERNAL PARTNERS

- Wisconsin Department of Natural Resources
- Wisconsin Department of Transportation – Harbor Assistance Program
- Wisconsin Commercial Ports Association
- University of Wisconsin CFIRE Program
- Great Lakes Commission
- Great Lakes Dredging Team
- US Army Corps of Engineers
- Great Lakes Ports/Harbors/Marinas
- Lake Superior NERR

INTENDED AUDIENCE

- Wisconsin Department of Natural Resources
- Wisconsin Department of Transportation – Harbor Assistance Program
- Wisconsin Commercial Ports Association
- Great Lakes Commission
- Great Lakes Dredging Team
- US Army Corps of Engineers
- Great Lakes Ports/Harbors/Marinas
- Nemadji River watershed agencies (Lake Superior NERR, Douglas County, WI and Carlton County, MN).

PROJECT DURATION

48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)

- Healthy Coastal Ecosystems (HCE)

- Resilient Communities and Economies (RCE)

WISCONSIN STRATEGIES

- HCE. Support research and outreach to improve Great Lakes ecosystem health through innovations in measurement, predictive modeling and potential treatment or management approaches.
- HCE. Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- HCE. Support research and outreach to develop dynamic and interoperable information systems to support adaptive management of Great Lakes ecosystems.
- RCE. Promote research and outreach for sustainable and resilient ports, harbors and marinas, including beneficial use of dredged materials and science-based decision-making related to the timing of dredging to minimize impacts on critical fish spawning habitat.

OUTCOMES

- HCE. Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- HCE. Declining biodiversity, habitats and ecosystem functions and services are restored and sustained in Wisconsin.
- HCE. Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- RCE. Wisconsin communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACTS

- Great Lakes ports and harbors, State agencies, law makers, and resource planners will have an increased awareness of the importance of the sustainable beneficial re-use of clean dredged material.
- Great Lakes ports and harbors will promote and conduct several beneficial re-use of dredged material projects thereby enhancing the stewardship of critical coastal habitats and resources.
- Great Lakes ports and surrounding communities will promote regional sediment management by keeping eroding soil from entering the port and harbor tributaries, thus directly reducing the amount of sediment requiring dredging and disposal.

PERFORMANCE MEASURES AND METRICS

<u>National</u>

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities [10 managers]
- Number of acres of coastal habitat protected, enhanced, or restored as a result of Sea Grant activities [100 acres]
- Number of people engaged in Sea Grant-supported informal education programs [75]
- Number of peer-reviewed publications produced by Sea Grant [1]
- Number of Sea Grant-Sponsored/Organized Events [4]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [200]
- Number of Public or Professional Presentations [20]
- Number of Attendees at Public or Professional Presentations [400]

Wisconsin

- The number of Great Lakes ports and harbor projects that initiate the beneficial use of their harbor's navigational channel dredged material as a result of Wisconsin Sea Grant research and outreach. [5 projects]
- The amount of Great Lakes dredged material put to beneficial use as the result of Wisconsin Sea Grant Institute research and outreach, in cubic yards. [500,000 cubic yards]

Clark 4 - Port and Harbor Infrastructure Outreach & Project Assistance

BACKGROUND

Since 2004 when the accelerated freshwater corrosion problem was first discovered in the Duluth/Superior harbor, UW Sea Grant has provided education, research and outreach concerning the accelerated freshwater corrosion seen in Lake Superior port/harbor/marina structures. Prior to 2004, nothing was known about the rapid deterioration of steel structures in Lake Superior and why this was happening. To understand what the mechanisms were that were creating this problem and also how to repair/rehabilitate or when to replace steel structures damaged by this accelerated corrosion, UW Sea Grant helped form and guide a systematic approach to the research, inspections and field testing of many corrective options possible to assist ports/harbors and marinas cope with this previously unknown problem.

From the beginning of the research, UW Sea Grant has hosted the steering committee's web site and periodically updated a fact sheet detailing the results of any recent research, studies and field investigations. As the outreach news reached other harbors in on Lake Superior, they also found freshwater corrosion to exist in their structures, the requests for repair, and rehabilitation information has continued to increase.

The varying Great Lakes water levels have increased the deterioration of many Great Lakes timber and concrete structures. Many of these structures were built in the early 1900's and have seen an increasing rate of deterioration and failure. There is an increased need for non-advocacy science-based repair and rehabilitation information and Wisconsin Sea Grant is an ideal source for this information.

OBJECTIVES

- Understanding by Great Lakes coastal communities (ports, harbors and marinas) of the importance of coastal infrastructure and the risks of deterioration over their useful life cycles will be increased by the information of corrosion protection or timber structure repair technologies.
- Great Lakes ports, harbors and marinas will incorporate corrosion protection, timber and concrete repair/rehabilitation information from UW Sea Grant into their plans to repair and prolong the useful lives of their infrastructure.
- Grant funding programs will incorporate UW Sea Grant corrosion protection, timber and concrete repair/rehabilitation guidance into funded projects (WCMP & WI DOT Harbor Assistance Program).
- Ports, harbors and marinas will have an increased awareness and understanding about how to cope with the accelerated freshwater corrosion in Lake Superior, especially the damaging structural effects due to this rare phenomenon, and will use information from UW Sea Grant to plan for and implement appropriate mitigated strategies.
- UW Sea Grant research and/or outreach on methods to rehabilitate and prolong Great Lakes ports, harbors and marina infrastructure will be conducted by UW Sea Grant.

APPROACH/PLANNED ACTIVITIES

- UW Sea Grant will continue to conduct port/harbor/marina outreach to increase understanding of appropriate and new technology with respect to port, harbor and marina infrastructure repair.
- UW Sea Grant will provide significant coordination of ports, harbors and marinas structure repair and protection research.
- Two professional presentations and/or journal papers concerning ports, harbors and marinas coastal infrastructure repair option recommendations will be published.

- UW Sea Grant will continue to support education and outreach campaigns to increase understanding and promote the use of corrosion resistant materials, timber and concrete repair/rehabilitation practices to increase the useful life of steel, timber and concrete structures in the Great Lakes.
- UW Sea Grant will continue to provide Web page update on ports, harbors and marinas coastal infrastructure repair options recommendations using corrosion resistant materials and timber and concrete structure repair/rehabilitation practices.

WISG PERSONNEL
- Gene Clark (10%)
- Communications Staff (Marie Zhuikov 2%)

EXTERNAL PARTNERS
- Wisconsin Department of Transportation – Harbor Assistance Program
- Wisconsin Commercial Ports Association
- US Army Corps of Engineers

INTENDED AUDIENCE
- Wisconsin Department of Transportation – Harbor Assistance Program
- Wisconsin Commercial Ports Association
- US Army Corps of Engineers
- Great Lakes Ports/Harbors/Marinas
- WI Coastal Communities
- Coastal Engineering Consultant Firms

PROJECT DURATION
48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)
- Healthy Coastal Ecosystems (HCE)
- Resilient Communities and Economies (RCE)

WISCONSIN STRATEGIES
- HCE. Support research and outreach to improve Great Lakes ecosystem health through innovations in measurement, predictive modeling and potential treatment or management approaches.
- HCE. Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- RCE. Work with management and regulatory agencies, tribal entities and vulnerable and at-risk communities to reduce vulnerability to fluctuating water levels, storm impacts and a changing climate.
- RCE. Support research that evaluates the impacts of increased climate variability and change on coastal communities.
- RCE. Promote research and outreach for sustainable and resilient ports, harbors and marinas.

OUTCOMES
- HCE. Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.

- HCE. Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.
- RCE. Members of the community, including the underserved, are aware of and understand changing conditions and hazards and the implications to their Wisconsin communities and are prepared to respond and adapt.
- RCE. Wisconsin communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- RCE. Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACTS

- Great Lakes ports, harbors and marinas will incorporate accelerated freshwater corrosion protection, timber and concrete repair/rehabilitation information from UW Sea Grant sources into their infrastructure repair plans and implement appropriate mitigation strategies.
- Grant funding and permitting agencies (WDNR, WCMP and WI Harbor Assistance program) will incorporate UW Sea Grant outreach information into their permitted or grant assisted projects to increase project useful lifetimes and lessen risks of future infrastructure deterioration.

PERFORMANCE MEASURES AND METRICS

National

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities [5 port managers]
- Number of communities that adopt/implement hazard resiliency practices to prepare for and respond to/minimize coastal hazardous events as a result of Sea Grant activities.
    - Number of communities [5 communities]
- Number of Sea Grant tools, technologies and information services that are used by our partners/customers to improve ecosystem-based management.
    - Number of Products 'used' [10]
- Number of peer-reviewed publications produced by Sea Grant [1]
    - Resiliency Grant Products:
        - Sea Grant Fact Sheet and information included into grant product concerning the enhancement of the "Great Lakes Port and Harbor Infrastructure and Dredging Cost Evaluation Matrix" for applications in small commercial ports and marinas.
- Number of Volunteer Hours [40]
- Number of Public or Professional Presentations [4]
- Number of Attendees at Public or Professional Presentations [100]

Wisconsin

- The number of Great Lakes coastline erosion control, shoreline bluff stabilization or ports and harbor infrastructure projects that are completed utilizing significant Wisconsin Sea Grant coastal engineering research results, outreach and/or design assistance. [5]

Clark 5 - Coastal Engineering Outreach, Project Assistance, and Promotion of Using Non-biased Science-based Information in determining Environmental Dredging Windows

BACKGROUND

Great Lakes harbor and port navigation channel dredging has been occurring since the first harbor locations were built where the natural channels where too shallow for the required depths needed by the commercial ships which used them. Not surprisingly, these channels also where in locations or near habitat areas which are used by native species of fish and other aquatic life for spawning, migration and/or living.

In attempts to minimize the disruption of the natural use of the region by aquatic life during the dredging of the navigation channel, permitting agencies establish protective "Environmental Dredging Windows". These are specific periods (called "windows") of the year when navigation dredging is not allowed so spawning and/or migration would not be disrupted. Due to the complex nature of the harbor environment and the variety of aquatic life that may be present in the harbor, setting accurate windows is a very difficult task. In many harbors, these window assumptions are set with a lack of detailed data. If more data that are accurate had existed and was used in the window determination, the window could be shortened and the dredging allowed earlier in the spring, continuing later in the fall or both. Lengthy, arbitrary windows can cause un-necessary time delays for the contractor, additional expenses for the harbor, and a general concern for all. In many cases, environmental dredging windows have been set with no science-based considerations.

In recent years critical habitat areas can now be accurately delineated, the existence or absence of fish and other aquatic species can be determined or predicted as well as the possible effects that the dredging operations may or may not have on those concerns. University researchers, the US Army Corps of Engineers ERDC scientists, private environmental consultants, and both state and federal conservation agencies can collect this data. The use of this science-based collected data can better justify proper environmental dredging windows in a coordinated and collaborative approach to improve resiliency and optimize efforts across multiple goals.

OBJECTIVES

- Coastal Engineering specialty activities will provide increased awareness and understanding by Great Lakes ports and harbors and state permitting agencies about how a science-based Environmental Dredging Window can be beneficial to all interests involved.
- Promote science-based Environmental Dredging Windows as a way to both lessen unnecessary contractor downtime (and the resulting increase expenses) as well as providing for greater and more efficient protection of important aquatic species and critical habitats.
- Promote the use of the HTAC model (Harbor Technical Assistance Committee) to assist in the development of a pilot project, which would prepare a science-based Environmental Dredging Window as the result. This model promotes differing agency opinions to be aired, discussed and cooperatively agreed upon.
- Promote and support science-based Environmental Dredging Window determinations throughout the Great Lakes basin.
- Expand access to Great Lakes science-based Environmental Dredging Window development information throughout the Great Lakes by completing a Great Lakes wide workshop (most likely during an annual Great Lakes Dredging Team meeting), a training manual on how to develop a

science-based Environmental Dredging Window and new UW Sea Grant fact sheet describing the process completed by the pilot project.

APPROACH/PLANNED ACTIVITIES

- Starting with the Duluth/Superior harbor, complete a demonstration project by co-chairing with MN Sea Grant in organizing a harbor technical advisory Environmental Dredging Window committee consisting of the port of Duluth/Superior, US Corps of Engineers and the appropriate regulatory agencies (state and federal).
- With the Duluth/Superior committee, determine the aquatic species spawning and migration research, dredging turbidity research, and habitat mapping requested in order to prepare a science-based Environmental Dredging Window.
- Seek funding opportunities for the design and completion of the requested studies (Note that the US Corps of Engineers ERDC has already offered to conduct aquatic species spawning studies and turbidity studies with their own funding).
- Lead the Duluth/Superior committee to use the research results and map critical habitat location data to prepare a Science-Based Environmental Dredging Window.
- Develop a "How to Prepare a Science-Based Environmental Dredging Window" manual for ports to follow based upon the results of the Duluth/Superior demonstration project.
- Conduct a workshop for the Great Lakes Dredging Team concerning "How to initiate and complete a Science-based Environmental Dredging Window" utilizing the lessons learned from the Duluth/Superior demonstration project.
- Prepare at least one technical presentation/paper on the results of the Duluth/Superior demonstration project.
- Develop a UW Sea Grant fact sheet on the initiation and completion of a Science-based Environmental Dredging Window.

WISG PERSONNEL

- Gene Clark (15%)
- Communications Staff (Marie Zhuikov/Elizabeth White/Yael Gen -5%)
- Tom Xiong (web development services as needed -1%)

EXTERNAL PARTNERS

- Wisconsin Coastal Management Program
- Wisconsin Department of Natural Resources
- Great Lakes Commission
- Great Lakes Dredging Team
- US Army Corps of Engineers

INTENDED AUDIENCE

- Wisconsin Coastal Management
- Wisconsin Department of Natural Resources
- US Army Corps of Engineers
- Great Lakes Ports/Harbors/Marinas
- WI Coastal Communities
- Coastal Engineering Consultant Firms

PROJECT DURATION
48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)
- Healthy Coastal Ecosystems (HCE)
- Resilient Communities and Economies (RCE)

WISCONSIN STRATEGIES
- HCE. Support research and outreach to improve Great Lakes ecosystem health through innovations in measurement, predictive modeling and potential treatment or management approaches.
- HCE. Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- HCE. Support research and outreach to develop dynamic and interoperable information systems to support adaptive management of Great Lakes ecosystems.
- HCE. Help residents, resource managers, businesses, industries and the agricultural sector understand the effects of human activities and environmental changes on coastal resources.
- RCE. Support research and outreach to assess and share the impacts of human activities on Great Lakes water quality and supply, as well as coastal and nearshore habitats.
- RCE. Promote research and outreach for sustainable and resilient ports, harbors and marinas, including beneficial use of dredged materials and science-based decision-making related to the timing of dredging to minimize impacts on critical fish spawning habitat.

OUTCOMES
- HCE. Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- HCE. Declining biodiversity, habitats and ecosystem functions and services are restored and sustained in Wisconsin.
- HCE. Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- HCE. Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- HCE. Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.
- RCE. Wisconsin communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- RCE. Community members understand how actions will impact water quantity and quality and are able to make informed decisions.
- RCE. Wisconsin communities have access to sound science, data, tools and services to understand and anticipate changes in water quantity and quality.
- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACTS
- Great Lakes ports and harbor managers, navigation dredging contractors, state and federal resource managers and state project permit reviewers all understand the navigation dredging techniques and impacts, aquatic species spawning and migration patterns, and locations of critical harbor habitats so that appropriate science-based Environmental Dredging Windows can be determined to lessen

contractor economic losses, protect important aquatic species spawning and migration patterns and protect critical harbor habitat.

- Great Lakes ports and harbors will promote and conduct several examples of establishing science-based Environmental Dredging Windows.
- Expanded access to Great Lakes science-based Environmental Dredging Window development information throughout the Great Lakes will be prepared by completing a Great Lakes wide workshop (most likely during an annual Great Lakes Dredging Team meeting), a training manual on how to develop a science-based Environmental Dredging Window and new UW Sea Grant fact sheet describing the process completed by the pilot project.

PERFORMANCE MEASURES AND METRICS

National

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities [4 managers]
- Number of people engaged in Sea Grant-supported informal education programs [30]
- Number of peer-reviewed publications produced by Sea Grant [1]
    - Sea Grant Fact Sheet Describing Method for Formulating a Science-Based Environmental Dredging Window
- Number of Sea Grant-Sponsored/Organized Events [4]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [60]
- Number of Public or Professional Presentations [4]
- Number of Attendees at Public or Professional Presentations [60]

Wisconsin

- There were no specific Wisconsin performance measures or metrics included in our WI 2018-2021 Strategic plan. However, these are appropriate metrics to reach for:
    - The number of harbor Environmental Dredging Window committees formed because of Wisconsin and other Great Lakes network Sea Grant programs (where appropriate). The purpose of the committee is to collaborate in identifying and initiating the collection of science-based data used to determine the harbors mutually agreed upon environmental dredging window. [2 harbor project teams]
    - WI Sea Grant Fact Sheet concerning the purpose and process for establishing a harbor Environmental Dredging Window committee applicable to Great Lakes ports and harbors.

Julia Noordyk – Coastal Storms and Water Quality Specialist and Green Bay Field Office

Noordyk 1 - Tackling Barriers to Green Infrastructure

BACKGROUND

Extreme rainfall events are expected to continue to increase in the Great Lakes region causing more frequent and intense flooding and water quality problems. In a 2014 needs assessment by Wisconsin Sea Grant (WSG) and the NOAA Coastal Storms Program, Great Lakes planners and resource managers identified "stormwater" as contributing to four of the top five coastal storm hazards that impact coastal communities where they work. In addition, 79% of survey respondents rated "local ordinance, zoning and building code assessment and analysis maps" as a top need to address coastal storm hazards.

Green infrastructure is a proven and effective means to improve water quality, habitat and flooding by reducing stormwater pollution and volume, but there remain critical barriers to its implementation. Barriers can include cost and performance uncertainty of technology, prohibitive or discouraging regulations and an inadequate workforce. In particular, local codes and ordinances can have a broad impact, as they govern and can incentivize or deter GI implementation by both the private and public sectors.

Based on the work of 1000 Friends of Wisconsin, Wisconsin Sea Grant, developed Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances, a workbook to help communities audit, revise and prioritize codes that deter the implementation of green infrastructure. The Audit can assist local zoning, land use and stormwater staff, planners and consultants in reviewing codes and ordinances to promote and advance green infrastructure practices in their own communities. What makes this project unique in comparison to similar audits? We recognize the need for a "no judgement" approach in working with communities to audit their codes and ordinances. Barriers to green infrastructure can vary widely within the code language, therefore, solutions need to be customized for the specific municipality and cannot be satisfactorily addressed by model ordinances. The workbook includes a community-oriented engagement approach and provides a detailed codes and ordinances auditing tool.

OBJECTIVES

- Municipal codes are not a barrier to green infrastructure implementation (long-term)
- Municipal codes encourage implementation of green infrastructure in development and redevelopment projects (long-term)
- Municipalities are actively working to implement recommended code amendment list (mid-term)
- Municipalities amend codes to allow and/or encourage green infrastructure implmentation (mid-term)
- All audiences understand how codes and ordinances inhibit green infrastructure implmentation (short-term)
- Audiences are interested and willing to overcome code and ordinance barriers in own communities or are able to use the guidebook to help communities audit codes and ordinances (short-term)
- Municipalities understand the needed code amendments that are needed to allow and/or encourage green infrastructure implmentation (short-term)

APPROACH/PLANNED ACTIVITIES

- Develop complimentary outreach materials to aid communities in code audits
- Give presentations
- Provide technical assistance to all audiences
- Host/co-host train-the-trainer workshops
- Host/co-host municipal workshops
- Work with municipalities to complete audits and prioritization lists

WISG PERSONNEL

- Julia Noordyk (25%)
- Communications staff (1%)

EXTERNAL PARTNERS

- 1000 Friends of Wisconsin
- Clean Wisconsin
- Sea Grant Green Infrastructure Community of Practice
- Fox-Wolf Watershed Alliance
- Milwaukee Metropolitan Sewerage District
- Orion Planning and Design

INTENDED AUDIENCE

- Municipal staff with roles in zoning, land use, urban forestry, stormwater and engineering
- Planning and zoning commissioners and board members; local elected officials
- Consulting civil engineers, landscape architects and planners who prepare development, landscape and engineering plans
- Organizations, nonprofits, university extension and government agencies whose mission is to protect water resources and/or promote community resiliency

PROJECT DURATION

48 months - 2018-2021

FOCUS AREA(S)

- Healthy Coastal Ecosystems
- Resilient Communities and Economies

WISCONSIN STRATEGIES

- HCE. Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- HCE. Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- HCE. Help residents, resource managers, businesses, industries and the agricultural sector understand the effects of human activities and environmental changes on coastal resources.
- HCE. Help managers incorporate public input in natural resource decision-making processes.
- RCE. Support research and outreach to promote the development and implementation of green infrastructure practices.

- RCE. Support research and outreach to develop or enhance community planning and visualization tools that demonstrate the benefits, risks and impacts of land use on the coastal environment.

OUTCOMES

- HCE. Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.
- HCE. Declining biodiversity, habitats and ecosystem functions and services are restored and sustained in Wisconsin.
- HCE. Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- HCE. Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- HCE. Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.
- RCE. Existing and innovative training programs improve community leaders' understanding of changing conditions in their Wisconsin communities and implement adaptive strategies.
- RCE. Wisconsin communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- RCE. Wisconsin communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.
- RCE. Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- RCE. Leaders in Wisconsin's coastal economic sectors understand how they can become more resilient through diversification and through conservation of ecosystem services.
- RCE. Community members understand how actions will impact water quantity and quality and are able to make informed decisions.
- RCE. Wisconsin communities have access to sound science, data, tools and services to understand and anticipate changes in water quantity and quality.
- RCE. Wisconsin communities have diverse, sustainable economies and industries that support existing and emerging water-resource needs.
- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACT

- Audiences have requested a copy of the guidebook and/or asked for assistance within two weeks of a workshop or presentation. (short-term)
- Audiences have worked with a community to use the guidebook within one year of a train-the-trainer workshop or learning of the workbook. (short-term)
- Communities have completed full/partial audits and lists of recommended and prioritized code amendments. (mid-term)
- Communities who have completed the audit have taken steps to make changes to codes. (mid-term)
- Communities have made code changes based on the results of the audit workbook. (long-term)
- Communities who have completed the audit and made code changes decrease policy barriers for green infrastructure implementation. (long-term)
- Communities amend purpose statements, comprehensive plans and applications that encourage green infrastructure use. (long-term)

PERFORMANCE MEASURES AND METRICS

National

- Number of Sea Grant tools, technologies and information services that are used by our partners/customers to improve ecosystem-based management.
    - Number of Products 'developed' [1 products]
    - Number of Products 'used' [2 products]
- Number of communities that adopt/ implement sustainable economic and environmental development practices and policies as a result of Sea Grant activities [6]
- Number of Sea Grant-Sponsored/Organized Events [3]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [90]
- Number of Public or Professional Presentations [10]
- Number of Attendees at Public or Professional Presentations [100-300]

Noordyk 2 - Clean Marina Program

BACKGROUND

The maintenance, operation and storage of recreational vessels have the potential to release pollutants to lakes and rivers. The Wisconsin Clean Marina Program promotes and celebrates voluntary adoption of measures to reduce pollution from marinas, boatyards and recreational boats. The program provides guidance education that enable marina and boatyard operators to become certified clean marinas that protect the resources that sustain their livelihood — clean water, clean air, and healthy fish and wildlife communities. The Clean Marina Program is administered by the Wisconsin Marine Association with guidance and technical assistance from Wisconsin Sea Grant.

OBJECTIVES

- A sustainable program that employees effective and efficient strategies for maintaining and increasing certification.
- Marina and boatyard operators will be more knowledgeable and have an increased awareness of the Clean Marina Program, the best-management practices required for Clean Marina certification, and resources for certification.
- Marina operators have access to and use the tools to provide effective boater education.

APPROACH/PLANNED ACTIVITIES

- Provide outreach and educational assistance to the Wisconsin Marine Association and Wisconsin Clean Marina technical staff.
- Survey boater behaviors and attitudes concerning clean boating practices.
- Assist Clean Marinas with marketing and boater education.
- Tailor marketing strategies to the WSG and Ohio Sea Grant Clean Marina survey results (2017).
- Provide Clean Marina training and education to Wisconsin Marine Association members.
- Participate in Great Lakes Clean Marina Network and leverage resources, tools and products for Wisconsin

WISG PERSONNEL

- Julia Noordyk (15%)
- Student (25%)

EXTERNAL PARTNERS

- Wisconsin Coastal Management Program
- Wisconsin Department of Natural Resources
- Wisconsin Marine Association
- JJR Smith
- Great Lakes Clean Marina Network

INTENDED AUDIENCE

- Wisconsin Great Lakes marinas

PROJECT DURATION

48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)

- Healthy Coastal Ecosystems
- Resilient Communities and Economies

WISCONSIN STRATEGIES

- HCE. Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- HCE. Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- HCE. Help residents, resource managers, businesses, industries and the agricultural sector understand the effects of human activities and environmental changes on coastal resources.
- RCE. Support research and outreach to promote the development and implementation of green infrastructure practices.
- RCE. Promote research and outreach for sustainable and resilient ports, harbors and marinas, including beneficial use of dredged materials and science-based decision-making related to the timing of dredging to minimize impacts on critical fish spawning habitat.

OUTCOMES

- HCE. Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal entities.
- HCE. Declining biodiversity, habitats and ecosystem functions and services are restored and sustained in Wisconsin.
- HCE. Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- RCE. Wisconsin communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.
- RCE. Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- RCE. Community members throughout Wisconsin understand watershed functions and the services those watersheds provide to support communities and economies.
- RCE. Community members understand how actions will impact water quantity and quality and are able to make informed decisions.
- RCE. Wisconsin communities have diverse, sustainable economies and industries that support existing and emerging water-resource needs.
- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACT

- Clean Marina certification reduces pollution into lakes and rivers and supports the economic sustainability of Great Lakes marinas.

PERFORMANCE MEASURES AND METRICS

National

- Number of communities that adopt/ implement sustainable economic and environmental development practices and policies as a result of Sea Grant activities [20]

- Number of Marinas Certified as "Clean Marina" by the Clean Marina Program as a result of Sea Grant Activities [20]

Noordyk 3 - Restoring the Health of the Lower Fox River and Green Bay

BACKGROUND

Lower Green Bay and 14 tributaries in the Lower Fox River Basin do not meet Wisconsin water-quality standards due to low dissolved oxygen. Excessive suspended solids and phosphorous cause nuisance and harmful algal blooms (HABs) that have led to a dead zone in lower Green Bay. The Lower Fox River and Green Bay are listed on the state's 303(d) list of impaired waterbodies and have been designated a Great Lakes Area of Concern (AOC). In 2012, the Wisconsin Department of Natural Resources (DNR) approved total maximum daily load (TMDL) standards for the area and implementation began in 2013. The DNR is coordinating the implementation of the Remedial Action Plan (RAP) for addressing environmental problems in the AOC.

Due to the magnitude and complexity of the water quality problems in the basin, a multitude of approaches is necessary to make progress. UW Sea Grant is collaborating with multiple agencies and groups to support the delisting of Beneficial Use Impairments (BUI) in the AOC and the implementation of the TMDL. Noordyk holds membership on the AOC technical stakeholder-working group and Noordyk chairs the AOC Citizen Advisory Committee Outreach sub-committee (a.k.a., Clean Bay Backers) a diverse collaboration of public, private and non-profit members who represent community interests in creating a better future by restoring the health of the Lower Fox River and bay of Green Bay. The Committee provides outreach and education to elected officials, community leaders and the public about the progress and ongoing challenges to improving water quality and restoring the AOC through an annual experiential event. In addition, Noordyk helped to create, and remains a Steering Committee Co-chair for the Green Bay Conservation Partners, a regional partnership to facilitate coordinated conservation activities in the northeast Wisconsin region of the Green Bay watershed. Formed in 2014, the partnership consists of individuals working on natural resource issues for government agencies, tribal nations, universities, non-profit groups and others. The focus region of this partnership is the bay of Green Bay, the Lower Fox River watershed, Green Bay's west shore and the Door Peninsula.

UW Sea Grant is committed to providing research and outreach towards effective solutions to Green Bay's water quality problems, especially from non-point sources of pollution, with meaningful participation and stewardship of knowledgeable stakeholders throughout the Lower Fox River basin.

OBJECTIVES

- Residents, resource managers, business leaders and local officials will understand: 1) the causes and consequences HABs in Green Bay, 2) the environmental, social, and economic impacts degraded water quality has on the region, and 3) what work is being done to improve water quality in the basin, and 4) ways that they can contribute to the improvement of water quality in the basin.
- Governments, organizations and universities will use ecosystem approaches to implement adaptive management plans that reduce ecosystem stressors and restore beneficial uses.
- The effectiveness of conservation projects will be enhanced by Sea Grant-supported research and outreach.

APPROACH/PLANNED ACTIVITIES

- Provide outreach and education on for Green Bay water quality history, science and management.
- Promote interdisciplinary research that focuses on social science knowledge gaps.
- Develop fact sheets on the dead zone and harmful algal blooms.

- Coordinate professional and educational events related to improving the health of the Lower Fox River and Green Bay.

WISG PERSONNEL
- Julia Noordyk (25%)
- Student (10%)
- Communications staff (2%)

EXTERNAL PARTNERS
- Green Bay watershed municipalities, counties and regional planning commissions
- Wisconsin Coastal Management Program
- Wisconsin Department of Natural Resources
- University of Wisconsin-Green Bay
- University of Wisconsin-Milwaukee
- U.S. Fish and Wildlife Service
- The Nature Conservancy
- Save the Bay Initiative
- NEW Water
- Fox-Wolf Watershed Alliance
- Northeast Wisconsin Land Trust
- UW-Extension
- Oneida Nation
- League of Women Voters
- Ducks Unlimited
- East Shore Drive Neighborhood Association
- Gathering Waters
- Alliance for the Great Lakes

INTENDED AUDIENCE
- Elected officials and community leaders
- Government agencies, tribal nations, universities, nonprofit groups and others working on water quality, conservation and natural resource issues in the northeast Wisconsin region of the Green Bay watershed.

PROJECT DURATION
48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)
- Healthy Coastal Ecosystems

WISCONSIN STRATEGIES
- HCE. Support research and outreach that bridges natural sciences, social sciences and policy studies to support more holistic management and restoration of Green Bay and its watershed.
- HCE. Support research and outreach to understand the environmental and socioeconomic effects of current and emerging challenges on Great Lakes ecosystem and human health including, but not limited to, contaminants, aquatic invasive species, harmful algal blooms, bacterial outbreaks, physical processes, climate change and changes to biodiversity and ecosystem structure.

- HCE. Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- HCE. Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- HCE. Help managers incorporate public input in natural resource decision-making processes.

OUTCOMES

- HCE. Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- HCE. Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.
- HCE. Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal entities.
- HCE. Declining biodiversity, habitats and ecosystem functions and services are restored and sustained in Wisconsin.
- HCE. Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- HCE. Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- HCE. Wisconsin communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.

IMPACT

- A community made of residents, resource managers, business and local officials who are invested in restoring the health of the Lower Fox River and Green Bay.
- Governments, organizations and universities will use ecosystem approaches to implement adaptive management plans that reduce ecosystem stressors and restore beneficial uses.
- The effectiveness of conservation projects is enhanced by Sea Grant-supported research and outreach.
- A strong collaborative network of individuals from government agencies, tribal nations, universities, nonprofit groups and others working on water quality, conservation and natural resource issues in the northeast Wisconsin region of the Green Bay watershed.

PERFORMANCE MEASURES AND METRICS

National

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities [150 managers]
- Number of Sea Grant products that are used to advance environmental literacy and workforce development [2]
- Number of people engaged in Sea Grant-supported informal education programs [500]
- Number of Volunteer Hours [?]
- Number of Sea Grant-Sponsored/Organized Events [12]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [560]
- Number of Public or Professional Presentations [8]
- Number of Attendees at Public or Professional Presentations [400]

Noordyk 4 - Building Resilient Coastal Communities

BACKGROUND

Coastal communities in the Great Lakes are faced with several storm hazards, including bluff and shoreline erosion, runoff pollution and flooding. The increasing frequency and severity of weather events make planning for coastal storm hazards an important part of helping Great Lakes communities become more resilient to climate change.

In a 2014 needs assessment by Wisconsin Sea Grant (WSG) and the NOAA Coastal Storms Program, Great Lakes planners and resource rated the following as the top five coastal storm hazards that moderately to greatly impact their communities:

1. Bluff and shoreline erosion
2. Stormwater/agricultural runoff pollution
3. Stormwater/agricultural runoff sedimentation
4. Overflow of combined sewer and stormwater systems
5. Stormwater flooding of residential and commercial developments

Wisconsin Sea Grant in collaboration with state and federal agencies is working to provide relevant data, tools and education for coastal communities that address coastal storm hazards. Much of the 2018-2021 effort will be focused on planning and mitigation actions that can reduce the impacts of varying water levels, bluff erosion, storms and coastal flooding.

OBJECTIVES

- Coastal communities will have access to data, tools and educational materials relevant to the coastal hazards they face.
- Coastal communities and residents will be more resilient and prepared to the impacts of varying water levels, bluff erosion, storms and coastal flooding

APPROACH/PLANNED ACTIVITIES

- Develop a factsheet on bluff top stormwater management.
- Work with marinas using Ohio Sea Grant's Coastal Storms Preparation, Adaptation, and Response Tool.
- Collaborate with Wisconsin Emergency Management on Community Rating System and other floodplain related efforts.
- Participate in the Wisconsin Coastal Hazards Working Group.
- Deliver education related to climate change and coastal hazards.
- Engage communities in incorporating climate change projections and impacts into hazard planning.

WISG PERSONNEL

- Julia Noordyk (15%)
- Communications staff (1%)

EXTERNAL PARTNERS

- Coastal municipalities, counties and regional planning commissions
- Wisconsin Coastal Management Program
- Wisconsin Department of Natural Resources
- NOAA Office for Coastal Management

- Association of State Floodplain Managers
- Wisconsin Emergency Management
- Wisconsin Association for Floodplain, Stormwater, and Coastal Management

INTENDED AUDIENCE
- Coastal resource managers
- Local government planners
- Coastal residents

PROJECT DURATION
48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)
- Resilient Communities and Economies

WISCONSIN STRATEGIES
- RCE. Support research and outreach to promote the development and implementation of green infrastructure practices.
- RCE. Work with management and regulatory agencies, tribal entities and vulnerable and at-risk communities to reduce vulnerability to fluctuating water levels, storm impacts and a changing climate.
- RCE. Promote research and outreach for sustainable and resilient ports, harbors and marinas, including beneficial use of dredged materials and science-based decision-making related to the timing of dredging to minimize impacts on critical fish spawning habitat.
- RCE. Support research and outreach on nature-based shore protection along Great Lakes coasts.

OUTCOMES
- RCE. Wisconsin communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- RCE. Existing and innovative training programs improve community leaders' understanding of changing conditions in their Wisconsin communities and implement adaptive strategies.
- RCE. Wisconsin communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.
- RCE. Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACT
- Coastal communities, marinas and residents are be more resilient and prepared to the impacts of varying water levels, bluff erosion, storms and coastal flooding.

PERFORMANCE MEASURES AND METRICS
<u>National</u>
- Number of communities that adopt/implement hazard resiliency practices to prepare for and respond to/minimize coastal hazardous events as a result of Sea Grant activities
    - Number of Communities [2]

    - Number of hazard resiliency training/ technical assistance provided [2]
- Number of people engaged in Sea Grant-supported informal education programs [30]
- Number of Sea Grant tools, technologies and information services that are used by our partners/customers to improve ecosystem-based management.
    - Number of Products 'developed' [1 product]
    - Number of Products 'used' [1 product]
- Number of Sea Grant-Sponsored/Organized Events [2]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [50]
- Number of Public or Professional Presentations [6]
- Number of Attendees at Public or Professional Presentations [90]

<u>Wisconsin</u>

- The number of training sessions for coastal hazards decision-support tools conducted by Wisconsin Sea Grant staff and partners. [2]

Titus Seilheimer – Fisheries Outreach Specialist and Manitowoc Field Office

Manitowoc Field Office

BACKGROUND

University of Wisconsin-Manitowoc: The Manitowoc field office is located on the shore of Lake Michigan and the fisheries specialist responds to diverse requests for information and support on fisheries, aquatic ecology and related issues. The specialist, housed in this office since 1999, provides support to Door, Kewaunee, Manitowoc, and Sheboygan counties. Forty-two percent of Wisconsin's Great Lakes charter fishing trips depart from Kewaunee, Manitowoc and Sheboygan counties each year. Another 33 percent depart from nearby Door, Ozaukee and Milwaukee counties. Half of Wisconsin's commercial fishing licenses are located in this primary service area, and another 25 percent are located within 75 miles. This field office provides education and outreach to the service area on ecological topics to stakeholder groups as well as K-12. The specialist also has the flexibility to respond to changing ecological issues and fisheries problems that arrive over time. Support of habitat restoration projects is also provided through this office to enhance fisheries habitat in the service area. The specialist brings diverse research experience to the Manitowoc field office including fish habitat in Great Lakes coastal wetlands, fish habitat modeling, river flow regime classification, stream and lake ecology, and watershed scale modeling.

WISG PERSONNEL

- Titus Seilheimer (32%)
- Communications staff (1%)

EXTERNAL PARTNERS

- Wisconsin Maritime Museum
- Service Area School Districts
- Wisconsin Department of Natural Resources
- Woodland Dunes Nature Center
- NOAA Marine Sanctuary Program

PERFORMANCE MEASURES AND METRICS

National

- Number of acres of coastal habitat protected, enhanced, or restored as a result of Sea Grant activities [60 acres]
- Number of P-12 Students Reached through Sea Grant-Trained Educators or Directly through Sea Grant Education Programs [500]
- Number of Sea Grant-Sponsored/Organized Events [5]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [500]
- Number of Public or Professional Presentations [25]
- Number of Attendees at Public or Professional Presentations [500]

Seilheimer 1 - Great Lakes and food web ecosystem ecology

BACKGROUND

The Great Lake waters of Wisconsin support jobs and economic impacts through the harvest of fish by commercial, charter, and recreational fishers. The food webs that support these fisheries are dynamic systems and are influenced by factors such as invasive species, nutrient loading, and resource management. Understanding the complexity of these food webs is essential for ecosystem-based management and for stakeholder support of management decisions. Sustainable fisheries and food web webs will benefit stakeholders and the state of Wisconsin. This work plan action will support outreach, education, and research in Wisconsin's Great Lakes ecosystems.

OBJECTIVES

- Improve understanding of past, present, and future Great Lakes food webs
- Support evidence-based decision-making for Great Lakes resource management
- Provide knowledge and tools for ecosystem-based management of Wisconsin's Great Lakes
- Improve understanding of the impacts of aquatic invasive species on Great Lakes ecosystems
- Engage stakeholders in citizen-science to monitor changes in the food web

APPROACH/PLANNED ACTIVITIES

- Chair and facilitate the Lake Michigan Fisheries Forum (2-4 meetings per year)
- Provide outreach on Great Lakes food webs to angling and community groups (5-10 presentations per year; 50-100 stakeholders reached per year)
- Assist Michigan Sea Grant with Wisconsin recruitment for Great Lakes Angler Diary and diet study
- Assistance and support for cisco reintroduction actions for a more sustainable prey fish base
- Serve on fisheries advisory committees (Great Lakes Fishery Commission, WI Department of Natural Resources Wisconsin Fisheries Advisory Council)
- Produce a food web change fact sheet

WISG PERSONNEL

- Titus Seilheimer (32%)

EXTERNAL PARTNERS

- Wisconsin Department of Natural Resources
- US Fish and Wildlife Service
- Sport Fishing Groups
- Commercial Fishing Industries
- Great Lakes Sea Grant Network
- University of Wisconsin Madison, Milwaukee, Green Bay, and Stevens Point
- Lawrence University
- Michigan State University

INTENDED AUDIENCE

- Recreational and charter fishers
- Commercial and tribal fishers
- Coastal stakeholders

PROJECT DURATION
48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)
- Healthy Coastal Ecosystems
- Sustainable Fisheries and Aquaculture

WISCONSIN STRATEGIES
- Support research and outreach to understand the environmental and socioeconomic effects of current and emerging challenges on Great Lakes ecosystem and human health including, but not limited to, contaminants, aquatic invasive species, harmful algal blooms, bacterial outbreaks, physical processes, climate change and changes to biodiversity and ecosystem structure.
- Support research and outreach to improve Great Lakes ecosystem health through innovations in measurement, predictive modeling and potential treatment or management approaches.
- Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- Support research and outreach to develop dynamic and interoperable information systems to support adaptive management of Great Lakes ecosystems.
- Help managers incorporate public input in natural resource decision-making processes.
- Support research and outreach to better understand our Great Lakes fisheries, including status and trends, measurement and modeling techniques, future scenarios, and socioeconomic costs and benefits under different management approaches and environmental conditions.
- Support research and outreach to advance an environmentally sustainable and robust recreational, commercial and subsistence Great Lakes fishery.
- Better understand threats to Great Lakes fisheries, including, but not limited to, nutrient enrichment, invasive species, food web changes, genetics and climate change as well as effective responses.

OUTCOMES
- Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.
- Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- Citizen science initiatives are engaged and contribute to improving our knowledge with respect to coastal communities and ecosystems.
- Innovative solutions that increase understanding of climate impacts on state and regional fisheries and aquaculture are available and accessible to resource managers and fishing and aquaculture communities.
- Resource managers and fishing and aquaculture communities have access to science and tools to increase Wisconsin-based capacity to adapt to future resource-management needs.

IMPACT

- Improve stakeholder understanding of Great Lakes food web change in order to support science-based decision-making.

PERFORMANCE MEASURES AND METRICS

National

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities [5]
- Number of people engaged in Sea Grant-supported informal education programs [500]
- Number of Sea Grant tools, technologies and information services that are used by our partners/customers to improve ecosystem-based management [5]
- Number of Volunteer Hours [500]
- Number of Sea Grant-Sponsored/Organized Events [15]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [50]
- Number of Public or Professional Presentations [8]
- Number of Attendees at Public or Professional Presentations [500]

Wisconsin

- The number of training sessions for stakeholders and key stakeholder groups on Great Lakes aquatic invasive species prevention efforts. [1]
- The Lake Michigan Fisheries Forum educates sport and commercial fishermen through seminars and discussion. [8 meetings]

Seilheimer 2 - Commercial fishing industry support

BACKGROUND

Wisconsin's commercial fisheries in Lake Superior and Lake Michigan provide jobs, economic impacts, and food for Wisconsin's residents. Freshwater fishes are a healthy source of protein and a sustainable industry. The primary commercial catch in Lake Michigan is lake whitefish, while Lake Superior harvests are a combination of cisco (roe market) and lake whitefish. There is a long tradition of commercial harvest in Wisconsin. This work will attempt to reduce conflicts between commercial fishers and anglers, increase efficiency of fishing methods, and to better understand the dynamics of bycatch in the fisheries. Safety of fishers will also be a priority.

OBJECTIVES

- Support a sustainable state-licensed and tribal commercial fishing industry
- Provide research expertise on different fishing gear types and gear modification
- Assist in the understanding of catch composition in different locations and with differing gear types
- Commercial net safety and awareness
- Improve safety in commercial fishing industry
- Support fishing industry through working waterfronts
- Increase reach of Great Lakes Fisheries Heritage Trail in Wisconsin with emphasis on role of current commercial fisheries

APPROACH/PLANNED ACTIVITIES

- Work with commercial fishers and other partners to develop research projects to support the commercial fishing industry
- Continued support of commercial whitefish trawling study
- Provide outreach, such as trap net locations, to reduce user conflict
- Plan and teach drill conductor courses to increase safe practices in commercial fishing industry (2 per year with Michigan Sea Grant)
- Support the Eat Wisconsin Fish program to raise awareness of local seafood sources
- Participate in Great Lakes Fisheries Heritage Trail meetings and outreach in Wisconsin

WISG PERSONNEL

- Titus Seilheimer (32%)

EXTERNAL PARTNERS

- Wisconsin commercial fishers
- Wisconsin Department of Natural Resources
- University of Wisconsin researchers
- Michigan Sea Grant

INTENDED AUDIENCE

- Commercial fishers
- Seafood consumers

PROJECT DURATION

48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)

- Healthy Coastal Ecosystems
- Sustainable Fisheries and Aquaculture

WISCONSIN STRATEGIES

- Support research and outreach to better understand our Great Lakes fisheries, including status and trends, measurement and modeling techniques, future scenarios, and socioeconomic costs and benefits under different management approaches and environmental conditions.
- Support research and outreach to advance an environmentally sustainable and robust recreational, commercial and subsistence Great Lakes fishery.
- Better understand threats to Great Lakes fisheries, including, but not limited to, nutrient enrichment, invasive species, food web changes, genetics and climate change as well as effective responses.
- Support research that leads to a better understanding of the benefits and risks of consuming Wisconsin-produced fish.
- Support research and outreach that encourages the application of behavioral and consumer sciences toward consumer perception and preferences, food safety, labeling and certifications, seafood demand studies and promotion of local seafood.
- Support research and outreach to develop and improve economically viable and environmentally sustainable aquaponics operations, with an emphasis on business planning, risks and socioeconomics.

OUTCOMES

- Freshwater resource industries employ technologies and reinforce strategies to ensure safe and sustainable Great Lakes fisheries and products.
- Consumers understand the health benefits of Great Lakes fish and purchase safe and sustainable products.
- Freshwater resource industries employ strategies that balance economic, community and conservation goals.
- Commercial and recreational fishers and aquaculturists in Wisconsin are knowledgeable about efficient, sustainable and responsible tools, techniques and uses of coastal and freshwater resources.
- Innovative solutions that increase understanding of climate impacts on state and regional fisheries and aquaculture are available and accessible to resource managers and fishing and aquaculture communities.

IMPACT

- Fisheries supply food, jobs and economic and cultural benefits to Wisconsin and the region and this industry support will enhance the economic impacts of the fishery

PERFORMANCE MEASURES AND METRICS

<u>National</u>

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities [5]
- Number of fishermen, seafood processing and aquaculture industry personnel who modify their practices using knowledge gained in fisheries sustainability and seafood safety as a result of Sea Grant activities [5]

- Economic and societal impacts derived from Sea Grant activities (market and non-market; jobs and businesses created or sustained) [2 jobs created, 2 jobs sustained, $200,000 economic impact]
- Number of peer-reviewed publications produced by Sea Grant [1]
- Number of Sea Grant-Sponsored/Organized Events [5]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [5]
- Number of Public or Professional Presentations [5]
- Number of Attendees at Public or Professional Presentations [50]

Wisconsin

- Investment in research projects that hold promise to address Wisconsin strategies in the Sustainable Fisheries and Aquaculture focus area [1]
- Trap net location maps are used by anglers [2,000 maps]
- Trap net location maps are used by anglers [10,000 downloads]

Seilheimer 3 - Marine debris and Great Lakes ghost nets

BACKGROUND

Marine debris is a growing issue in the Great Lakes. This debris takes many forms, from small microplastics (e.g., fragments) to lost fishing nets. Research is needed to understand the biotic impacts of microplastics, in addition to additional outreach on the impacts of marine debris on stakeholders and biota. Building on past work with the Great Lakes Indian Fish and Wildlife Commission and Apostle Islands Sportfishermen's Association, continued work on preventing and removing ghost nets is needed. Wisconsin Sea Grant will also continue to collaborate with the network of Great Lakes professionals working to remove and reduce marine debris.

OBJECTIVES

- Reduce the rate of new ghost nets in the Great Lakes.
- Reduce the number of ghost nets in the Great Lakes through effective removal.
- Work with Great Lakes Sea Grant Network on marine debris issues.
- Assist with completion of actions in NOAA's Great Lakes Marine Debris Action Plan

APPROACH/PLANNED ACTIVITIES

- Continue work on ghost net reduction and other associated marine debris projects (complete actions in NOAA Marine Debris funded project)
- Work with Great Lakes Sea Grant colleagues on NOAA's Great Lakes Marine Debris Action Plan (2 progress reports per year)

WISG PERSONNEL

- Titus Seilheimer (4%)
- Tom Xiong (web development services as needed – 1%)

EXTERNAL PARTNERS

- Great Lakes Sea Grant Network
- Great Lakes Indian Fish and Wildlife Commission
- Sport fishing groups
- NOAA Marine Debris Program

INTENDED AUDIENCE

- Coastal stakeholders
- Commercial and subsistence fishers

PROJECT DURATION

48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)

- Healthy Coastal Ecosystems

WISCONSIN STRATEGIES

- Support research and outreach that bridges natural sciences, social sciences and policy studies to support more holistic management and restoration of Green Bay and its watershed.

- Support research and outreach to understand the environmental and socioeconomic effects of current and emerging challenges on Great Lakes ecosystem and human health including, but not limited to, contaminants, aquatic invasive species, harmful algal blooms, bacterial outbreaks, physical processes, climate change and changes to biodiversity and ecosystem structure.
- Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.

OUTCOMES

- Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.
- Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal entities.
- Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- Citizen science initiatives are engaged and contribute to improving our knowledge with respect to coastal communities and ecosystems.
- Wisconsin communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
- Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.

IMPACT

- Marine debris, including ghost nets, is an emerging issue in the Great Lakes and may be impacting the ecology of the food webs and fisheries

PERFORMANCE MEASURES AND METRICS

National

- Number of P-12 Students Reached through Sea Grant-Trained Educators or Directly through Sea Grant Education Programs [100]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [2]
- Number of Public or Professional Presentations [5]
- Number of Attendees at Public or Professional Presentations [50]

Deidre Peroff – Social Science Outreach Specialist and Milwaukee Field Office

Peroff 1 – Improve environmental literacy of Lake Michigan coastal communities

BACKGROUND

One of Sea Grant's four overarching focus areas is to improve environmental literacy about coastal issues and opportunities and, in the process, build capacity among communities to develop and support jobs in the water industry. According to the National Sea Grant office's website, "An environmentally literate person is someone who has a fundamental understanding of the systems of the natural world, the relationships and interactions between the living and non-living environment and the ability to understand and utilize scientific evidence to make informed decisions regarding environmental issues." Wisconsin Sea Grant has demonstrated this as a key focus area through the development of a variety of educational programs for students and teachers, some of which have run regularly for years. Moreover, social science tools and theories are often needed to better understand stakeholders with diverse cultural backgrounds, beliefs, and values, and to learn how to effectively engage them in solving complex water problems. Combined with outreach and community engagement, social science tools, methods, and theory are utilized to both assess and improve environmental literacy and, in effect, build capacity among coastal communities.

OBJECTIVES

- Improve environmental literacy about coastal issues among Wisconsin's coastal counties
- Increase environmental stewardship among urban youth through watershed education programs
- Improve understanding of diverse values and perspectives among stakeholders
- Provide career development opportunities to undergraduate and graduate students to increase capacity for blue-green jobs

APPROACH/PLANNED ACTIVITIES

<u>Coastal Collaboration for Healthy Lake Michigan</u>

- Project funded by Wisconsin Coastal Management Program to develop uniform messaging around stormwater pollution prevention along Lake Michigan coastal counties. Partnering with Sweet Water (Southeast Wisconsin Watersheds Trust, Inc.), Lakeshore Natural Resource Partnership (LNRP), Fox-Wolf Watershed Alliance, and Lake Michigan Stakeholders. Steps include development and analysis of preliminary survey of organizations with stormwater outreach programs (completed), analysis of a series of household surveys, and development of a media campaign to reach Lake Michigan coastal stakeholders. Post-analysis will also be conducted to evaluate effectiveness of media campaign among coastal residents. Project should be completed by Fall 2019.

<u>Watershed Education programs with funding by NOAA B-WET and National Marine Sanctuary Foundation</u>

- With various partners such as Milwaukee Metropolitan Sewerage District (MMSD), Community Learning Centers (CLCs), Upham Woods Education Center, Urban Ecology Center, and School of Freshwater Sciences (SFS), I'll coordinate, teach, and evaluate STEM-focused watershed education programs. Program will be ongoing and may include afterschool or summer programs in Milwaukee Public School district. Education will include school visits and, when funds are available, local field

trips with participating organizations so students can experience hands-on, inquiry-based learning and exploration of various water ecosystems (e.g., wetlands, rivers, Lake Michigan watershed).

PESC initiative

- In partnership with Dr. Scott Graham, a visiting scholar with the Center for Water Policy at School of Freshwater Sciences (SFS), we'll further develop the PESC (Public Engagement and Science Communication) initiative, which provides trainings, workshops, and opportunities for collaboration among SFS students and faculty who strive to further develop PESC and career skills.

Wisconsin Water Thinkers Network (Leadership Committee)

- WWTN commenced in 2016 as an initiative to use systems thinking to engage an inclusive community of people in Wisconsin who care about water and are interested in participating in dialogue around water issues, sharing resources, and collaborating to solve 'wicked' water problems. Focused on outreach and education, we hold regular webinars and training sessions, annual meetings, and local/regional opportunities for engagement around thinking critically about water.

Lake Michigan Stakeholders (Steering Committee)

- Lake Michigan Stakeholders is a diverse group of Wisconsin professionals and residents focused on inspiring and engaging a community of stewards to ensure Lake Michigan and its natural and cultural resources are viable for present and future generations. The steering committee works to maintain existing materials and to further develop activities, meetings, communication outlets, and other resources to educate members and improve environmental literacy about Lake Michigan in Wisconsin.

WISG PERSONNEL

- Deidre Peroff (20%)
- Communications staff (help distributing information via press releases, blog posts, social media, etc. – as needed – 1%)
- Jim Grandt (system administration services as needed – 1%)

EXTERNAL PARTNERS

- Southeastern Wisconsin Watersheds Trust, Inc. (Sweet Water)
- Lakeshore Natural Resource Partnership (LNRP)
- Wisconsin Coastal Management Program (WCMP)
- Fox-Wolf Watershed Alliance
- Milwaukee Metropolitan Sewerage District (MMSD)
- Urban Ecology Center
- School of Freshwater Sciences

INTENDED AUDIENCE

- Lake Michigan Stakeholders – includes general public, Wisconsin coastal county residents, businesses, government officials, tribes
- Educators – including Community Learning Centers (CLCs), public school teachers, environmental educators
- Students – including urban youth, college students

PROJECT DURATION

Varies by activity (more detailed in activities section above). Overall topic will be ongoing throughout the 4-year cycle, 2018-2021.

FOCUS AREA(S)

- Environmental Literacy and Workforce Development (ELWD)
- Resilient Communities and Economies (RCE)

WISCONSIN STRATEGIES

- ELWD. Work with education partners to promote Great Lakes literacy principles within formal and informal learning environments.
- ELWD. Develop Pre-K-12 resources that address the Great Lakes literacy principles and support state and national educational standards.
- ELWD. Support education projects that incorporate innovative technologies or practices in Great Lakes education.
- ELWD. Promote the intersection of the arts, sciences and humanities to inspire a science- informed society.
- ELWD. Promote place-based learning as a way to engage citizens in local stewardship.
- ELWD. Identify and promote Great Lakes-related career pathways in Wisconsin.
- RCE. Support research and outreach to promote the development and implementation of green infrastructure practices.
- RCE. Support research to document the socioeconomic contributions of water- dependent industries.

OUTCOMES

- ELWD. Teachers and students are better informed in science, technology, engineering and mathematics fields and can employ their knowledge to support sustainable practices within their communities throughout Wisconsin.
- ELWD. Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources.
- ELWD. Communities implement sustainable strategies when managing Wisconsin's natural resources and make decisions based on information acquired through informal science education.
- ELWD. All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain the state's coastal communities and ecosystems.
- ELWD. Undergraduate and graduate students, particularly those from under-represented groups, are supported and have access to formal and experiential learning, training and research experiences.
- RCE. Existing and innovative training programs improve community leaders' understanding of changing conditions in their Wisconsin communities and implement adaptive strategies.
- RCE. Community members throughout Wisconsin understand watershed functions and the services those watersheds provide to support communities and economies.
- RCE. Community members understand how actions will impact water quantity and quality and are able to make informed decisions.
- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACT

- Environmentally literate individuals and communities will have the knowledge, attitudes, and skills to be better stewards of the environment, tackle highly complex water problems and fill water-focused ("blue-green") jobs
- Social science and systems thinking research helps people understand diverse views, values, and perspectives to be more impactful when working with stakeholders
- Career development opportunities provide students with training needed to acquire water-focused jobs from various industries

PERFORMANCE MEASURES AND METRICS

National

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities [10]
- Number of communities that adopt/ implement sustainable economic and environmental development practices and policies as a result of Sea Grant activities [2]
- Number of Sea Grant products that are used to advance environmental literacy and workforce development. [8]
- Number of people engaged in Sea Grant supported informal education programs [3500]
- Number of Sea Grant-supported graduates who become employed in a job related to their degree within two years of graduation. [4]
- Number of Sea Grant tools, technologies and information services that are used by our partners/customers to improve ecosystem-based management. [Products 'developed' -4; Products 'used'-15]
- Economic and societal impacts derived from Sea Grant activities (market and non-market; jobs and businesses created or sustained) [Jobs Created -2]
- Number of P-12 students reached through Sea Grant-trained educators or directly through Sea Grant education programs [800]
- Number of P-12 Educators who participated in Sea Grant education programs [80]
- Number of volunteer hours [80]
- Number of Sea Grant-Sponsored/Organized Events [12]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [800]
- Number of Public or Professional Presentations [14]
- Number of Attendees at Public or Professional Presentations [800]

Wisconsin

- The number of products developed by Wisconsin Sea Grant PIs with Wisconsin Sea Grant outreach staff to effectively communicate their research projects to Great Lakes stakeholders. [6]

Peroff 2 – Promote environmental justice in Wisconsin's coastal communities

BACKGROUND

Environmental justice (EJ) is fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (EPA, 2017). At Sea Grant, environmental justice has increasingly been raised as an important topic related to the overarching goal of ensuring programs include representation from participants and partners with diverse backgrounds. Accordingly, a Diversity and Inclusion Community of Practice was formed in November 2016 during Sea Grant Week with participation from most of Sea Grant's 33 programs. As part of this broader effort, individual state programs such as Wisconsin Sea Grant are initiating projects and outreach efforts with the intention of increasing access to and responsible use of Wisconsin's vast coastal resources and opportunities among disenfranchised communities – or in ensuring water-related risks do not negatively affect one group over another. Therefore, environmental justice projects may (and should) overlap with subjects such as water safety, tourism/recreation, response to severe weather and disasters, water quality, traditional ecological knowledge, and many others. Specific projects with a prominent environmental justice focus, and how social science tools and methods can be used to address them, are outlined here.

OBJECTIVES

- Increase meaningful involvement among ethnically and racially diverse communities in Wisconsin Sea Grant projects and outreach efforts
- Increase access to and responsible use of coastal resources and water-related recreational opportunities among disenfranchised peoples and communities in Wisconsin
- Employ effective outreach that ensures all people are safe when participating in water-related activities or when in contact with severe weather

APPROACH/PLANNED ACTIVITIES

- Facilitation and/or development of meetings focused on community engagement around water resources. Activities include collaborating with many local and regional partners and may include information sessions on water-related topics, facilitation of volunteer activities such as weed-outs or beach cleanups, and/or public meetings.
- Active participation in Sea Grant's Diversity and Inclusion Community of Practice. Currently co-chairing initiative on increasing environmental justice initiatives and contributing to development of best practices paper. Paper will be completed by Winter 2018 for distribution.
- Co-chair committee on Education and Recreation as part of Milwaukee Water Commons Water City 3.0 initiative to characterize Milwaukee as a 'global water city' by year 2026. Development and implementation of outreach efforts focusing on ensuring Milwaukee residents have safe and meaningful water experiences. Accordingly, outreach on water safety will be developed as well as a "Water Safety Week" to launch in May 2018. Activities will likely include swimming lessons or vouchers, recreational activities, dissemination of information on rip current safety, proclamation of "Water Safety Day" by Mayor Barrett. Activities will be ongoing.
- Active member of Milwaukee Water Commons' Community Water Assembly, a 'think tank' of local Milwaukee partners focusing on environmental justice related to water issues in Milwaukee. Topics include green infrastructure, arts & culture, education & recreation, water quality, drinking water, and blue-green jobs. Meets quarterly.
- Development of educational learning exchange between College of Menominee Nation students and UW-Milwaukee's School of Freshwater Sciences (SFS) around lake sturgeon. Design and

implementation of the program will include aquaculture faculty at SFS, WISG's education outreach specialist, Wisconsin Department of Natural Resources, and staff at College of Menominee Nation's Sustainable Development Institute. It will provide an opportunity for faculty and students at both educational institutions to teach and learn about the traditional history of Lake Sturgeon up to present day conservation efforts. Program will hopefully become annual, in April, with first experience planned for April 2018.

- As part of National Weather Service's (NWS) efforts to create a Weather Ready Nation (WRN), WISG is partnering with NWS on a research and outreach project to assess how economically disadvantaged people receive weather information. The use of social science tools such as small group discussions with community leaders and face to face surveys will be used to assess the most effective ways to communicate about severe weather among the urban, rural, and elderly poor in Wisconsin. Results will be presented at conferences and reports will be produced for use among emergency managers, community leaders, businesses, and the public in order to save lives and livelihoods through use of appropriate technology and communication. Project will be ongoing and is currently in first phase with urban poor in Milwaukee, Wisconsin.
- Collaborate with Minnesota Sea Grant, Bad River Tribe, and NOAA Federal Office to develop wild rice education toolkits to support restoration and conservation of wild rice on tribal lands in Wisconsin. Toolkits will be developed based on results from April 2017 workshops on Lake Superior Manoomin Restoration, held on Bad River Reservation. Completion date of Fall 2018.

WISG PERSONNEL

- Deidre Peroff (50%)
- Communications staff, as needed (1%)
- Jim Grandt, system administration services. as needed (1%)

EXTERNAL PARTNERS

- Local community members (project-based)
- Lake Michigan Stakeholders
- Wisconsin Water Thinkers Network
- Milwaukee Water Commons
- Sea Grant programs (e.g., Minnesota, IN/IL, Michigan, Guam)
- Great Lakes Safety Consortium
- National Weather Service
- NOAA National Office
- Milwaukee County Parks' Friends groups (e.g., Lincoln Park, South Shore Park, Grant Park)
- College of Menominee Nation
- Bad River Tribe
- Sixteenth Street Community Health Center
- Urban Ecology Center
- Harbor District, Inc.
- Milwaukee Riverkeepers

INTENDED AUDIENCE

- General public - including urban youth, park users, educators, businesses
- Government officials – local, regional, tribal
- Emergency managers, first responders, meteorologists
- Other Sea Grant and NOAA-affiliated programs

PROJECT DURATION
Varies by activity (more detailed in activities section above). Overall topic will be ongoing throughout the 4-year cycle, 2018-2021.

FOCUS AREA(S)
- Resilient Communities and Economies (RCE)
- Environmental Literacy and Workforce Development (ELWD)

WISCONSIN STRATEGIES
- RCE. Work with management and regulatory agencies, tribal entities and vulnerable and at-risk communities to reduce vulnerability to fluctuating water levels, storm impacts and a changing climate.
- RCE. Support research and outreach to understand the value of and opportunities for subsistence, tourism, and commercial and recreation-related activities in coastal communities.
- RCE. Support research that evaluates the impacts of increased climate variability and change on coastal communities.
- ELWD. Work with education partners to promote Great Lakes literacy principles within formal and informal learning environments.
- ELWD. Support education projects that incorporate innovative technologies or practices in Great Lakes education.
- ELWD. Promote the intersection of the arts, sciences and humanities to inspire a science- informed society.
- ELWD. Promote place-based learning as a way to engage citizens in local stewardship.
- ELWD. Identify and promote Great Lakes-related career pathways in Wisconsin.

OUTCOMES
- ELWD. Wisconsin communities are knowledgeable and equipped with the best available science and technology in order to contribute to adaptive management planning processes and stewardship.
- ELWD. Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources.
- ELWD. All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain the state's coastal communities and ecosystems.
- ELWD. College-level courses, internships and fellowships provide increased literacy, experience and preparedness in all areas of watershed, coastal and freshwater ecosystems for all students, with a particular focus on those from under-represented groups.
- ELWD. Undergraduate and graduate students, particularly those from under-represented groups, are supported and have access to formal and experiential learning, training and research experiences.
- ELWD. Employment in all sectors of the U.S. marine and freshwater resources enterprise expands and diversifies.
- RCE. Members of the community, including the underserved, are aware of and understand changing conditions and hazards and the implications to their Wisconsin communities and are prepared to respond and adapt.
- RCE. Existing and innovative training programs improve community leaders' understanding of changing conditions in their Wisconsin communities and implement adaptive strategies.
- RCE. Wisconsin communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.

- RCE. Members of the community, including the underserved, have access to information needed to understand how Wisconsin coastal economic activities and trends will impact environmental and community well-being.
- RCE. Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- RCE. Leaders in Wisconsin's coastal economic sectors understand how they can become more resilient through diversification and through conservation of ecosystem services.
- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACT

- A direct and deliberate focus on engaging racially and ethnic diverse individuals and communities will provide new expertise, skills, and perspectives needed to solve complex water problems.
- People will not be at greater risk to being adversely affected by Great Lakes issues based on their social, economic, cultural or racial identity.
- Through education and promotion of the cultural significance of coastal resources, Wisconsin's public will be more knowledgeable and cautious about sustaining them (ex: wild rice).

PERFORMANCE MEASURES AND METRICS

National

- Number of communities that adopt/implement hazard resiliency practices to prepare for and respond to/minimize coastal hazardous events as a results of Sea Grant activities [8]
- Number of Sea Grant products that are used to advance environmental literacy and workforce development. [6]
- Number of people engaged in Sea Grant supported informal education programs [1000]
- Number of Sea Grant tools, technologies and information services that are used by our partners/customers to improve ecosystem-based management. [Products 'developed' -4; Products 'used'-5]
- Economic and societal impacts derived from Sea Grant activities (market and non market; jobs and businesses created or sustained) [Jobs Sustained -2]
- Number of peer-reviewed publications produced by Sea Grant [4]
- Number of P-12 students reached through Sea Grant-trained educators or directly through Sea Grant education programs [600]
- Number of volunteer hours [20]
- Number of Sea Grant-Sponsored/Organized Events [20]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [1000]
- Number of Public or Professional Presentations [10]
- Number of Attendees at Public or Professional Presentations [800]

Wisconsin

- The number of products developed by Wisconsin Sea Grant PIs with Wisconsin Sea Grant outreach staff to effectively communicate their research projects to Great Lakes stakeholders. [4]

Kathy Kline – Education Outreach Specialist

Kline 1 - Great Lakes Education Collaboration and Coordination in Wisconsin

BACKGROUND

As stated in the Environmental Literacy and Workforce Development (ELWD) section of Wisconsin Sea Grant's 2018-2021 strategic plan, an environmentally literate person is someone who has a fundamental understanding of the systems of the natural world, the relationships and interactions between the living and non-living environment and the ability to understand and use scientific evidence to make informed decisions regarding environmental issues. Moreover, a Great Lakes-literate person understands the essential principles and fundamental concepts about the characteristics, functioning and value of the Great Lakes; can communicate accurately about the Great Lakes' influence on systems and people in and beyond his/her watershed; and is able to make informed and responsible decisions regarding Great Lakes and watershed resources. Wisconsin Sea Grant advances these literacy principles in formal and informal learning environments throughout the state to produce a diverse and skilled workforce that is engaged and able to address critical Great Lakes needs.

The Wisconsin Sea Grant education outreach specialist supports the ELWD focus area through both outreach activities and coordinating peer-reviewed education project grant funding as part of the Wisconsin Sea Grant biennial requests for research proposals. These activities warrant require closely with other NOAA programs in the state, as well as other Wisconsin education partners, to coordinate activities, priorities and leverage funds for Great Lakes education in order to increase Great Lakes literacy in the state.

OBJECTIVES

- Great Lakes Literacy Principles will be incorporated into statewide Wisconsin environmental education and workforce development efforts.
- Wisconsin education stakeholders will have access to funding opportunities in order to increase Great Lakes Literacy in the state.
- Wisconsin Great Lakes education funding agencies will coordinate priorities in order to maximize increases in statewide Great Lakes Literacy.

APPROACH/PLANNED ACTIVITIES

- Confer with Wisconsin and Great Lakes education partners to coordinate Wisconsin Great Lakes funding priorities.
- Work with Wisconsin and Great Lakes education partners to incorporate Great Lakes Literacy Principles into Common Core Literacy and Mathematics Standards.
- Work with Wisconsin and Great Lakes education partners to expose students statewide—not just on the coasts—to the Great Lakes Literacy Principles.
- Work with Wisconsin Department of Public Instruction to incorporate a variety of Great Lakes marine careers into its "Career Pathways" program.
- Coordinate and support peer-reviewed education research and/or project grant funding as part of the Wisconsin Sea Grant biennial requests for research proposals.
- Provide assistance to other Wisconsin and Great Lakes agency grant proposal reviews.

WISG PERSONNEL

- Kathleen Kline (20%)
- Anne Moser (1%)
- Communications Staff (Marie Zhuikov/Elizabeth White/Yael Gen 1%)
- Tom Xiong (web development services as needed 1%)

EXTERNAL PARTNERS

- Wisconsin Coastal Management Program
- NOAA Great Lakes Bay Watershed Education and Training (B-WET) Program
- Wisconsin Department of Natural Resources
- Lake Superior National Estuarine Research Reserve
- Wisconsin Department of Public Instruction
- Proposed Wisconsin-Lake Michigan National Marine Sanctuary

INTENDED AUDIENCE

- Wisconsin Coastal Management Program
- NOAA Great Lakes Bay Watershed Education and Training (B-WET) Program
- Wisconsin Department of Natural Resources
- Lake Superior National Estuarine Research Reserve
- Wisconsin Department of Public Instruction
- Proposed Wisconsin-Lake Michigan National Marine Sanctuary
- Wisconsin Formal and Informal Educators and Organizations

PROJECT DURATION

48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)

- Environmental Literacy and Workforce Development (ELWD)

WISCONSIN STRATEGIES

- ELWD. Support research that will provide robust data about the current level of Great Lakes and water literacy in Wisconsin students to serve as a foundation for future education efforts in the state.
- ELWD. Work with education partners to promote Great Lakes literacy principles within formal and informal learning environments.
- ELWD. Support education projects that incorporate innovative technologies or practices in Great Lakes education
- ELWD. Develop Pre-K-12 resources that address the Great Lakes literacy principles and support state and national educational standards.
- ELWD. Promote place-based learning as a way to engage citizens in local stewardship.
- ELWD. Identify and promote Great Lakes-related career pathways in Wisconsin.

OUTCOMES

- ELWD. Teachers and students are better informed in science, technology, engineering and mathematics fields and can employ their knowledge to support sustainable practices within their communities throughout Wisconsin.
- ELWD. Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources.
- ELWD. All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain the state's coastal communities and ecosystems.
- ELWD. College-level courses, internships and fellowships provide increased literacy, experience and preparedness in all areas of watershed, coastal and freshwater ecosystems for all students, with a particular focus on those from under-represented groups.
- ELWD. Undergraduate and graduate students, particularly those from under-represented groups, are supported and have access to formal and experiential learning, training and research experiences.
- ELWD. Employment in all sectors of the U.S. marine and freshwater resources enterprise expands and diversifies.

IMPACTS

- Knowledge of Great Lakes Literacy Principles is broadened.
- Educators and students increase knowledge of Great Lakes, watersheds, ecosystem impairments, and Great Lakes/marine careers options.
- Teachers increase use of Great Lakes curricula and materials in classrooms
- Broadened support for Great Lakes Literacy education through engagement with educators, school administrators, non-formal education partners, government agencies, watershed associations, city/county governments, and non-governmental organizations.
- Great Lakes watershed stewardship behaviors increase.

PERFORMANCE MEASURES AND METRICS

- Number of Sea Grant products that are used to advance environmental literacy and workforce development activities [1]
- Number of people engaged in Sea Grant-supported informal education programs [100]
- Number of P-12 Students Reached Through Sea Grant-trained educators or directly through Sea Grant education programs [200]
- Number of P-12 Educators who participated in Sea Grant education programs [2]
- Number of Sea Grant-Sponsored/Organized Events [1]
- Pre-proposals submitted (# of proposals) [16]
- Pre-proposals submitted (# of institutions involved) [5]
- Pre-proposals submitted (# from home institution) [2]
- Full proposals submitted (# of proposals) [10]
- Full proposals submitted (# of institutions involved) [4]
- Full proposals submitted (# from home institution) [1]
- Proposals funded (# of proposals) [4]
- Proposals funded (# of institutions involved) [3]
- Proposals funded (# from home institution) [1]

Kline 2 - Coordination of Wisconsin Participation in the Center for Great Lakes Literacy

BACKGROUND

The Great Lakes Restoration Initiative (GLRI) Action Plan II recognizes the importance of engaging citizens, especially students and educators, in stewardship and hands-on, real-world learning experiences in their local environment. Specifically, Objective 2 of the GLRI's Focus Area 5 (Foundation for Future Restoration Actions) seeks to "educate the next generation about the Great Lakes ecosystem by promoting Great Lakes-based ecosystem education and stewardship, with a focus on educator training." High-quality environmental stewardship requires environmental literacy, and the Center for Great Lakes Literacy is receiving a 5-year GLRI grant to carry out that charge. Built upon the framework of the Great Lakes Literacy Principles, the group's vision is to develop a Great Lakes-literate public capable of effectively contributing to the environmental, economic and social sustainability of the Great Lakes. A Great Lakes literate person "understands essential principles and fundamental concepts about the characteristics, functioning, and value of the Great Lakes; can communicate accurately about the Great Lakes' influence on systems and people in and beyond their watershed; and is able to make informed and responsible decisions regarding the Great Lakes and the resources of their watershed" (www.greatlakesliteracy.net).

The Center for Great Lakes Literacy (CGLL) is a collaborative effort led by Sea Grant educators throughout the Great Lakes watershed. The center fosters informed and responsible decisions that advance basin-wide stewardship by providing hands-on experiences, educational resources and networking opportunities that promote Great Lakes literacy among an engaged community of educators, scientists and citizens. Signature CGLL offerings include annual Great Lakes Shipboard Science workshops that connect educators with scientists aboard the EPA's R/V Lake Guardian; webinars and social media postings featuring pressing Great Lakes issues; land-based watershed workshops that facilitate strong community-school partnerships resulting in action-oriented Great Lakes stewardship and restoration activities; Great Lakes Awareness Day events for the public at prominent educational institutions—aquariums, zoos, museums, etc.; Limno Loan Program for Hydrolab water-quality monitoring equipment; Educator Day at the International Association for Great Lakes Research Conference; and citizen science and other volunteer activities that create opportunities for adults to become involved in watershed restoration.

OBJECTIVES

- Wisconsin communities will gain awareness of the science behind critical issues in the Great Lakes such as climate change impacts, changes in food web interactions, aquatic invasive species, and water quality.
- Great Lakes educators will have access to hands-on materials to support CGLL lesson plans and activities.
- Wisconsin educator participants of CGLL workshops will have opportunities to provide hands-on experiences for their students with the Great Lakes.
- Sea Grant graduate student researchers will be encouraged to share their Great Lakes knowledge and career experiences with CGLL educators and their students.
- Wisconsin educator participants of CGLL workshops will have opportunities to share their Great Lakes experiences at Wisconsin science education conferences and the International Association of Great Lakes Research conference.

APPROACH/PLANNED ACTIVITIES

- Coordinate and facilitate Wisconsin Sea Grant's contributions to the overall program throughout the five-year project. Oversee the project budget and evaluation tools for all project components, and complete reporting requests from the Project Coordinator, Wisconsin Sea Grant, the Sea Grant Education Network and NOAA.
- Host public Great Lakes Awareness Days (GLADs) in conjunction with state education partners. These one-day events will incorporate hands-on learning strategies for the public to become more aware and gain knowledge of the science behind critical issues in the Great Lakes such as climate change impacts, changes in food web interactions, aquatic invasive species, and water quality.
- Produce Great Lakes educational kits containing hands-on materials that will relate directly to CGLL lessons and activities, and distribute to each of the seven Great Lakes Sea Grant programs.
- Provide stipends to assist Wisconsin educator participants of CGLL workshops and their students to directly experience the Great Lakes, such as an educational ship program or visiting a Great Lakes educational science center.
- Provide stipends and travel reimbursements to Sea Grant graduate students to participate in the experiential activities and visit each participating school to meet with students and work with the educator to present a CGLL lesson and use an educational kit in the classroom.
- Provide stipends to assist Wisconsin educator participants of CGLL workshops to attend and present at Wisconsin science education conferences and the International Association of Great Lakes Research conference.
- Work with Wisconsin Sea Grant communication team to publicize and showcase CGLL products, outcomes and impacts resulting from this work; this may take the form of news releases, newsletter articles, web features, videos, social media, white papers or publications in peer-reviewed journals.

WISG PERSONNEL

- Kathleen Kline (50%)
- Anne Moser (25%)
- Communications Staff (5%)

EXTERNAL PARTNERS

- Great Lakes Sea Grant Educators (MN, IL-IN, MI, OH, PA, NY)
- U.S. Geological Survey
- Wisconsin Formal and Informal Educators
- Wisconsin Education Partners (Museums, Science Centers, State/Federal Agencies, etc.)

INTENDED AUDIENCE

- Wisconsin Formal and Informal Educators
- Wisconsin PK-12 students
- Wisconsin Communities

PROJECT DURATION

36 months - 2018-2020 (current funding period)

FOCUS AREA(S)

- Environmental Literacy and Workforce Development (ELWD)

WISCONSIN STRATEGIES

- ELWD. Work with education partners to promote Great Lakes literacy principles within formal and informal learning environments.
- ELWD. Develop PreK-12 resources that address the Great Lakes literacy principles and support state and national educational standards.
- ELWD. Support a graduate student and post-graduate fellows program to provide emerging professionals with opportunities to practice stakeholder engagement and actionable science and to connect them with the full range of Sea Grant activities and Great Lakes-related employment opportunities.
- ELWD. Promote the intersection of the arts, sciences and humanities to inspire a science-informed society.
- ELWD. Promote place-based learning as a way to engage citizens in local stewardship.
- ELWD. Identify and promote Great Lakes-related career pathways in Wisconsin.

OUTCOMES

- ELWD. Teachers and students are better informed in science, technology, engineering and mathematics fields and can employ their knowledge to support sustainable practices within their communities throughout Wisconsin.
- ELWD. Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources.
- ELWD. All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain the state's coastal communities and ecosystems.
- ELWD. Undergraduate and graduate students, particularly those from under-represented groups, are supported and have access to formal and experiential learning, training and research experiences.
- ELWD. Employment in all sectors of the U.S. marine and freshwater resources enterprise expands and diversifies.

IMPACTS

- Project participants engage in experiential Great Lakes education.
- Knowledge of Great Lakes Literacy Principles is broadened.
- Educators and students increase knowledge of Great Lakes, watersheds, ecosystem impairments, and Great Lakes/marine careers options.
- Teachers increase use of Great Lakes curricula and materials in classrooms.
- Informal educators increase use of Great Lakes instructional materials.
- Educators share new Great Lakes watershed knowledge with colleagues.

PERFORMANCE MEASURES AND METRICS

- Number of Sea Grant products that are used to advance environmental literacy and workforce development activities [3]
- Number of people engaged in Sea Grant-supported informal education programs [300]
- Number of P-12 Students Reached Through Sea Grant-trained educators or directly through Sea Grant education programs [9,500]
- Number of P-12 Educators who participated in Sea Grant education programs
- Number of Sea Grant-Sponsored/Organized Events [4]
- Number of Public or Professional Presentations [4]
- Number of Attendees at Public or Professional Presentations [60]

Kline 3 - Great Lakes Education in the Wisconsin Idea

BACKGROUND

The foundation of Wisconsin's public university system is the "Wisconsin Idea," the premise that knowledge gained at state campuses should be shared with all state citizens to improve their quality of life. The University of Wisconsin System is a leader in communicating the importance of scientific research to the public in dynamic, innovative ways. From supporting K-12 enrichment programs to contributing to a statewide public science festival, Wisconsin Sea Grant partners with a wide variety of UW and other outreach programs in the state to connect Wisconsin citizens to Great Lakes science and issues.

OBJECTIVES

- Wisconsin citizens will gain awareness of the science behind critical issues in the Great Lakes such as climate change impacts, changes in food web interactions, aquatic invasive species, and water quality, as well as Great Lakes industries and maritime heritage.
- Wisconsin informal educators will have access to Great Lakes experts and information to enhance their programming.
- Sea Grant graduate students will have opportunities to gain outreach experience sharing their Great Lakes knowledge in a variety of programs.

APPROACH/PLANNED ACTIVITIES

- Participate in outreach and informal education partner programs throughout the state to increase Great Lakes Literacy of program participants.
- Engage Sea Grant-funded graduate students in a variety of Great Lakes education outreach activities.

WISG PERSONNEL

- Kathleen Kline (10%)
- Anne Moser (3%)
- Additional Sea Grant outreach specialists as needed (2%)
- Jennifer Hauxwell (2%)
- Communications Staff (3%)

EXTERNAL PARTNERS

- University of Wisconsin System Outreach Programs
- Private Wisconsin College and University Outreach Programs
- Wisconsin Department of Natural Resources
- Wisconsin Informal Education Centers, Libraries and Museums

INTENDED AUDIENCE

- Wisconsin citizens

PROJECT DURATION

48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)

- Environmental Literacy and Workforce Development (ELWD)

WISCONSIN STRATEGIES

- ELWD. Work with education partners to promote Great Lakes literacy principles within formal and informal learning environments.
- ELWD. Support a graduate student and post-graduate fellows program to provide emerging professionals with opportunities to practice stakeholder engagement and actionable science and to connect them with the full range of Sea Grant activities and Great Lakes-related employment opportunities.
- ELWD. Support research projects that engage and train graduate and undergraduate students and lifelong learners about Great Lakes and marine resources.
- ELWD. Identify and promote Great Lakes-related career pathways in Wisconsin.

OUTCOMES

- ELWD. Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources
- ELWD. Communities implement sustainable strategies when managing Wisconsin's natural resources and make decisions based on information acquired through informal science education.
- ELWD. All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain the state's coastal communities and ecosystems.
- ELWD. Employment in all sectors of the U.S. marine and freshwater resources enterprise expands and diversifies.
- ELWD. The existing and future workforce is able to adapt and thrive in changing environmental, social and economic conditions.

IMPACTS

- Wisconsin informal educators increase use of Great Lakes instructional materials.
- Great Lakes stewardship ethics develop in students, teachers, and other citizens.

PERFORMANCE MEASURES AND METRICS

- Number of people engaged in Sea Grant-supported informal education programs [4700]
- Number of public or professional presentations [8]
- Number of attendees at public or professional presentations [200]

Anne Moser – Senior Special Librarian

Moser 1 – Pre-K through Gray Education

BACKGROUND
In the Wisconsin Sea Grant Strategic Plan for 2018-21, it states that "an environmentally literate person is someone who has a fundamental understanding of the systems of the natural world, the relationships and interactions between the living and non-living environment and the ability to understand and use scientific evidence to make informed decisions." As such, the staff of Wisconsin Sea Grant provides programming in formal and informal learning environments to educate the public to be a Great Lakes-literate society.

As a member of advisory services, the Wisconsin Water Library has been supporting this goal in three ways. Moser has focused her programming on children ages three through ten in informal education settings including public libraries and Head Start and preschool classrooms. The library has been successful in using the library model of literacy story time for preschoolers to include Great Lakes and water science. The library also provides support for programming and resources for teacher education related to WSG's participation in the Center for Great Lakes Literacy (CGLL), the Sea Grant network of educators around the Great Lakes basin. Activities supported include shipboard science workshops and the Attack Pack loan program. Third, the library participates in outreach events via the network of science outreach at the University of Wisconsin-Madison, including Grandparents University and the Wisconsin Science Festival.

For the period of 2018 through 2021, Moser will continue to move forward with these efforts by expanding on existing relationships to reach new and diverse audiences, by providing continued support of the programs and resources offered by CGLL and by finding new avenues to promote Great Lakes literacy around the state.

OBJECTIVES
- To widen reach of the library's programs to Wisconsin public libraries not yet served by its services
- To expand preschool offerings to reach additional diverse audiences
- To encourage more public librarians and preschool teachers to explore and provide programming on the Great Lakes
- To provide materials for librarians interested in offering multi-week explorations of water and Great Lakes science.
- To bring Great Lakes literacy programming to participants in UW-Madison's science outreach events To fully support WSG's participation in CGLL by continued loan of curricular kits and by supporting teacher education programs

APPROACH/PLANNED ACTIVITIES
- Work with libraries in areas of Wisconsin that have yet not hosted programming from the library
- Expand on successful relationship with Ho-Chunk Nation to offer additional programming in Head Start programs in native communities in Wisconsin
- Create a multi-week story time curriculum for public librarians and preschool teachers
- Develop STEM kits for librarians and preschool teachers on the topics covered by the CGLL loan kits

- Support Center for Great Lakes Literacy activities and resources including coordination of the scientist and educator spotlights for the CGLL website, support for teacher training opportunities such as the shipboard science workshops, and continued loans of the CGLL-developed curriculum kits
- Assist in the development of future CGLL loan kits
- Explore place-based education and technologies for early elementary students by expanding on relationship with Shorewood Elementary School in Madison

WISG PERSONNEL
- Anne Moser (50%)
- Kathy Kline (1%)
- Tom Xiong (1%)
- Communications (as needed)

EXTERNAL PARTNERS
- Center for Great Lakes Literacy
- Madison Metropolitan School District
- Public library community throughout Wisconsin
- Ho-Chunk Nation
- UW-Madison, Information School
- UW-Madison, Science Outreach

INTENDED AUDIENCE
- Preschool and early elementary students
- Preschool through high school teachers
- Informal learners

PROJECT DURATION
24 months - 2018-19

FOCUS AREA(S)
- ELWD – Environmental Literacy and Workforce Development

WISCONSIN STRATEGIES
- Work with education partners to promote Great Lakes literacy principles within formal and informal learning environments.
- Develop Pre-K-12 resources that address the Great Lakes literacy principles and support state and national educational standards.
- Promote the intersection of the arts, sciences and humanities to inspire a science informed society.
- Promote place-based learning as a way to engage citizens in local stewardship.

OUTCOMES
- An environmentally literate public that is informed by lifelong formal and informal opportunities that reflect the range of diversity of the nation's coastal communities.
- Teachers and students are better informed in science, technology, engineering and mathematics fields and can employ their knowledge to support sustainable practices within their communities throughout Wisconsin.

- Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources.

IMPACT

- Knowledge of Great Lakes literacy is broadened to include young learners, ages three through ten.
- Pre-K formal and informal educators increase their use of Great Lakes science in their learning environments.
- Public librarians from a broader swath of Wisconsin offer Great Lakes story times.
- Teachers have access to Great Lakes curricula and materials at no cost.

PERFORMANCE MEASURES AND METRICS

- Number of Sea Grant products that are used to advance environmental literacy and workforce Development [6 products]
- Number of people engaged in Sea Grant-supported informal education programs [1,000]
- Number of P-12 Students Reached through Sea Grant-Trained Educators or Directly through Sea Grant Education Programs [40 students]
- Number of P-12 Educators who participated in Sea Grant education programs
- Number of Public or Professional Presentations [12 presentations]
- Number of Attendees at Public or Professional Presentations [360 attendees]

Moser 2 - Arts, Sciences and Humanities

BACKGROUND

The research supported by Wisconsin Sea Grant is ultimately relevant to people of all backgrounds, regardless of age, race, gender, socioeconomic status, or education level. As part of its 2018-21 Strategic Plan, Wisconsin Sea Grant has committed to the overarching principle of "enhancing diversity and inclusion" in its pursuit of coastal and freshwater conservation and use. In order to reach a wide audience to enhance diversity and inclusion, Wisconsin Sea Grant seeks out a diverse set of collaborators with its education and outreach efforts. One compelling collaboration is an interdisciplinary one, bringing water science, the arts and humanities together.

The linkages between art, science and humanities are growing rapidly as both scientists and artists look to connect in order to inform their work. Artists are looking to examine scientific findings so that they can accurately communicate their concerns and inspirations. Scientists are searching for ways to better translate their research to engage a broader public in their findings. Writers, artists and scientistis can benefit from this relationship while the basic goal of reaching a broader audience is achieved.

As an outreach component of Wisconsin Sea Grant, the Wisconsin Water Library has held events in recent years in support of this multidisciplinary approach to educating the public about wicked problems relating to water. A recent example occurred in the spring of 2016 when the library collaborated with two UW-Madison MFA student artists as part of their academic course on public art. For the public art piece, the students created a sculpture that became part of "Poly Pledge" events. The artists' aim for the piece was to raise awareness about the issue of plastic waste in the Great Lakes and area waters. Before beginning the project, the artists were concerned with the aesthetic issue of trash in the water but their concern deepened as they learned more about current NOAA-led efforts relating to marine debris. The class and the project finished with a public lecture sponsored by WSG that paired an artist talk with a scientific presentation by a Sea Grant-funded researcher. The event and the lecture looked at the issue of marine debris from two lens and brought to Wisconsin Sea Grant an audience that would not typically benefit from their outreach efforts.

OBJECTIVES

- To use arts and humanities to achieve a science-inspired society
- To create an interdisciplinary platform to discuss current trends in Great Lakes issues
- To create a more diverse audience for Wisconsin Sea Grant research
- To provide a broader access to Wisconsin Sea Grant-research through collaborations with artists and writers
- To encourage informal and formal educators to consider art as an integral part of their water curriculum

APPROACH/PLANNED ACTIVITIES

- Lake Sturgeon Zine and Traveling Exhibit – a traveling exhibit of 40 works of art on the lake sturgeon
- Words about Water – exploring personal connection to water through poetry and writing in grades one through three
- Use film to communicate about Great Lakes issues
- Connect with BFA and MFA students in UW system schools interested in exploring water through art
- Collaborate with early elementary classrooms to infuse art into their water science curriculum

- Connect to and provide support for Wisconsin Sea Grant-funded education projects with art elements

WISG PERSONNEL
- Anne Moser – 15%
- Tim Campbell – 1%
- Kathy Kline – 1%
- Yael Gen – 1%
- Communications – 1%

EXTERNAL PARTNERS
- University of Wisconsin-Madison, Department of Art
- University of Minnesota, Department of Art and Design
- Museum and gallery partners
- Madison Metropolitan School District
- Public libraries around Wisconsin

INTENDED AUDIENCE
- Wisconsin residents
- Undergraduate and graduate students
- Pre K through elementary students

PROJECT DURATION
24 months - 2018-19

FOCUS AREA(S)
- ELWD – Environmental Literacy and Workforce Development

WISCONSIN STRATEGIES
- Promote the intersection of the arts, sciences and humanities to inspire a science-informed society.

OUTCOMES
- Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources.

IMPACT
- Arts, science and humanities programming leads to a broader audience introduced to Great Lakes science.
- Program participants engage in increased stewardship of Great Lakes.
- Partnerships between artists, scientists and humanists are created for ongoing collaborations.

PERFORMANCE MEASURES AND METRICS
- Number of Wisconsin Sea Grant-supported events or products that promote the intersection of the arts, sciences and humanities to inspire a science-informed society. [2 events]
- Number of Attendees at Sea Grant-Sponsored/Organized Events [100]
- Number of Public or Professional Presentations [2]
- Number of Attendees at Public or Professional Presentations [50]

Moser 3 - Library Collections and Outreach

BACKGROUND

The Wisconsin Water Library is a unique function within the National Sea Grant College Program and has evolved in recent years to fully function as an outreach component of the advisory services team as both a library and as a part of the Environmental Literacy and Workforce Development focus area. One of the library's goal is the preservation of the library's collections for future as well as historical value and includes curating vulnerable collections and materials in both print and digital format so that the breadth of knowledge and scholarship about the Great Lakes and Wisconsin's waters is preserved. Library collections reflect changing ecosystems and it is vital that preservation of past research and data is made a priority and both are used to make sound decisions.

OBJECTIVES

- To continue the development of a relevant and useful library collection in print and digital form
- To curate vulnerable and unique materials, collections and data related to Great Lakes sciences
- To create valuable digital collections with the goal to increase awareness of issues related to Great Lakes science
- To develop and maintain award-winning books and materials in support of the library's education programming and outreach efforts to public libraries, preschools and informal learning environments.

APPROACH/PLANNED ACTIVITIES

- Completion of the Earthwatch Radio Show digital archive
- Creation of a permanent archive of oral histories collected as part of the *People of the Sturgeon* book
- Curation of other significant oral histories related to fishing on the Great Lakes
- Investigation of community archiving function for collecting and archiving vulnerable, ephemeral materials related to the Great Lakes
- Analysis of previously donated materials related to water education curriculum and coastal resilience for permanent digital and print storage
- Analysis of video format materials for long-term preservation

WISG PERSONNEL

- Anne Moser (35%)
- Kathy Kline (5%)
- Tom Xiong (1%)
- James Grant (1%)

EXTERNAL PARTNERS

- University of Wisconsin Digital Collections
- University of Wisconsin Extension
- University of Wisconsin Stevens Point
- University of Wisconsin-Madison
- Community archiving partners

INTENDED AUDIENCE

- Scholars and researchers in environmental and Great Lakes history

- Wisconsin Sea Grant staff
- Wisconsin residents

PROJECT DURATION
24 months - 2018-19

FOCUS AREA(S)
- ELWD – Environmental Literacy and Workforce Development

WISCONSIN STRATEGIES
- Develop Pre-K-12 resources that address the Great Lakes literacy principles and support state and national educational standards.
- Promote place-based learning as a way to engage citizens in local stewardship.

OUTCOMES
- Stakeholders develop a sense of awareness, understanding and stewardship in order to sustain watershed, coastal and freshwater ecosystems and resources.
- Wisconsin communities are knowledgeable and equipped with the best available science and technology in order to contribute to adaptive management planning processes and stewardship.
- Communities implement sustainable strategies when managing Wisconsin's natural resources and make decisions based on information acquired through informal science education.

IMPACT
- Vulnerable and unique materials related to Great Lakes science and stewardship are preserved.
- Valuable digital collections on Great Lakes science and stewardship are created for use by scholars, outreach staff and the public.
- Gray literature created and collected by unique partners is preserved.
- Literature and scientific materials in support of Great Lakes research and programming is made available free of charge to all Wisconsin residents.

PERFORMANCE MEASURES AND METRICS
- Number of Sea Grant products that are used to advance environmental literacy and workforce development [4 products]
- Number of Public or Professional Presentations [4 presentations]
- Number of Attendees at Public or Professional Presentations [100 attendees]

Fred Binkowski – Aquaculture Outreach Specialist, in partnership with the School of Freshwater Sciences, UW-Milwaukee

Binkowski 1 - Great Lakes Aquaculture Extension

BACKGROUND

Science and technology information for aquaponics is dated and most of this information comes from the mid-1970's, the hydroponics era. Numerous publications on aquaponics have been produced over the past 20 years. Amazon alone features more than 700 books. There are currently more than 17 books published using tilapia specifically as an aquaponics species. In the past, most aquaponics publications were based on plant production associated with tilapia as the food fish. With the diminishing interest in tilapia, practitioners are turning toward higher valued species such as yellow perch, bluegill, hybrid bluegill, etc. Consequently, the environmental requirements for these fin fish are significantly different as compared to tilapia. These differences are reflected in the necessary changes and modifications for systems, water chemistry, temperature, aquatic microbiology, and nutrition.

The rationale for publishing an aquaponics manual is due to the increased interest in the fin fish and shellfish species used in integrated systems. At the present time the aquaponics manual we have been developing will consist of 6 chapters. We propose to expand the manual to include 6 more chapters. These chapters will represent Fish health, shellfish biology (husbandry), Processing and marketing, Case study/operating a business, Policy, legal, and societal issues, and Business models.

At this time, there are no specific aquaculture and aquaponic courses in the Ag. Education schools within UW-System. The Ag. Education Program Coordinator at UW-Platteville stated, "We really don't do anything in the School of Agriculture on the topic of aquaculture." The Coordinator of Learning Effectiveness at UW-River Falls supports new initiatives related to aquaculture education, saying, "We are interested in finding ways to increase the aquaculture experience our students receive and we support creating aquaculture workshops/classes for Ag. education majors." WDPI supports the development and offering of aquaculture training for future Ag. educators. This approach will lead to producing an educational workforce with the knowledge, skillset, and expertise to introduce aquaculture and aquaponics education to high school students. This education and training at an earlier academic level will better prepare students for entry into the aquaculture workforce and advanced academic education.

There is a large bubble of very active agricultural educators who are currently or will soon be retiring (~25%). These retirees will take many years of educational experience and expertise with them into retirement. The replacement instructors will have little to no aquaculture experience. This proposed effort will provide aquaculture and aquaponics education to fill the gap.

The Sea Grant programs in the Great Lakes region have made a significant effort to support workforce development. Most of these efforts have focused on educating and training programs for the commercial aquaculture industry. For teachers who want to get into aquaculture and aquaponics education and training, there is no structure or consistency with regards to in-service and professional development training programs. Agricultural education to increase aquaculture awareness requires that

more resources be allocated to professional development efforts. This Sea Grant initiative will attempt to create educational programming and make it a statewide curriculum with more consistent messaging and efficient delivery.

As the global population increases, food production and the availability of food will be critical. Nation-wide, aquaculture and aquaponics is the fastest growing segment of US agriculture. There is currently a grass-roots resurgence of interest in small scale local food production that emphasizes home or urban community-based farming. Large-scale commercial aquaculture food fish production is limited in Wisconsin and the region. Rainbow trout is the primary food fish species raised in aquaculture in Wisconsin. There is increased interest in other salmonid species such as Arctic char and Atlantic salmon. The husbandry information for salmonid aquaculture dates back to the mid-1800s. Today salmonid aquaculture uses state-of-the-art technology for food production. Other species of interest for commercial aquaculture include: walleye, hybrid walleye, yellow perch, bluegill, hybrid bluegill, lake sturgeon, shellfish, etc. Husbandry practices for cool-water species is less developed and for most of these species nutrition and reproduction are limiting factors. In the non-food fish category, bait fish is the largest aquaculture industry in Wisconsin. Baitfish aquaculture could also have a role in small-scale aquaponics.

Wisconsin and the Great Lakes region have a short growing season, making them less competitive for growing fish outdoors. To overcome this limitation, technology using biosecure, climate-controlled, and water conserving recirculating systems is used. Our goal is to focus on delivering more specialized services to the aquaculture industry. We will provide technical assistance to aquaculture practitioners on systems, biology, water chemistry, reproduction, spawning techniques, nutrition, and production cost estimates. This technical assistance will be provided as information resources, on-site consultation, university facilities visits, and recommendations for other educational and training programs available.

OBJECTIVES

- Continue the development of a regional aquaponics manual.
- Improve agricultural education for future Agriculture teachers and offer in-service and professional development for Agriculture and Science educators.
- Provide technical assistance for commercial aquaculture and aquaponics entrepreneurs.

APPROACH/PLANNED ACTIVITY

Objective 1: Wisconsin Sea Grant has supported over 30 aquaponics workshops in collaboration with Growing Power of Milwaukee, WI from 2010 through 2017 including 4 international workshops. Videos from the workshops will be produced and these videos, in transcription form, will be used to produce the chapters of the Aquaponics manual. Chapters cover all aspects of fin fish, plant and shellfish production from the initial concept and system design to the final phase of processing and marketing and business case studies.

Aquaponics Manual

In Production Now

- Aquaponic Systems Technology
- Production Systems Water Chemistry
- Fin Fish Biology (Husbandry)
- Aquatic Microbiology
- Aquaponics Horticulture

- Fish Feed and Feed Management

Proposed Additional Chapters

- RAS Technology
- Fish Health
- Shellfish Biology (Husbandry)
- Processing and Marketing
- Case Study/Operating a Business
- Policy, Legal, and Societal Issues
- Business Models

Transcripts are produced from the videos of the workshops and the transcripts are turned over to the Sea Grant Science Writing and Editing team. The writing and editing team modifies the transcript for inclusion into a printed document. The Sea Grant team also works with the author of the chapter topic to confirm meaning, context, and graphics placement. The author also works with the graphics designer and layout Sea Grant specialists. The author provides appropriate quality graphics for the publication. The author does final proof-reading.

Objective 2: Professional development for existing Agriculture and Science educators will be supported using the workshop format. A 3-4 day summer workshop for Agriculture teachers will be held using a combination of classroom and hands-on training. The sessions will be held at Freedom High School; UW-Milwaukee School of Freshwater Sciences and selected industry sites. Participants will receive a certificate of achievement recognizing their attendance and workshop completion.

For undergraduate Agriculture majors, a 1 day workshop at UW-Platteville and UW-River Falls will be held during their orientation prior to practice teaching. Topics included will be: History of Aquaculture and Aquaponics; Engineering: system design, material selection, construction & operation; Water Chemistry; Aquatic Microbiology; Fish Health; Fish Nutrition; and Information on References and Available Resources.

Undergraduate Agriculture majors are not required but can voluntarily sign up for a hands-on experience at a commercial site. This would complement their 1 day workshop they received at orientation. We will conduct a 3-4 day winter workshop that will include classroom, hands-on training and working at a commercial site. This would include detailed activities related to all husbandry practices, water chemistry monitoring, fundamental principles of fish health and nutrition, and biosecurity practices. At the end of the workshop there will be an open discussion related to ideas and activities for classroom projects.

Objective 3: Our goal is to focus on delivering more specialized services to the aquaculture industry. We will provide technical assistance to aquaculture practitioners on systems, biology, water chemistry, reproduction, spawning techniques, nutrition, and production cost estimates. The Great Lakes Aquaculture Center has also formed many relationships over the past 30 years with small-scale traditional aquaculture operations and developing large, commercial scale aquaculture and aquaponic operations and we will continue in an advisory capacity to help them. This can be in the form of on-site technical consultations, providing information resources, university facilities visits and recommending further educational programs.

Recently, most of the requests for technical assistance are related to: systems engineering; broodstock development and spawning; and aquatic microbiology. With Sea Grant's support, the UW-Milwaukee School of Freshwater Sciences has the team with the knowledge, skillset, expertise, and experience to provide this service.

WISG PERSONNEL

- Moira Harrington
- Elizabeth White
- John Karl
- Kathy Schmitt Kline
- Yael Gen

EXTERNAL PARTNERS

- Wisconsin Dept. of Public Instruction
- UW-Platteville Agricultural Program
- UW-River Falls Agricultural Program
- Milwaukee Public Schools
- Freedom High School (Freedom, WI)
- Fernwood Montessori School (Milwaukee)
- PortFish, Ltd. (Port Washington, WI)
- All Natural Greens (Marinette, WI)
- The Urban Farm Project (Minneapolis, MN)
- Institute of Urban Agriculture and Nutrition (Milwaukee, WI)

INTENDED AUDIENCE

- UW System Ag. Education Undergraduate Majors
- WDPI Ag. and Science Educators
- Aquaponic practitioners
- Urban aquaponic and aquaculture industries

PROJECT DURATION

February 1, 2018 to January 31, 2022

FOCUS AREA(S)

- Sustainable Fisheries and Aquaculture
- Environmental Literacy and Workforce Development

WISCONSIN STRATEGIES

- Identify and better understand the barriers to expansion of the aquaculture industry in Wisconsin and implement innovative partnerships to address scientific, business, economic, policy and legal challenges.
- Collaborate in identifying Great Lakes regional aquaculture opportunities and best-management practices.
- Support research that leads to a better understanding of the benefits and risks of consuming Wisconsin-produced fish.

- Support research and outreach that encourages the application of behavioral and consumer sciences toward consumer perception and preferences, food safety, labeling and certifications, seafood demand studies and promotion of local seafood.
- Support research and outreach to develop and improve economically viable and environmentally sustainable aquaponics operations, with an emphasis on business planning, risks and socioeconomics.
- Support research to develop and improve commercially viable and environmentally sustainable aquaculture practices and techniques, including nutritional value of feeds, broodstock selection, water supply and quality, husbandry, and disease and pathogen prevention and diagnosis.
- Support the development of environmental and economically sustainable aquaculture through workforce development and trainings, K-12 education and technical assistance.
- Support development of urban aquaculture in new markets and provide knowledge resources to existing operations.
- Investigate emerging species suitable for aquaculture in Wisconsin.
- A diverse and skilled workforce that is engaged and enabled to address critical local, regional and national needs.

OUTCOMES

- Increased understanding and technological solutions aid Wisconsin aquaculture management and production.
- Partnerships enable the Wisconsin aquaculture industry to adapt and acquire innovative technologies.
- Resource managers and fishing and aquaculture communities have access to science and tools to increase Wisconsin-based capacity to adapt to future resource-management needs.
- Teachers and students are better informed in science, technology, engineering and mathematics fields and can employ their knowledge to support sustainable practices within their communities throughout Wisconsin.
- Undergraduate and graduate students, particularly those from under-represented groups, are supported and have access to formal and experiential learning, training and research experiences.
- Employment in all sectors of the U.S. marine and freshwater resources enterprise expands and diversifies.
- The existing and future workforce is able to adapt and thrive in changing environmental, social and economic conditions

IMPACT

- Adoption of sustainable aquaculture and best management practices or techniques for the Wisconsin aquaculture industry.
- Increased production of aquaculture in Wisconsin due to adoption of best management practices or techniques.
- Increasing numbers of skilled and educated aquaculture workforce available to the industry.
- Greater accessibility of information and resources regarding tools, techniques, equipment and research promoting best management practices in aquaculture to the industry.

PERFORMANCE MEASURES AND METRICS

National:

- Number of aquaculture industry personnel who modify their practices using knowledge gained in fisheries sustainability and seafood safety as a result of Sea Grant activities: We anticipate 3-5 intermediate sized urban aquaponics businesses will modify their practices.
- Number of P-12 Educators who participate in Sea Grant education programs: 24
- Number of Attendees at Sea Grant organized events: 50
- Number of public or professional presentations: 6
- Number of Attendees at public or professional presentations: 70

Wisconsin:

- The production of a state-of-the-art aquaponics manual associated with supporting new commercial aquaponic opportunities.
- Preparing new Science Agriculture Educators to teach aquaculture and aquaponics in classrooms.
- In-service, certification, and/or professional development for existing Agriculture educators with current or developing aquaculture and aquaponics programs
- Students receiving Agriculture Education in Wisconsin Department of Public Instruction Agriculture programming will benefit from new aquaculture and aquaponics curriculum.
- Advancing intermediate level commercial aquaponic businesses.

Emma Wiermaa – Aquaculture Outreach Specialist, in partnership with Northern Aquaculture

Wiermaa 1 - Aquaculture Outreach and Education: Continuous Activities

BACKGROUND

The aquaculture outreach and education position is a collaboration between WISG and UWSP Northern Aquaculture Demonstration Facility. The position is to advance sustainable aquaculture through outreach and education of facility research and demonstration projects, technical assistance to farmers on best management practices, workforce development or training, and public education. This is a general and continuous workplan that is tied to various research, education and demonstration projects in which the facility is involved. Currently, this outreach work is being applied to over 10 different grant funded projects through the UWSP NADF and is directly integrated and applied toward Wisconsin Sea Grant aquaculture activities.

OBJECTIVES

- One objective is to; educate the public on aquaculture such as different techniques and systems, public perceptions, how the public is affected by aquaculture, and the role aquaculture plays now and in the future.
- The second objective is to outreach various research outcomes of various projects to the aquaculture industry to promote best management practices and sustainable industry advancement.
- The third objective is to advance workforce development to promote aquaculture education and training on sustainable practices and management to provide a skilled workforce the expanding aquaculture industry.

APPROACH/PLANNED ACTIVITY

- To educate the public, the approach is to attend and present at public events (i.e. WISG Eat Wisconsin Fish, Kids Fishing Day, Science on Tap, Science Fest), provide hands on or interactive tours at the UWSP NADF to all ages, and to share information through various press releases, and media outlets, facility webpages and social networking sites (UWSP NADF Facebook, Twitter, YouTube and webpage, UWSP Aquaponics Innovation Center, Facebook and webpage, Email Newsletter).
- To outreach facility research and demonstration, approaches are; on-site and off-site (calls, emails) technical assistance to farmers or industry personnel, technical tours of facility practices, equipment, management techniques and discussions, creation and distribution of technical how-to videos, creation and distribution of manuals or white papers and presentations at industry conferences and events (World Aquaculture, Aquaculture America, US Trout Farmers, Wisconsin Aquaculture Association, and Aquaculture Extension Conference).
- To advance workforce development, the approach is to assist in training opportunities at the UWSP NADF and UWSP Aquaponics Innovation Center for students, technicians, and industry personnel. Using the facilities, hands on training can be achieved working alongside qualified and skilled staff to learn production and management techniques such as biosecurity, technology and equipment, various production systems and designs, various cold and cool water species rearing techniques at all life stages, harvesting and purging, aquaculture feeds and feeding regimes, etc. This training is done through facility workshops, internships, technician positions, and industry cross-training. This position also works closely with Wisconsin high schools to incorporate aquaculture and aquaponics

systems into the classroom providing technical assistance, donation of materials, grant application assistance, resources and classroom activities.

WISG PERSONNEL
50% Emma Wiermaa. <5% from various staff for assistance in outreaching to K-12 education, teachers, public and sharing research results to WISG media outlets or social networking sites. i.e. Moira Harrington, Anne Moser, Titus Seilheimer, Kathy Kline.

EXTERNAL PARTNERS
The facility works with a wide range of partners including state, federal, tribal and private facilities or organizations. Specifically, partners for this position may include: University of Wisconsin-Stevens Point and facilities, Wisconsin School Districts, other universities (i.e. current projects with Michigan State University and Ohio State University), Wisconsin Aquaculture Association, North Central Regional Aquaculture Center, and private farmers (i.e. current project with Superior Fresh, LLC. and Riverence, LLC.), and other state or national events and organizations (i.e. Aquaculture America, US Trout Farmers, National Aquaculture Association).

INTENDED AUDIENCE
Depending on the objective audiences vary from the general Public, K-12 students, undergraduate students, and industry personnel or management including state, federal, tribal or private hatcheries or organizations.

PROJECT DURATION
Full duration of 2018-2021; Position is continuous and ongoing relating to all grant funded projects through UWSP NADF.

FOCUS AREAS
- Sustainable Fisheries and Aquaculture
- Environmental Literacy and Workforce Development

WISCONSIN STRATEGIES
- Identify and better understand the barriers to expansion of the aquaculture industry in Wisconsin and implement innovative partnerships to address scientific, business, economic, policy and legal challenges.
- Collaborate in identifying Great Lakes regional aquaculture opportunities and best-management practices.
- Support research and outreach that encourages the application of behavioral and consumer sciences toward consumer perception and preferences, food safety, labeling and certifications, seafood demand studies and promotion of local seafood.
- Support research and outreach to develop and improve economically viable and environmentally sustainable aquaponics operations, with an emphasis on business planning, risks and socioeconomics.
- Support research to develop and improve commercially viable and environmentally sustainable aquaculture practices and techniques, including nutritional value of feeds, broodstock selection, water supply and quality, husbandry, and disease and pathogen prevention and diagnosis.
- Support the development of environmental and economically sustainable aquaculture through workforce development and trainings, K-12 education and technical assistance.

- Investigate emerging species suitable for aquaculture in Wisconsin.

OUTCOMES

- Increased understanding and technological solutions aid Wisconsin aquaculture management and production.
- Partnerships enable the Wisconsin aquaculture industry to adapt and acquire innovative technologies.
- Consumers understand the health benefits of Great Lakes and farm raised fish and how to purchase safe and sustainable products.
- Commercial and recreational fishers and aquaculturists in Wisconsin are knowledgeable about efficient, sustainable and responsible tools, techniques and uses of coastal and freshwater resources.
- Resource managers and fishing and aquaculture communities have access to science and tools to increase Wisconsin-based capacity to adapt to future resource-management needs.

IMPACT

- Greater numbers of informed consumers on health benefits in purchasing safe and sustainable farm raised fish in the U.S. and in Wisconsin through public tours of facility and public events (Kids Fishing Day 400+ students).
- Adoption of sustainable aquaculture and best management practices or techniques for Wisconsin aquaculture industry. Working closely with Wisconsin Aquaculture Industry to bring new state-of-the-art equipment, systems and information on emerging species through technical assistance and technology transfer. UWSP NADF is leading in walleye research and technologies for recirculating aquaculture systems and aquaponics. Producing technical videos of techniques and management practices which also will share current UWSP NADF and UWSP AIC research on density, nutrient recycling, and economic evaluations.
- Increased production of aquaculture in Wisconsin due to adoption of best management practices or techniques. Recently Superior Fresh, LLC official partners of UWSP NADF is the world's largest cold water aquaponics facility estimates production of 160K lbs annually. Also active partnerships with other Wisconsin industry partners including tribal, state, federal and private facilities, moving forward to increase production. Examples include Aquaterra, LLC., Rushing Waters, LLC., Nelson and Pade, Inc., Hayward Bait.
- Increasing numbers of skilled and educated aquaculture workforce available to industry. Organizing and offering trainings each year at least two USTE Technician appointments, four internship appointments, management training for Wisconsin facilities, Pond Culture Workshop.
- Greater accessibility of information and resources regarding tools, techniques, equipment and research promoting best management practices in aquaculture to the industry. Specific examples include sharing specific and suggested equipment, research projects and results on webpage, newsletters, and social networking. Presenting this information to specific audiences and conferences such as Wisconsin Aquaculture Association, World Aquaculture and Aquaculture America. For example, walleye and saugeye BMP, systems and techniques are currently being shared through these avenues.

PERFORMANCE MEASURES AND METRICS

National

- Number of aquaculture industry personnel who modify their practices using knowledge gained in fisheries sustainability and seafood safety as a result of Sea Grant activities: 174 industry personnel/year
- Number of P-12 students reached through Sea Grant-Trained Educators: 931students/year
- Number of P-12 Educators who participated in Sea Grant education programs: 53 educators/year
- Number of Sea Grant Organized Events: 79 events/year
- Number of Attendees at Sea Grant Organized Events: 123 attendees/year
- Number of Public or Professional Presentations: 8 presentations/year
- Number of Attendees at Public or Professional Presentations: 230 attendees/year

Wisconsin

- Increased production of 50,000 pounds at various Wisconsin aquaculture facilities as a result of this work plan for 2018-2021. Recently Superior Fresh, LLC official partners of UWSP NADF is the world's largest cold water aquaponics facility estimates production of 160K lbs annually. Also active partnerships with other Wisconsin industry partners, moving forward to increase production.

Tim Campbell – Aquatic Invasive Species Outreach Specialist, in partnership with UW-Extension

Campbell 1 - Wisconsin AIS Partnership Coordination

BACKGROUND

The Wisconsin AIS Partnership consists of about fifty AIS professionals across the state the implement AIS programming at the local, regional, and state level. Keeping their work coordinated, consistent, and up-to-date helps improve AIS management across the state and region. It is the task of UWEX and WISG to help coordinate this network, investigate information gaps, and create new outreach materials when needed to increase the efficacy of this network.

OBJECTIVES

- Increase consistency of AIS work in Wisconsin
- Reduce duplication of efforts
- Keep WI AIS professionals up-to-date on most current science and methods of AIS prevention, monitoring, and control

APPROACH/PLANNED ACTIVITIES

- Two in person meetings
- Three webinars
- AIS Partnership Box file sharing
- AIS Partnership email listserv
- Publication fulfillment
- Prevention event coordination
- UMISC Planning
- Communication and outreach support for AIS response events (when we find new things)
- Coordinating outreach at trade shows in WI

WISG PERSONNEL

- Tim Campbell (50%)

EXTERNAL PARTNERS

- UW-Extension
- Wisconsin DNR

INTENDED AUDIENCE

- Wisconsin DNR staff
- County AIS professionals
- Nonprofit AIS professionals
- Federal AIS staff in WI

PROJECT DURATION

48 months – 2018-2021 (continuing activity)

FOCUS AREAS(S)

- Healthy Coastal Ecosystems

WISCONSIN STRATEGIES

- Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- Help residents, resource managers, businesses, industries and the agricultural sector understand the effects of human activities and environmental changes on coastal resources.
- Help managers incorporate public input in natural resource decision-making processes.

OUTCOMES

- Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.
- Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal entities.
- Declining biodiversity, habitats and ecosystem functions and services are restored and sustained in Wisconsin.
- Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- Citizen science initiatives are engaged and contribute to improving our knowledge with respect to coastal communities and ecosystems.
- Wisconsin communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
- Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.

IMPACT

- Stakeholders across Wisconsin have access to the latest and best tools to help them prevent the spread of AIS in their communities
- More effective and efficient AIS prevention and monitoring throughout Wisconsin

PERFORMANCE MEASURES AND METRICS

<u>Wisconsin</u>

- The number of Wisconsin Sea Grant partners that, as a result of Wisconsin Sea Grant research and outreach, design, modify an initial design, permit and/or provide grant assistance to a project. [20 partners]

Campbell 2 - GLSGN Habitattitude Surrender Collaborative

BACKGROUND

AIS outreach programs have historically focused on the movement of recreational watercraft since that is the primary vector for secondary spread of invasive species. However, as boaters become aware of AIS issues and comply with AIS laws, that makes other pathways become more of a concern. Organisms in trade (OIT) is a group of pathways that includes the purchase of pets and plants for a number of purposes and they then find their way into the environment through purposeful and accidental introductions. A number of notable invasive species have invaded Wisconsin through this pathway, including water lettuce, water hyacinth, and red swamp crayfish.

The Great Lakes Sea Grant Network has been working on OIT issues by implementing the Habitattiutde campaign since 2012 with the help of GLRI funds. The Habitattitude campaign is a community-based social marketing effort that outlines consumer alternatives to pet release. Much of the work of the GLSGN has involved helping implement those alternatives in local communities.

OBJECTIVES

- Create a self-sustaining alternative to pet release in Wisconsin communities
- Prevent the sale of potentially invasive species in Wisconsin
- Provide natural resource managers, academia, and industry with the latest science and programs to help prevent the spread of invasive species through the organisms in trade pathway

APPROACH/PLANNED ACTIVITIES

- Fostering the Green Bay Habitattitude Surrender Collaborative
- Expanding the surrender collaborative model to other areas of WI
- Planning the second Great Lakes Briefs on Invasive Organisms Traded in Commerce Symposium at UMISC 2018
- Help Wisconsin Implement the GLDIATR web crawler for OIT on the internet

WISG PERSONNEL

- Tim Campbell (15%)

EXTERNAL PARTNERS

- Great Lakes Sea Grant Network
- Kingdom Animalia Exotic Animal Rescue
- Green Bay Aquarium Society
- Steve the Snake Man
- Fox Wolf Watershed Alliance
- 1000 Island Nature Center

INTENDED AUDIENCE

- AIS professionals
- Natural resources managers
- People with pets they can no longer care for

PROJECT DURATION
24 months with the possibility of extension with grant funds

FOCUS AREAS(S)
- Healthy Coastal Ecosystems

WISCONSIN STRATEGIES
- Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- Help residents, resource managers, businesses, industries and the agricultural sector understand the effects of human activities and environmental changes on coastal resources.
- Help managers incorporate public input in natural resource decision-making processes.

OUTCOMES
- Greater awareness and understanding of freshwater ecosystem functions and services they provide improve stewardship efforts among resource managers, communities and tribal entities.
- Declining biodiversity, habitats and ecosystem functions and services are restored and sustained in Wisconsin.
- Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- Citizen science initiatives are engaged and contribute to improving our knowledge with respect to coastal communities and ecosystems.
- Wisconsin communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
- Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.

IMPACT
- Less unwanted pets and potentially invasive species being introduced into the environment
- Communities will be implementing and running their own alternatives to pet release
- Fewer restricted and prohibited species will be sold and shipped to Wisconsin
- More natural resource managers will have the tools to prevent the introduction of new species through the organism in trade pathway

PERFORMANCE MEASURES AND METRICS
<u>Wisconsin</u>
- The number of promotional events on how to prevent the introduction and spread of aquatic invasive species and organisms in trade in the Great Lakes region. [8 events]

Campbell 3 - Closing AIS Pathways

BACKGROUND

One key commitment from GLRI Action Plan II is to "Prevent new introductions of invasive species by blocking pathways through which AIS can be introduced to the Great Lakes ecosystem." Wisconsin's AIS outreach program is doing a good job of addressing many of the primary pathways, including recreational boating and OIT, but with new invasions still appearing on the landscape, clearly not all pathways are being addressed.

Some of these pathways are subsets of already addressed pathways (waterfowl hunters, wakeboard boats) while others are low frequency, but potentially high risk events (Buddhist animal release). The understanding of these pathways including what the risk for AIS introduction is and how we can prevent invasions through these pathways should be at the same understanding as the currently addressed pathways to ensure that no new invasive species enter the Great Lakes.

The pathways that WISG plans to address are pathways that have been suggested by the Wisconsin AIS Partnership or by regional working groups (Great Lakes ANS Panel, Mississippi River ANS Panel).

OBJECTIVES

- Block pathways of introduction into the Great Lakes and Wisconsin's inland waters.
- Better understand previously unaddressed pathways to better direct prevention resources

APPROACH/PLANNED ACTIVITIES

- Waterfowl hunter outreach
- Development a of standard outreach program like Clean Boats Clean Waters
- Buddhist practice of animal release
- Produce publication and prevention guidance
- Wakeboard boats and personal watercraft
- Produce instructional videos on how to prevent spread of AIS through this watercraft
- Other pathways of need that are identified by stakeholders

WISG PERSONNEL

- Tim Campbell (10%)

EXTERNAL PARTNERS

- UWEX Evaluation Unit
- Wisconsin Waterfowl Association
- Ducks Unlimited
- Potentially Skipper Buds/other marinas

INTENDED AUDIENCE

- Natural resource managers
- AIS professionals

PROJECT DURATION

48 months – 2018-2021 (continuing activity)

FOCUS AREAS(S)

- Healthy Coastal Ecosystems

WISCONSIN STRATEGIES

- Support research and outreach to understand the environmental and socioeconomic effects of current and emerging challenges on Great Lakes ecosystem and human health including, but not limited to, contaminants, aquatic invasive species, harmful algal blooms, bacterial outbreaks, physical processes, climate change and changes to biodiversity and ecosystem structure.
- Support research and outreach to improve Great Lakes ecosystem health through innovations in measurement, predictive modeling and potential treatment or management approaches.

OUTCOMES

- Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.

IMPACT

- Additional science-based approaches will be developed to address new AIS pathways

PERFORMANCE MEASURES AND METRICS

Wisconsin

- The number of training sessions for stakeholders and key stakeholder groups on Great Lakes aquatic invasive species prevention efforts. [8 training sessions]

Campbell 4 - Refining AIS Communication Techniques

BACKGROUND

National brands promoted through the USFWS and the Aquatic Nuisance Species Task Force are the backbone of Wisconsin's AIS prevention messages. Using these messages has resulted in high awareness of AIS issues and compliance with AIS prevention regulations among Wisconsin water users. However, with new invasions appearing on the landscape, there must be gaps in Wisconsin's AIS prevention efforts.

One possible explanation is that the Wisconsin AIS prevention message is not reaching all of Wisconsin's water users because it is tailored towards the water user that has already received our message. Different approaches are needed to reach the remaining stakeholders with the AIS prevention message and currently no work is being done to determine what techniques are effective at reaching what water users. This research can make AIS messaging more effective and make better use of limited funds.

OBJECTIVES

- Make AIS communications more effective
- Better understand who is and is not being reached with the Wisconsin AIS Partnership message
- Identify gaps in the Wisconsin AIS prevention message
- Understand the impacts of our current message frames and develop an understanding of how to better use those frames to achieve program objectives

APPROACH/PLANNED ACTIVITIES

- Complete boater/angler survey to identify knowledge gaps and to direct future AIS outreach
- Publish executive summary
- AIS metaphor implications
- Publish results in a peer reviewed journal
- SWF Communication
- Publish results in a peer reviewed journal

WISG PERSONNEL

- Tim Campbell (10%)

EXTERNAL PARTNERS

- UW-Extension ERC Evaluation Unit
- UW-Madison Life Sciences Communication
- Wisconsin DNR

INTENDED AUDIENCE

- AIS professionals
- Communications professionals

PROJECT DURATION

48 months – 2018-2021 (continuing activity)

FOCUS AREAS(S)

- Healthy Coastal Ecosystems
- Environmental Literacy and Workforce Development

WISCONSIN STRATEGIES

- Support research and outreach to understand the environmental and socioeconomic effects of current and emerging challenges on Great Lakes ecosystem and human health including, but not limited to, contaminants, aquatic invasive species, harmful algal blooms, bacterial outbreaks, physical processes, climate change and changes to biodiversity and ecosystem structure.
- Support research and outreach to improve Great Lakes ecosystem health through innovations in measurement, predictive modeling and potential treatment or management approaches.

OUTCOMES

- Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.
- Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.

IMPACT

- More efficient, strategic, and effective AIS communications
- Adoption of science-based approaches to communication and messaging
- More citizens taking action to prevent the spread of AIS

PERFORMANCE MEASURES AND METRICS

<u>Wisconsin</u>

- Number of Wisconsin Sea Grant-supported events or products that promote the intersection of the arts, sciences and humanities to inspire a science-informed society. [2 events]

Campbell 5 - Great Lakes and Mississippi River Regional Coordination

BACKGROUND

The national Aquatic Nuisance Species Task Force was established in 1990 to prevent and control nonindigenous species within the United States. Six regional panels have been authorized by the task force to plan for research, control and prevent aquatic nonindigenous species. These include panels for the Great Lakes and Mississippi River basins. Coordination between these panels has the potential to improve the effectiveness of AIS research and outreach and reduce duplication of effort.

OBJECTIVES

- Meet the needs of natural resource managers across the Great Lakes and Mississippi River basin
- Provide extension and science-based approaches to regional AIS problems
- Reduce duplication of effort and leverage resources through regional coordination

APPROACH/PLANNED ACTIVITIES

- Serve on Great Lakes ANS Panel Outreach Committee
- Serve on Mississippi River ANS Panel as co-hair (3 year commitment)
- Participate in national ANS Task Force meetings

WISG PERSONNEL

- Tim Campbell (15%)

INTENDED AUDIENCE

- AIS Professionals
- Natural Resource managers

PROJECT DURATION

48 months – 2018-2021 (continuing activity)

FOCUS AREAS(S)

- Healthy Coastal Ecosystems

WISCONSIN STRATEGIES

- Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- Help residents, resource managers, businesses, industries and the agricultural sector understand the effects of human activities and environmental changes on coastal resources.
- Help managers incorporate public input in natural resource decision-making processes.

OUTCOMES

- Scientific understanding and technological solutions inform and improve conservation and the management of natural resources in Wisconsin and the Great Lakes basin.
- Ecosystem science and conservation priorities for Wisconsin are those that are developed through stakeholder participation.
- Improved collaborative planning and decision-making lead to enhanced freshwater and Wisconsin coastal stewardship.

- Collaborations with state and regional partners and stakeholders support planning, research and technological solutions to address resource-management needs.
- Citizen science initiatives are engaged and contribute to improving our knowledge with respect to coastal communities and ecosystems.
- Wisconsin communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
- Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.

IMPACT

- Solutions to difficult regional AIS problems
- More efficient use of AIS resources

PERFORMANCE MEASURES AND METRICS

National

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities
- Number of Public or Professional Presentations
- Number of Attendees at Public or Professional Presentations

Wisconsin

- The number of training sessions for stakeholders and key stakeholder groups on Great Lakes aquatic invasive species prevention efforts. [4 training sessions]

David Hart – Extension Program Leader and Geographic Information Systems Specialist

Hart 1 - Leverage Geographic Information Science to Promote Adaptive Coastal Management

BACKGROUND

Since 1994, Wisconsin Sea Grant has collaborated with many partners to apply geospatial technologies to better understand coastal management issues facing the Great Lakes. This effort has evolved through several phases in that time: 1) providing GIS training for specific coastal issues; 2) discovering, acquiring, and integrating local data to study regional coastal issues; 3) implementing interoperable web mapping services to build a dynamic and distributed coastal GIS; 4) utilizing visualization and animation to promote a more intuitive understanding of complex coastal issues; and 5) promoting a coastal spatial data infrastructure through development of the Wisconsin Coastal Atlas.

OBJECTIVES

- Increase access to spatial data about coastal resources in Wisconsin.
- Expand use of the Wisconsin Coastal Atlas.
- Promote the Wisconsin Coastal Atlas as a component of a coastal spatial data infrastructure for the Great Lakes region.
- Promote the development of information services and spatial decision support tools for adaptive management of coastal resources.
- Develop spatial narratives/deep maps that promote coastal stewardship.
- Apply geospatial technologies for ecosystem-based management.
- Apply geospatial technologies to promote resilience to coastal hazards.

APPROACH/PLANNED ACTIVITIES

Continue development of the Wisconsin Coastal Atlas as a component of a coastal spatial data infrastructure for the Great Lakes region and as an interoperable data catalog that can be searched as part of a global network of coastal atlases.

- Add new spatial data to the map server and metadata catalog for the Wisconsin Coastal Atlas (http://wicoastalatlas.net/). Priorities include coastal heritage tourism, nearshore habitats, coastal infrastructure, elevation data, hydrology, land use and human impacts.
- Conduct workshops for coastal constituencies on effective use of the Wisconsin Coastal Atlas.
- Collaborate with the state Geographic Information Officer to enhance access to spatial data about coastal resources in Wisconsin.
- Collaborate with neighboring states on the use of interoperable spatial data to address transboundary coastal management issues, such as management of the St. Louis River Estuary, land/water interactions in Green Bay and nearshore sediment dynamics.
- Continue active participation in the International Coastal Atlas Network.
- Author a white paper on the role that distributed, interoperable spatial data plays in supporting adaptive management of coastal resources.

Demonstrate how narrative maps, place-based learning, 3D visualization, and other emerging geospatial technologies can be used to promote resilience to coastal hazards and ecosystem-based management.

- Develop and apply interactive maps and decision tools that promote resilience to coastal hazards through issues such as water level visualization, bluff erosion, nearshore sediment movement and stormwater management.
- Develop and apply interactive maps and decision tools that promote ecosystem-based management through issues such as estuary management, green infrastructure and water quality.
- Author a white paper on how deep maps and spatial narratives can be used to promote stewardship of coastal resources.

WISG PERSONNEL

- David Hart (25%)
- Jim Grandt (system administration services as needed – 1%)
- Tom Xiong (web development services as needed – 1%)

EXTERNAL PARTNERS

- Coastal municipalities, counties and regional planning commissions
- Wisconsin Coastal Management Program
- Wisconsin Department of Natural Resources
- NOAA Office for Coastal Management
- Association of State Floodplain Managers

INTENDED AUDIENCE

- Coastal resource managers
- Local government planners

PROJECT DURATION

48 months - 2018-2021 (continuing activity)

FOCUS AREA(S)

- Healthy Coastal Ecosystems
- Resilient Communities and Economies

WISCONSIN STRATEGIES

- HCE. Develop tools and approaches for preserving and restoring Great Lakes ecosystems that can also be used for outreach to stakeholders.
- HCE. Improve and enhance stakeholder access to and understanding of socioeconomic and environmental data, models and policy information in Wisconsin and the Great Lakes region that support ecosystem-based planning, decision-making and management approaches.
- HCE. Support research and outreach to develop dynamic and interoperable information systems to support adaptive management of Great Lakes ecosystems.
- HCE. Help managers incorporate public input in natural resource decision-making processes.
- RCE. Develop and apply innovative geodesign methods to promote resilient coastal communities and understand the consequences of alternative development scenarios.
- RCE. Support research and outreach to develop or enhance community planning and visualization tools that demonstrate the benefits, risks and impacts of land use on the coastal environment.

OUTCOMES

- HCE. Wisconsin communities have access to information and understand projected changes within coastal ecosystems and how changes will impact coastal ecosystems.
- HCE. Wisconsin communities can access case studies, training and tools to improve their ability to plan, prepare and adapt to future ecosystem conditions.
- RCE. Wisconsin communities have access to information needed to understand the factors impacting ecosystems and participate in adaptive management planning.
- RCE. Wisconsin communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.
- RCE. Wisconsin communities employ adaptive management strategies and apply tools to engage diverse members of the community to improve resilience and community sustainability.
- RCE. Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.
- RCE. Wisconsin communities have access to sound science, data, tools and services to understand and anticipate changes in water quantity and quality.
- RCE. Wisconsin communities have access to science, tools and technologies to protect and sustain water resources and make informed decisions.

IMPACT

- A robust spatial data infrastructure makes it easier and more effective to discover, assess and use geospatial data to address coastal issues.
- Leveraging distributed spatial data directly from custodians “just-in-time” for spatial analyses promotes the ideals of adaptive management of coastal resources, allowing managers to make better decisions.
- Place-based narratives about coastal issues provides a human element to resource management and leads to higher levels of stewardship of coastal resources.

PERFORMANCE MEASURES AND METRICS

National

- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities [100 managers]
- Number of Sea Grant tools, technologies and information services that are used by our partners/customers to improve ecosystem-based management.
    - Number of Products 'developed' [4 products]
    - Number of Products 'used' [24 products]

Wisconsin

- The number of Wisconsin Coastal Atlas-based resilience tools used by Great Lakes coastal communities. [8 tools]

Hart 2 - Sustainable Great Lakes Tourism

BACKGROUND

Wisconsin Sea Grant has collaborated on several projects that promote a better understanding of Wisconsin's Great Lakes coastal heritage. They include Wisconsin Shipwrecks (http://www.wisconsinshipwrecks.org/) – a collaboration with the Wisconsin Historical Society and the Wisconsin Coastal Guide (http://wisconsincoastalguide.org/) – a web mapping site that promotes exploration of the Great Lakes Circle Tour and nearby attractions. This project will enhance those efforts and promote sustainable coastal tourism in Wisconsin.

OBJECTIVES

- Promote discovery and stewardship of the Great Lakes.
- Enhance appreciation of maritime heritage in Wisconsin.
- Increase awareness and visitation of Great Lakes public access sites.

APPROACH/PLANNED ACTIVITIES

Enhance the Wisconsin Coastal Guide

- Update the Wisconsin Coastal Guide website with an image-rich interface using the WordPress content management system.
- Promote use of the Wisconsin Coastal Guide by a variety of different audiences, including tourists, government agencies, and schools.

Develop Place-Based Learning Activities for the Great Lakes Coasts

- Using Oregon Coastal Quests and Valley Quests as models, develop place-based learning activities in the spirit of British letterboxing that promote discovery and exploration of cultural heritage and scenic resources of the Great Lakes coasts in Wisconsin.
- Partner with the Field Day Lab at UW-Madison to develop place-based learning activities with coastal themes using the ARIS and Siftr platforms.

Promote Public Access to the Great Lakes Coasts

- Develop geospatial apps that leverage the new geodatabase of Great Lakes public access in Wisconsin.
- Update the panorama photos of coastal public access sites in the Wisconsin Coastal Guide.

WISG PERSONNEL

- David Hart (10%)
- Deidre Peroff
- Tom Xiong (web development services as needed – 1%)
- Jim Grandt (system administration services as needed – 1%)

EXTERNAL PARTNERS

- Wisconsin Coastal Management Program
- Wisconsin Harbor Towns Association
- Wisconsin Department of Tourism
- Wisconsin Department of Natural Resources
- Wisconsin Historical Society
- NOAA Office of National Marine Sanctuaries

INTENDED AUDIENCE
- Government agencies
- Tourists
- Schools

PROJECT DURATION
48 months - 2018-2021 (continuing activity)

FOCUS AREA
- Resilient Communities and Economies

WISCONSIN STRATEGIES
- RCE. Support research and outreach to understand the value of and opportunities for subsistence, tourism, and commercial and recreation-related activities in coastal communities.
- RCE. Support research and outreach that documents and preserves cultural and historical resources in coastal and marine areas, including those within or adjacent to the proposed marine sanctuary.

OUTCOMES
- RCE. Communities have access to tools, services and technologies to adapt and grow resilient Wisconsin economies.

IMPACT
- Wisconsin Harbor Towns experience an increase in tourism related to coastal heritage.
- An increase in "deep travel" experiences – those that evoke an exhilarating state of mind when everything seems suddenly fresh, vivid, intensely interesting, and memorable (Hiss 2010) – enabled by coastal quests and other place-based learning activities promote increased stewardship of scenic and cultural resources along the Great Lakes coasts.

PERFORMANCE MEASURES AND METRICS
<u>National</u>
- Economic and societal impacts derived from Sea Grant activities (market and non-market; jobs and businesses created or sustained)
    - Economic benefit [$100,000 in additional coastal tourism revenue]

Appendix A

Curricula Vitae

Moira Harrington
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Experience

1/10 – Present	**Assistant Director for Communications** for the University of Wisconsin Aquatic Sciences Center, Madison, Wisconsin. Prepare, manage and measure outcomes of a statewide communications program. Oversee the work of five communications professionals. Serve on the Center's management team.
7/07 – 11/09	**Communications Director** for the University of Wisconsin Center for Tobacco Research and Intervention, Madison, Wisconsin. Led state, national and international publicity on research findings; website design and content; publications; advertising; media relations; personnel management; and served on the Center's management team.
4/00 – 7/07	**Promotion Manager** for Wisconsin Public Television, Madison, Wisconsin. Conceptualized and implemented earned and paid media promotion strategies for statewide public television organization that reaches nearly 600,000 viewers each week with broadcasts, and community outreach projects and events. Handled media relations. Produced a monthly publication, annual reports, e-newsletters and advertising materials. Ensured brand stewardship and consistency. Managed a staff of four, and numerous interns.
6/98 – 6/99	**Communications Director** for the Tobacco-Free Wisconsin Coalition, Madison, Wisconsin. Handled all media relations for a statewide public health coalition. Designed and conducted training presentations. Established and fostered statewide relationships to build grassroots coalitions to achieve numerous policy and public awareness objectives. Managed a $1 million grant.
7/97 – 6/98	**Media Advocacy Coordinator** for the American Cancer Society, Wisconsin Division, Madison, Wisconsin. Responsible for development and implementation of statewide tobacco control media message. Partnered with diverse groups in communities around the state to develop and carry out public-policy goals.
1/97 – 6/97	**Reporter** for Wheeler News Service, Madison, Wisconsin. Covered all state legislative activities for a daily newsletter. Covered all meetings of the Wisconsin Public Service Commission for a newsletter that was published twice a week. Responsible for a weekly news roundup that circulated to more than 5,000 statewide subscribers.
1/93 – 1/97	**State Director** for United States Senator Russ Feingold, Middleton, Wisconsin. Responsible for the start-up and oversight of all functions in five in-state offices, managed a 25-person staff, and numerous volunteers and interns. Acted as speaking surrogate for the senator at numerous public functions throughout the state. Oversaw an in-state media team.

4/87 – 12/92	**Press Secretary/Legislative Aide** for Wisconsin State Senator Russ Feingold, Madison, Wisconsin. Prepared news conferences, releases, columns and newsletters. Acted as the media contact for the senator. Completed legislative analysis, legislative preparation and handled constituent relations. Advised on building and maintaining successful coalitions and partnerships.
6/92 – 8/92	**Volunteer Press Secretary** for Russ Feingold's 1992 Campaign for the United States Senate, Middleton, Wisconsin. Devised and implemented entire earned-media strategy for the successful upset campaign to unseat an incumbent U.S. senator.

Education

8/79 – 12/83	University of Wisconsin-Madison, B.A. in Journalism and B.A. in Political Science

Professional Membership

8/08 – Present	Member of the Public Relations Society of America and chair of the Scholarship Committee

Service

1/16 – 1/18	Chair, Sea Grant National Communicators Network
6/16 – Present	Board member, Friends of Pope Farm Conservancy
3/12 – 9/15	Town of Middleton Park Commissioner
7/10 – Present	Committee on Academic Staff Issues, University of Wisconsin-Madison, current chair
8/00 – 8/17	Volunteer, Middleton Outreach Ministry Food Pantry
12/07-12/10	Chair, Scholarship Committee, Public Relations Society of America, Madison, Wisconsin Chapter
8/09 – 1/10	Board member, Smokefree Wisconsin
7/06 – 1/10	Board member, Dane County Transition School
6/01 – 6/03	Board member, Madison Civics Club
9/02 – 5/03	Participant in Leadership Greater Madison
9/98 – 12/99	Board member, Coalition of Wisconsin Aging Groups

Awards

2017	AVA Digital Awards Platinum Award for a podcast series and an honorable mention for a video
2015	Council for Advancement and Support of Education Bronze Award for 2012-14 Sea Grant Biennial Report
2015	APEX Grand Award for the Eat Wisconsin Fish campaign
2006	PBS National Communications Award for the Wisconsin Public Television Annual Report
2005	Public Relations Society-Wisconsin Chapter for the Wisconsin World War II Stories campaign
2001	PBS National Communications Award for the Wisconsin Public Television Annual Report

Jennifer A. Hauxwell
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-University of Wisconsin Sea Grant and Water Resources Institutes
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Academic Training:

2000	Ph.D., Biology, Boston University Marine Program, Marine Biological Laboratory, Woods Hole, MA
1994	B.S., Biology, Michigan Secondary Teaching Cert. in Biology and Chemistry, University of Michigan, Ann Arbor, MI

Professional Experience:

2014-present	Assistant Director for Research and Student Engagement, University of Wisconsin-Madison Aquatic Sciences Center.
2008-2014	Section Chief, Fisheries & Aquatic Sciences Research, Wisconsin Dept. Natural Resources, Madison, WI.
2001-2008	Research Limnologist, Fisheries & Aquatic Sciences Research, Wisconsin Dept. Natural Resources, Madison, WI.
2001-2012	Courtesy Assistant Professor, Department of Zoology, University of Florida, Gainesville, FL.
2000-2001	Postdoctoral Associate, Depts. Zoology/Fisheries & Aquatic Sciences, University of Florida, Gainesville, FL.
2000-2001	Independent Contractor (Lead author of publication on nutrient inputs), Florida Sea Grant, Gainesville, FL.
2000	Visiting Professor, Boston University Marine Program, Marine Biological Laboratory, Woods Hole, MA.
2000	Visiting Lecturer, Waquoit Bay National Estuarine Research Reserve, Falmouth, MA.
1998-1999	Editorial Assistant, Journal of Crustacean Biology, Marine Biological Laboratory, Woods Hole, MA.
1999	Visiting Research Scientist, CINVESTAV-IPN, Unidad Mérida, Yucatan, Mexico.
1994	Outdoor Science Center Educator, Institute of Ecosystem Studies, Millbrook, NY.

Major Research and Professional Interests

Aquatic ecology, eutrophication, linkages between land use and aquatic ecosystems, aquatic invasive plant population ecology, vegetation monitoring, natural resources management, science outreach.

Grantsmanship, Research Administration and Supervision

Total grants received as PI or Co-PI on research projects = $2.4 million (1997-2017)

As Assistant Director of Research and Student Engagement, administered a total of approximately $3.5 million across 64 projects – UW-Madison (2014-2017)

As research section chief, administered a total of approximately $16.2 million and supervised a total of 75 professional scientists and technicians working on over 100 research projects – Wisconsin Dept. Natural Resources (2008-2014)

As scientist, supervised a total of 57 research technicians working on a variety of my projects – Wisconsin Dept. Natural Resources, University of Florida, Boston University (1994-2008)

Selected Publication (Career total of 33 peer-reviewed journal articles and 5 book chapters with over 2800 citations, 10 technical reports, 6 popular articles, 11 administrative reports; http://scholar.google.com/citations?user=sN2qaz4AAAAJ&hl=en&oi=ao)

Kujawa, E.R., et al. 2017. Lessons from a decade of lake management: effects of herbicides on Eurasian watermilfoil and native plant communities. Ecosphere 8(4):e01718. 10.1002/ecs2.1718.

Alahuhta, J., S. et al. 2017. Global variation in the beta diversity of lake macrophytes is driven by environmental heterogeneity rather than latitude. Journal of Biogeography. doi:10.1111/jbi.12978.

Oele, D.L., et al. 2015. Effecting compliance with invasive species regulations through outreach and education of live plant retailers. Biological Invasions 17:2707-2716.

Nault, M.E., et al. 2014. Efficacy, selectivity, and herbicide concentrations following a whole-lake 2,4-D application targeting Eurasian Watermilfoil in two adjacent northern Wisconsin lakes. Lake and Reservoir Management 30:1-10.

Hansen, G.J.A., et al. 2013. Commonly rare and rarely common: Comparing population abundance of invasive and native aquatic species. PLoS ONE 8(10): e77415. doi:10.1371/journal.pone.0077415.

Kosten, S., et al. 2009. Climate-related differences in the dominance of submerged macrophytes in shallow lakes. Global Change Biology 15:2503-2517.

Hauxwell, J., et al. 2007. An annual cycle of biomass and productivity of *Vallisneria americana* Michx in a subtropical spring-fed estuary. Aquatic Botany 87: 61-68.

Hauxwell, J., et al. 2004. Conflicting management goals: manatees and invasive competitors inhibit restoration of a native macrophyte. Ecological Applications 14:571-586.

Hauxwell, J., and I. Valiela. 2004. Effects of nutrient loading on shallow seagrass-dominated coastal systems: Patterns and processes. *In* S.L. Nielsen, M.F. Pedersen, and G. Banta (Eds.), *The Influence of Primary Producers on Estuarine Nutrient Cycling*. Kluwer Academic Publishers, the Netherlands.

Hauxwell, J., et al. 2003. Eelgrass (*Zostera marina* L.) loss in temperate estuaries: relationship to land-derived nitrogen loads and effect of light limitation imposed by algae. Marine Ecology Progress Series 247:59-73.

Hauxwell, J., et al. 2001. Macroalgal canopies contribute to eelgrass (*Zostera marina*) decline in temperate estuarine ecosystems. Ecology 82:1007-1022.

Hauxwell, J., C. Jacoby, T.K. Frazer, and J. Stevely. 2001. Nutrients and Florida's coastal waters: The links between people, increased nutrients, and changes to coastal aquatic systems. Florida Sea Grant publication (SGEB-55), Gainesville, FL.

Valiela, I., et al. 1997. Macroalgal blooms in shallow estuaries: Controls and eco-physiological and ecosystem consequences. Limnology and Oceanography 42:1105-1118.

Additional Activities

Developed 2 professional fellowship opportunities through partnership between UW-Madison and state agencies and placed a total of 3 fellows since 2015. Co-developed and serving as instructor for the Michigan Sea Grant Community Engaged Research Institute for graduate students. Served as a mentor for NSF-REU students conducting ecological work at the Woods Hole Marine Biological Laboratory, coauthoring 7 publications with them.

VITA

NAME: David A. Hart, Ph.D., AICP
TITLE: Assistant Director for Extension
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PHONE: (608) 262-6515
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EDUCATION:

Ph.D. in Land Resources. University of Wisconsin-Madison. December 2000
Dissertation: *Building a Horizontally and Vertically Integrated Coastal GIS Using Local Government Spatial Data: The Case of Coastal Erosion Hazards on the Lake Michigan Coast of Wisconsin.*

Master of Urban and Regional Planning. University of New Orleans. May 1986
Major: Environmental Planning.

B.S. in Natural Resources. University of Michigan. December 1981
Major: Natural Resource Policy and Management.

POSITIONS HELD:

Senior Scientist/Associate Scientist, University of Wisconsin Aquatic Sciences Center, University of Wisconsin-Madison, August 2002 to present
Serve as the Assistant Director for Extension for Wisconsin Sea Grant since November 2014. Conduct research and provide outreach that supports sustainable coastal development along the Great Lakes. Develop methods for discovery, acquisition, integration, and analysis of local geospatial data for use in decision-making about coastal management issues at a regional scale.

Senior Outreach Specialist/Research Assistant, Land Information and Computer Graphics Facility, University of Wisconsin-Madison, January 1993 to August 2002

Senior City Planner/City Planner, City Planning Commission, New Orleans, Louisiana, February 1987 to January 1993

Coastal Zone Planner, Department of Planning and Zoning, St. Charles Parish, Louisiana, December 1986 to February 1988

Planner, Burk & Associates, Inc., New Orleans, Louisiana, September 1985 to October 1986

PROFESSIONAL MEMBERSHIPS:

American Institute of Certified Planners, Certified Planner No. 6269, July 1988
American Planning Association, Wisconsin Land Information Association

SELECTED PUBLICATIONS:

Silbernagel, J., Host, G., Hagley, C., Hart, D., Axler, R., Fortner, R., Axler, M., Smith, V., Drewes, A., Bartsch, W. and Danz, N. 2015. Linking place-based science to people through spatial narratives of coastal stewardship. Journal of Coastal Conservation, 19(2), pp.181-198.

Roth R., Quinn, C., and D. Hart. 2015. "The competitive analysis method for evaluating water level visualization tools" In: A. Vondrakova, J. Brus, and V. Vozenilek (eds) Modern Trends in Cartography, Lecture Notes in Geoinformation and Cartography. pp. 241-256.

Hart, D. and E. Hamilton. 2012. "Spatial Decision Support Tools for Adaptive Management of Water Resources" in Geographic Information Systems (GIS) and Water Resources VII. AWRA.

Burkett, V., D. Zilkoski, and D. Hart. 2003. "Sea-Level Rise and Subsidence: Implications for Flooding in New Orleans" U.S. Geological Survey Subsidence Interest Group Conference, Proceedings for the Technical Meeting, Galveston, Texas, November 27-29, 2001. K.R. Prince and D.L. Galloway, Eds. USGS Water Resources Division, Open File Report 03-308. pp. 63-70.

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EDUCATION:

BSCE, Texas A & M University, 1979, Ocean Engineering
MSCE, University of Florida, 1981, Coastal Engineering
MSCE, University of Wisconsin, 1985, Civil Engineering

REPRESENTATIVE EXPERIENCE:

Mr. Clark has over 33 years of coastal engineering design experience, including the last thirteen years as the University of Wisconsin's Sea Grant Institutes Coastal Engineering Specialist and the Universities Lake Superior field office outreach manager. The coastal engineering specialist portion of his position focuses on serving Great Lakes communities, state and local agencies and shoreline property owners providing shoreline development Best Management Practice (BMP) education, coastal erosion process and erosion control guidance, and port/harbor/marina technical engineering assistance (infrastructure & dredging). Mr. Clark currently serves on the Great Lakes Dredging Team (GLDT) and has served as the GLDT state co-chair as well as the GLDT Beneficial Use of Dredged Material committee chairman. Mr. Clark also currently serves as the Duluth/Superior harbor technical advisory committee as the Dredging committee chairmen where he works directly with USACE harbor dredging and beneficial use issues. He also is actively serving on the USACE steering committee investigating the accelerated freshwater corrosion problem in the harbor.

Prior to his current position with the University of Wisconsin, Gene was with the Minnesota Board of Water and Soils Resources (BWSR) and several Great Lakes Coastal Engineering consulting firms. As the Minnesota State Lakeshore Engineer, Mr. Clark provided Lake Superior communities, coastal property owners and the Lake Superior Soil & Water Conservation Districts with technical design assistance for Great Lakes coastal process issues and lakeshore erosion control projects. He also provided technical training to district staff, local units of government, contractors and private property owners on shoreline BMP design and implementation. Mr. Clark also directed state and federal cost-share funds to implement Lake Superior shoreline erosion control studies, stabilization demonstration projects and educational opportunities.

As a Great Lakes practicing Coastal Engineer, Mr. Clark is licensed in the states of Wisconsin and Minnesota and has extensive Great Lakes coastal engineering shoreline process investigations and project design consulting experience. He has completed site analyses, hydrologic and hydraulic structure designs, designs for coastal protection and erosion control projects, and has been involved with dredging research. Mr. Clark began his professional coastal engineering career with the USACE Hydraulic Laboratory and the Coastal Engineering Research Center at the Waterways Experiment Station (WES) in Vicksburg, MS. While at WES, Mr. Clark was involved with coastal process and structure evaluations (harbor sand bypassing designs) as well as innovative dredging research.

NAME: Julia S. Noordyk
TITLE: Water Quality and Coastal Communities Outreach Specialist
DEPARTMENT: University of Wisconsin Sea Grant Institute
CAMPUS ADDRESS: University of Wisconsin-Green Bay, 2420 Nicolet Drive, MAC 212
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EMAIL ADDRESS: noordykj@uwgb.edu

EDUCATION:

M.S., Conservation Biology and Sustainable Development, University of Wisconsin, 2009
B.S., Zoology, Colorado State University, 2003

International

SupAgro - Ecole Nationale Supérieure Agronomique de Montpellier, France, 2009
School for International Training, Tanzania, 2002
Institut Catholique de Paris, France, 2001

POSITIONS HELD:

Water Quality and Coastal Communities Outreach Specialist, University of Wisconsin Sea Grant, University of Wisconsin - Green Bay, Green Bay WI, 2013-present
Senior Planner, NOAA Coastal Management Fellow, Maine Coastal Program, Department of Agriculture, Conservation, and Forestry, Augusta, ME, 2010-2013
Veterinary Assistant, Whole Pet Veterinary Clinic, Madison, WI, 2009-2010
Research Assistant: Conservation in Mediterranean Wetlands, L'Institut Nationalde la Recherche Agronomie, Montpellier, France, 2008-2009
Wetlands Mitigation Policy Intern, WI Department of Natural Resources, 2008-2008
Research Assistant: Implications of an Invasive Species on Biodiversity in Mediterranean Wetlands, University of Wisconsin, Madison, WI, 2007-2008
Teaching Assistant: Zoology Lab, University of Wisconsin, Madison, WI, 2007–2008
Veterinary Technician, Aspen Park Veterinary Hospital, Aspen Park, CO, 2005-2006
Field Manager: Environment California, the Fund for Public Interest Research Groups, San Diego, CA, 2004-2004
Biology Intern: California Condor Recovery Program, U.S. Fish and Wildlife, Ventura California, 2003-2004
Biology Research Fellow, Colorado State University, Fort Collins, CO, 2001-2001

PROFESSIONAL MEMBERSHIPS:

The Coastal Society
American Planning Association
Wisconsin Association of Floodplain, Stormwater and Coastal Managers

PUBLICATIONS:

Noordyk, J. 2017. Tackling Barriers to Green Infrastructure One Ordinance at a Time. *The Municipality*, September 2017.

Noordyk, J. Morgan, K., Hinds, J.B. 2016. Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances. University of Wisconsin Sea Grant Institute.

Noordyk, J. 2013. Maine Coastal Public Access Guide, Downeast Region.
Maine Coastal Program, Maine Department of Agriculture, Conservation and Forestry.

Noordyk, J. 2013. Maine Coastal Public Access Guide, Midcoast Region.
Maine Coastal Program, Maine Department of Agriculture, Conservation and Forestry.

Noordyk, J. 2013. Maine Coastal Public Access Guide, Southern Region.
Maine Coastal Program, Maine Department of Agriculture, Conservation and Forestry.

Noordyk, J. 2012. Renewable ocean energy: Developer files for lease off Maine coast. *Commercial Fishery News*, 39 (7): 1.

Noordyk, J. 2012. Renewable ocean energy: The 'Smart from the Start" initiative. *Commercial Fishery News*, 39 (5): 1.

Noordyk, J. 2011. Renewable ocean energy: Is deep-water floating wind next for Gulf of ME? *Commercial Fishery News*, 39 (1): 1.

Noordyk, J. 2011. Renewable ocean energy: Local supply chain critical to harnessing jobs. *Commercial Fishery News*, 38 (11): 1.

Noordyk, J. 2011. Renewable ocean energy: Can wind farms, fishing activities co-exist? *Commercial Fishery News*, 38 (9): 1-3.

Noordyk, J. 2011. Renewable ocean energy: Participating in the site selection process. *Commercial Fishery News*, 38 (8): 1.

Caldwell, J. 2011. Renewable ocean energy: Offshore wind permitting process explained. *Commercial Fishery News*, 38 (7): 1.

Caldwell, J. 2011. Renewable ocean energy: Fishermen's input is vital. *Commercial Fishery News*, 38 (6): 1.

Caldwell, J. 2011. Renewable ocean energy: Why wind? Why now? *Commercial Fishery News*, 38 (5): 1–3.

Caldwell, J. 2011. Wind energy: Sharing the waters. *National Fisherman*. January: 6.

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EDUCATION

06/2007 Ph. D. Biology, McMaster University, Hamilton, ON
06/2000 B.A. Biology, Lawrence University, Appleton, WI

PROFESSIONAL EXPERIENCE

12/2012-Present. FISHERIES SPECIALIST AND OUTREACH PROGRAM MANAGER. University of Wisconsin Sea Grant Institute, Manitowoc, WI.

- Developed outreach, education, and research programs in cooperation with fisheries stakeholders in Wisconsin's Great Lakes.
- Conduct applied research on commercial fishery issues.

07/2010-11/2012. RESEARCH ECOLOGIST. U.S. Forest Service, Northern Research Station, Forest Inventory and Analysis, St. Paul, MN

- Developed models to link watershed forest and land cover with water quality.

08/2009-06/2010. POSTDOCTORAL ASSOCIATE. New York Cooperative Fish and Wildlife Research Unit and Cornell University, Ithaca, NY.

- Project leader for study modeling fish habitat response to altered flow regime and environmental flows in rivers and streams.

01/2007-07/2009. POSTDOCTORAL FELLOW. Oklahoma Cooperative Fish and Wildlife Research Unit and Oklahoma State University, Stillwater, OK.

- Project leader for hydroecological classification project of Oklahoma streams and rivers (2008-2009).
- Planned and supervised 2 instream flow assessment of springs and streams in southern Oklahoma (2007-2009).

08/2001-12/2006. GRADUATE RESEARCH. McMaster University, Hamilton, ON.

- Dissertation title: *Development and use of fish-based indicators of wetland quality for Great Lakes coastal wetlands*.
- Conducted field-based research on Great Lakes wetlands.

02/2001-05/2001. SCA FISHERIES INTERN. Americorps/Bureau of Land Management, Eugene, OR.

- Conducted steelhead spawning and stream-reach surveys, culvert assessment for fish passage, and monitoring for salmonid and other species.

GRANTS/AWARDS

2013 to 2017 PI: **Titus Seilheimer**. Annual contract: Aquatic Invasive Species Outreach Coordination Along Wisconsin's Great Lakes Coasts. Five year total $235,000.

2016 Co-PIs: Philip Moy, **Titus Seilheimer**, Bart DeStasio. Intermediate Livewell and Bilge Testing to Simulate the Fox Locks Boat Transfer Station Hot Water Treatment. Contract from Fox River Navigation System Authority. Sub-award to TSS: $11,500.

2016 PI: **Titus Seilheimer**. Partners: Heather Bliss, Albert House. Increasing the Efficiency of Locating and Removing Ghost Nets in the Upper Great Lakes. NOAA Marine Debris Removal Program. $ 73,000.

2014 PI: **Titus Seilheimer**. Partners: Heather Bliss, Albert House. Using Outreach and Education to Reduce Fishing Net Loss and Marine Debris in Lake Superior. NOAA Marine Debris Program. $50,000.

2008 PI: William Fisher. Co-investigators: Jerry Brabander, **Titus Seilheimer**, Ellen Tejan, Don Turton, Rachel Esralew, and Kyle Arthur. Biological Assessment of Environmental Flows for Oklahoma. Science Support Partnership Grant. $100,000.

2008: PIs: Don Turton and William Fisher. Co-investigators: **Titus Seilheimer** and Rachel Esralew. An Assessment of Environmental Flows for Oklahoma: Part 1. Oklahoma Water Resource Research Institute. $75,000

Norman S. Baldwin Fishery Science Scholarship, International Association for Great Lakes Research and Great Lakes Fishery Commission (2004)

PROFESSIONAL AFFILIATIONS

American Fisheries Society (2003-present)
International Association for Great Lakes Research (2000-present)

PUBLICATIONS

9 peer-reviewed publications, 1 dissertation, and more than 10 technical reports, including:

Campbell, T., T. Verboomen, G. Montz, and **T. Seilheimer.** 2016. Volume and contents of residual water in recreational watercraft ballast systems. Management of Biological Invasions 7: 281–286.

Tavernia, B., M. Nelson, **T. Seilheimer**, D. Gormanson, C. Perry, P. Caldwell, G. Sun. 2016. Conservation and maintenance of soil and water resources. In: Shifley, Stephen R.; Moser, W. Keith, eds. Future forests of the northern United States. Gen. Tech. Rep. NRS-151. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station: 145-175. Chapter 6.

Seilheimer, T., P. Zimmerman, K. Stueve, and C.H. Perry. 2013. Landscape-scale modeling of water quality in Lake Superior and Lake Michigan watersheds: how useful are forest-based indicators? Journal of Great Lakes Research 39: 211–223.

Seilheimer, T. and W. Fisher. 2010. Habitat use by fishes in groundwater-dependent streams of southern Oklahoma. American Midland Naturalist 164: 201-216.

Seilheimer, T. and P. Chow-Fraser. 2006. Development and use of the Wetland Fish Index to assess the quality of coastal wetlands in the Laurentian Great Lakes. Canadian Journal of Fisheries and Aquatic Sciences 63: 354-366.

PRESENTATIONS

More than 45 presentations at scientific meetings and more than 95 to stakeholder groups, including:

Seilheimer, T. 2017. Win-Win: Reducing user conflict between recreational and commercial fishers in Lake Michigan. Annual Meeting – American Fisheries Society, August 20-24, *Oral Presentation.*

Conklin, A. and **T. Seilheimer**. 2017. The @DrFishSG is in: improving the great lakes through #outreach and #scicomm. Annual Meeting – International Association of Great Lakes Research, May 15-19. *Oral Presentation.*

Seilheimer, T., P. Moy, and J. Harrison. 2014. Differing Perceptions of Research Needs and Impacts of Asian Carp on the Great Lakes Annual Meeting – American Fisheries Society, August 14-21. *Oral Presentation.*

Seilheimer, T. and W. Fisher. 2008. Instream flow assessment of a groundwater dependent ecosystem in southern Oklahoma. IFC Flow 2008 Conference, October 7-9, 2008. *Poster Presentation.*

VITA

NAME: Deidre M. Peroff, Ph.D.
TITLE: Social Science Outreach Specialist
ORGANIZATION: Wisconsin Sea Grant Field Office, School of Freshwater Sciences, UW-Milwaukee
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EDUCATION:

Ph.D.. North Carolina State University. May 2016
Focus on Equitable and Sustainable Tourism. College of Natural Resources, Dept. of Parks, Recreation, and Tourism Management.
Dissertation: *The Role of Tourism Microentrepreneurship and Agricultural Production in Shaping Stewardship of Working Lands in Guatemala's Highlands and North Carolina's Coastal Plain*.
Committee Chair: Dr. Duarte Morais

M.S., Western Washington University. December 2009
Huxley College of the Environment, Dept. of Geography
Thesis: *Eco-Palms: Determining the Market in Bellingham, Washington for Certified Chamaedorea Palms from Guatemala and Mexico*.
Committee Chair: Dr. Grace Wang

B.S., University of Wisconsin-Madison. June 2003
Major: Geography-People and the Environment.
Certificate: Gaylord Nelson Institute of Environmental Studies

POSITIONS HELD:

Social Science Outreach Specialist, University of Wisconsin Sea Grant: Milwaukee, WI, Jan 2016-Present.
- Facilitate stakeholder engagement in promoting sustainable use of Great Lakes resources
- Apply social science theory and methods to solving complex coastal management issues
- Manage a field office at UW-Milwaukee School of Freshwater Sciences and collaborate with local, regional, and national partners

Adjunct Faculty, School of Freshwater Sciences, University of Wisconsin-Milwaukee, July 2016-Present.
- Partner with University of Wisconsin faculty, staff, and fellows on Great Lakes ecology and coastal projects
- Co-teach and guest lecture in undergraduate and graduate courses

Affiliate, Center for Water Policy, School of Freshwater Sciences, University of Wisconsin-Milwaukee, Dec 2016-Present.
- Collaborate with faculty, graduate students, and visiting research fellows to conduct policy-related research and share with stakeholders
- Develop and implement interdisciplinary workshops and career development resources for students

Social Science Research Assistant, NC Wildlife Resources Commission: Raleigh, NC, July 2015-Jan 2016
- Conducted in-depth semi-structured qualitative interviews with key stakeholders on Red Wolf Recovery Program in Albemarle Peninsula, NC
- Helped manage large grant co-funded by state and federal government agencies
- Analyzed qualitative interviews to inform quantitative mail survey

Research Assistant, People-First Tourism (P1T), NC State University: Raleigh, NC, 2012-July 2015
- Conducted regular field work and facilitated telepresence meetings during weekly labs to lead P1T workshops designed to establish networks with rural communities in NC and internationally
- Facilitated rural entrepreneurs with completing business profiles & collaborating in online networks

PROFESSIONAL MEMBERSHIPS:

- International Association for Great Lakes Research, Since 2017
- Wisconsin Association for Environmental Educators, Since 2017
- Western Social Science Association, Since 2017
- Wisconsin Harbor Towns Association, Since 2017
- Coastal Conservation Association, Since 2016
- Conference of Latin Americanist Geographers, Since 2013
- Travel and Tourism Research Association, Since 2012
- National Recreation and Park Association, Since 2012
- International Association for Society and Natural Resources, Since 2010
- Society for Economic Botany, Since 2009
- American Association of Geographers, Since 2007

SELECTED PUBLICATIONS:

Peroff, D.M., Deason, G., Seekamp, E., & Iyengar, J. (2017). Integrating frameworks for evaluating tourism partnerships: An exploration of success within the life cycle of a collaborative ecotourism development effort. Journal of Outdoor Recreation and Tourism 17 (2017), 100-111. doi: 10.1016/j.jort.2016.10.001

Rodrigues, A., Rodrigues, A. & Peroff, D.M. (2014). The sky and sustainable tourism development: A case study of a Dark Sky reserve implementation in Alqueva. International Journal of Tourism Research.17 (3), 292-302. doi: 10.1002/jtr.1987

LaPan, C., Hodge, C., Peroff, D.M., & Henderson, K. (2013). Female faculty in higher education: The politics of hope. Schole: a journal of leisure studies and recreation education, 28 (2). http://js.sagamorepub.com/schole/article/view/2878

Peroff, D.M., & Levitt, J. (2010). Eco-palms: A case study of the development of specialized markets for certified nontimber forest products. In J. Levitt (Ed.), Conservation Capital in the Americas. (pp. 97-107). Cambridge, MA: Lincoln Institute of Land Policy.

NAME: Kathleen S. Kline
TITLE: Education Outreach Specialist
DEPARTMENT: University of Wisconsin Sea Grant Institute
CAMPUS ADDRESS: 1975 Willow Drive
CITY, STATE, ZIP: Madison, WI 53706
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EDUCATION
B.A., Biology and English, Luther College, Decorah, Iowa, 1996
M.S., Life Sciences Communication, University of Wisconsin-Madison, 2001

POSITIONS HELD
Publishing Assistant, CourseWise.com, Madison, Wisconsin, 1998-99
Teaching Assistant, Department of Life Sciences Communication, University of Wisconsin-Madison, 1999-2000
Content Services Editor, CourseWise.com, Madison, Wisconsin, 2000
Freelance Copy Editor, Atomic Dog Publishing, Cincinnati, Ohio, 2000
Student Writer, *Earthwatch Radio*, University of Wisconsin Sea Grant Institute, Madison, Wisconsin, 2000-01
Science Writer, New Hampshire Sea Grant, University of New Hampshire, Durham, New Hampshire, 2002-04
Science Writer, UW-Madison Aquatic Sciences Center, Madison, Wisconsin, 2004-2010
Outreach Coordinator, UW-Madison Aquatic Sciences Center, Madison, Wisconsin, 2010-2012
Education Outreach Specialist, UW-Madison Aquatic Sciences Center, 2012-present

PROFESSIONAL MEMBERSHIPS
National Marine Educators Association, Wisconsin Society of Science Teachers, Wisconsin Association for Environmental Education

PROFESSIONAL AWARDS
Ellis/Henderson Outdoor Writing Award, Council for Wisconsin Writers, 2010. (*People of the Sturgeon*)
Winner, Environment: Political/Social Category, USA National Best Book Awards, 2010. (*People of the Sturgeon*)
Outstanding Achievement Award, Wisconsin Library Association, 2009. (*People of the Sturgeon*)
Winner, Nature Category, Book of the Year Award, ForeWord Reviews, 2010. (*People of the Sturgeon*)
Winner, Nature Category, Midwest Book Awards, 2010. (*People of the Sturgeon*)
Winner, Nature Category, National Indie Excellence Awards, 2010. (*People of the Sturgeon*)
Gold, Great Lakes–Best Regional Non-Fiction, Independent Publisher Book Awards, 2010. (*People of the Sturgeon*)
Winner, Science/Nature/Environment Category, Next Generation Indie Book Awards, 2010. (*People of the Sturgeon*)
Sports/Fitness/Recreation Book, Gold Award, PubWest Design Awards, 2010. (*People of the Sturgeon*)
International Communication Association Outstanding Article Award, *Journal of Communication,* Mapping boundaries of the hostile media effect, 2006.
Ocean Science Journalism Fellowship, Woods Hole Oceanographic Institution, 2005.
Blue Ribbon Award, Sea Grant Week 2003, Galveston, Texas. (NH Sea Grant program folder)

SELECTED PUBLICATIONS
Kline, K.S., Gen, Y., Seilheimer, T. and E. White. 2016. *Eat Wisconsin Fish: Guide for Retailers, Restaurants and Culinary Schools.* 2016. Madison: UW Sea Grant Institute.
Kline, K.S. 2012. Wisconsin's Sturgeon. *Wisconsin Public Radio.* February 12.
Kline, K.S. 2010. Can Asian carp invasion be averted? *Bay View Compass.* January 31.
Kline, K.S., Bruch, R.M. and F.B. Binkowski. 2009. *People of the Sturgeon: Wisconsin's Love Affair with an Ancient Fish.* Madison, Wisconsin: Wisconsin Historical Society Press.

Clark, G. and K.S. Kline. 2009. Finding solutions for a mysterious harbor corrosion problem. *Wisconsin Coastal Management Chronicle.*

Kline, K.S. 2009. Fingerprinting wild rice. *Aquatic Sciences Chronicle.* Winter.

Kline, K.S. 2009. Wave sensor may improve kayak safety. *Around the Archipelago: the official newspaper of the Apostle Islands National Lakeshore*. Summer.

Kline, K.S. 2007. Mercury accrues, declines in fish quickly. *Aquatic Sciences Chronicle.* Winter.

Kline, K.S. 2007. Salvaging sediments: committee seeks new resting place for dredged materials from the Duluth-Superior Harbor. *Aquatic Sciences Chronicle.* Winter.

Croley, T., Potter, K. and K.S. Kline. 2007. *Climate Change Impacts on Stormwater.* Fact sheet. Madison: UW Sea Grant Institute.

Trenberth, K. and K.S. Kline. 2007. *"Global Warming Is Unequivocal": Discussing the Science behind the Consensus.* Fact sheet. Madison: UW Sea Grant Institute.

Magnuson, J. and K.S. Kline. 2007. *Climate Change and the Waters of Wisconsin.* Fact sheet. Madison: UW Sea Grant Institute.

Keillor, P. and K.S. Kline. 2007. *Climate Change Coming to the Coasts of Wisconsin: How It May Affect Coastal Communities and Property Owners.* Fact sheet. Madison: UW Sea Grant Institute.

Patz, J. and K.S. Kline. 2007. *Climate Change and Health Risks for the Great Lakes Region.* Fact sheet. Madison: UW Sea Grant Institute.

Shuter, B. and K.S. Kline. 2007. *Effects of Climate Change on the Fish and Fisheries of the Great Lakes Basin.* Fact sheet. Madison: UW Sea Grant Institute.

Kline, K.S. 2007. Drinking hot water from tap not advised. *Wisconsin State Journal.* September 21.

Kline, K.S. 2007. Expert: don't reuse plastic water bottles. *Wisconsin State Journal.* September 7.

Schmitt, K. 2006. Keep it cool: prized Wisconsin trout streams need steady supply of groundwater. *Aquatic Sciences Chronicle.* Summer/Fall.

Schmitt, K. 2006. Ties to New Orleans help professor chart new UW course. *Wisconsin Week.* May 3.

Schmitt, K. 2006. Sedges under siege: hybrid cattails run amok. *Aquatic Sciences Chronicle.* Spring.

Schmitt, K. 2006. Resurrecting lost islands. *Aquatic Sciences Chronicle.* Spring.

Schmitt, K. 2006. *Sustaining Wisconsin's Great Lakes Assets.* Fact sheet. Madison: UW Sea Grant Institute.

Schmitt, K. 2005. Faculty and staff experiment with new type of broadcasting. *Wisconsin Week.* May 11.

Clark, G. and K. Schmitt. 2005. *Accelerated Freshwater Harbor Corrosion.* Fact sheet. Madison: UW Sea Grant Institute.

Harris, V. and K. Schmitt. 2005. *Nuisance Algae on Lake Michigan Shores.* Fact sheet. Madison: UW Sea Grant Institute.

Schmitt, K.M., Gunther, A.C. and J.L. Liebhart. 2004. Why partisans see mass media as biased. *Commun Res.* 31:623-641.

Gunther, A.C. and K. Schmitt. 2004. Mapping boundaries of the hostile media effect. *J Commun.* 7:55-70.

Adams, S. and K. Schmitt. 2004. *New Hampshire Sea Grant 2004 Program Guide.* Durham: New Hampshire Sea Grant.

Schmitt, K. 2003. Seaworthy. *University of New Hampshire Magazine.* Fall.

Schmitt, K. 2003. UNH named top tier Sea Grant College. *University of New Hampshire Campus Journal.* August 29.

Schmitt, K. 2003. Pingguo He: working with fishers to improve shrimp harvest gear. In: *Science, Sustainability and Partnerships: Sea Grant in the New Century. Biennial Report 2002-2003.* Silver Spring, MD: NOAA National Sea Grant College Program.

Barnaby, R. and K. Schmitt. 2003. *Growing Blue Mussels on Submerged Long Lines.* Fact sheet. Durham: New Hampshire Sea Grant.

Schmitt, K. 2002. The net result. *University of New Hampshire Magazine.* Fall.

Schmitt, K. 2002. UNH helps fisherman's cooperative. *University of New Hampshire Campus Journal.* October 12.

Schmitt, K. 2000-2001, 2004-2007. Approximately 75 radio scripts for *Earthwatch Radio*.

VITA

NAME: Anne Moser
TITLE: Senior Special Librarian
DEPARTMENT: University of Wisconsin Sea Grant Institute
CAMPUS ADDRESS: 1975 Willow Dr.
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FAX: (608) 262-0591
EMAIL: akmoser@aqua.wisc.edu

EDUCATION

B.A., Spanish and Art History, Colby College, May 1985
M.A., Library and Information Studies, University of Wisconsin-Madison, December 1987

POSITIONS HELD

Assistant Librarian, RMT Inc., Madison, Wisconsin, 1988-1989
Librarian, EBASCO Environmental, Bellevue, Washington, 1989-1991
Head Librarian, King County Hazardous Waste Library, 1991-2000
Outreach Specialist, UW Madison, School of Library and Information Studies, 2001-2004
Webmaster, US Geological Survey, Wisconsin Water Science Center, 2004-2008
Senior Special Librarian, UW Madison, Wisconsin Water Library, 2008-present

PROFESSIONAL MEMBERSHIPS

International Association of Aquatic and Marine Science Libraries and Information Centers
- Web and Communications Chair
- SAIL Regional Group

Wisconsin Library Association, Association of Wisconsin Special Librarians
- Chair, Ad Hoc Committee on Profession Development
- AWSL Vice Chair/Chair Elect
- AWSL Chair
- AWSL Board Representative
- AWSL Website Manager
- AWSL Newsletter Editor

Special Libraries Association
- Environment and Resource Management Division
- Wisconsin Chapter
- Faculty Advisor, Student Chapter, UW Madison, School of Library & Information Studies

PROFESSIONAL AWARDS

2008 MATS Webbie award for "Most accessible Web site", Wisconsin Library Association, Media and Technology section

SELECTED PRESENTATIONS

Children Learning with Nature 2016, 2017
Great Lakes Place Based Education Conference 2015

Head Start Education Conference 2016
IAMSLIC International Conference 2014, 2017
IAMSLIC SAIL Conference 2015-2017
Lake Superior Libraries Symposium, 2014
Madison Early Childhood Education Conference 2015
Multitype Library Council Summit 2013
National Association for Environmental Education 2016
Wisconsin Library Association Annual Conference 2013-2014, 2016
Wisconsin Association of Academic Libraries Annual Conference 2013, 2015, 2016
Wisconsin Association for Environmental Education 2013, 2017

SELECTED PUBLICATIONS

Moser, A., Jump Around With Frogs STEM KIT 2015.
Moser, A., Does it Sink or Does it Float STEM Kit, 2015.
Moser, A., Once Upon a Pond STEM Kit, 2016.
Moser, A., Creating a bright future: a library moves science learning FORWARD! Presented at the 39th IAMSLIC Conference: Dania Beach, Florida, U.S.A., October 20-24.
Moser, A. , 2009 Women and Water: Marginalization, Hope, and a Call to Action. *Feminist Quarterly*, v. 30, no. 1 (Winter 2009), pp. 12-15.
Moser, A., and J. Champoux. 2008. Water Research Guide. http://researchguides.library.wisc.edu/content.php?pid=13502
Frahm, A., Galvin, D., Gensler, G., Savina, G., Moser, A. 1995. *Changing Behavior: Insights and Applications* Seattle, Wash., Local Hazardous Waste Management Program in King County
Moser, A., 1993, Pollution prevention information: sources and resources, *7th Annual Conference on Household Hazardous Waste, Minneapolis, Minnesota, December 1992.*

UNIVERSITY SERVICE

OVCRGE Equity and Diversity Committee, Aquatic Sciences Center representative 2012-2017

VITA

Frederick P. Binkowski, Senior Scientist
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Milwaukee, WI 53204

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EDUCATION

Marquette University. 1967-1969. Biology Department.
University of Wisconsin-Milwaukee, 1971, Zoology, B.S.
University of Wisconsin-Milwaukee, 1974, Zoology (Fisheries Biology), M.S.

POSITIONS

Director (1993-present), Great Lakes Aquaculture Center, University of Wisconsin-Milwaukee School of Freshwater Sciences

Associate Scientist (1987-1993), Senior Fisheries Biologist (1984-1986), Associate Fisheries Biologist (1981-1983), and Assistant Fisheries Biologist (1978-1980), Center for Great Lakes Studies/University of Wisconsin Great Lakes Research Facility

Research Specialist (Fisheries) (1975-1978), Department of Zoology, University of Wisconsin-Milwaukee

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Fisheries Society
Early Life History Section, American Fisheries Society
Fish Culture Section, American Fisheries Society
U.S. Aquaculture Society
World Aquaculture Society

SELECTED SCIENTIFIC PUBLICATIONS

Emmenegger, E.J., Sanders, G, Conway, C. Binkowski, F.P., Winton, J., and Kurath, G. 2016. Experimental infection of six North American fish species with the North Carolina strain of Spring Viraemia of Carp Virus. *Aquaculture. 450:273-282.*

Zachary R. Snobl, Ryan P. Koenigs, Ronald M. Bruch & Fredrick P. Binkowski. 2015. Do Tags Exceeding 2% of Total Body Weight Impair Lake Sturgeon Movement?, North American Journal of Fisheries Management, 35:5, 880-884, DOI: 10.1080/02755947.2015.1069425

Shepherd, B.S., Rees, C.B., Sepulveda Villet, O.J., Palmquist, D.E., Binkowski, F.P. 2013. Identification of gender in yellow perch by external morphology: validation in four geographic strains and effects of estradiol. North American Journal of Aquaculture. 75: 361-372.

Shepherd, B.S., Rees, C.B., Binkowski, F., Goetz, F. 2012. Characterization and evaluation of sex-specific expression of suppressors of cytokine signaling (SOCS) -1 and -3 in juvenile yellow perch (Perca flavescens) treated with lipopolysaccharide. Fish and Shellfish Immunology. 33:468-481.

Rosauer, D.R., Biga, P.R., Lindell, S., Binkowski, F., Shepherd, B.S., Palmquist, D.E., Simchick, C., Goetz, F.W. 2011. Development of yellow perch (Perca flavescens) broodstocks: initial characterization of growth and quality traits following grow-out of different stocks. Aquaculture. 317: 58-66.

Grzybowski, M., Rosauer, D., Binkowski, F., Klaper, R., Shepherd, B., and Goetz, F. 2009. Genetic variation of 17 wild populations of yellow perch from the Midwest and East Coast analyzed via microsatellites. Transactions of the American Fisheries Society, 139:pp270-287.

Goetz, F., Rise,M.L., Rise, M. Goetz, G., Binkowski, F. and Shepherd, B. 2009. Stimulation of growth

and changes in the hepatic transciptome by 17β-estradiol in the yellow perch (Perca flavescens). Physiol Genomics 38: 261-280.

Kline, K., Bruch, R., Binkowski, F. 2009. People of the Sturgeon: Wisconsin's Love Affair with an Ancient Fish. Madison: Wisconsin Historical Society Press. 292pages.

Fulford, R.S., J.A. Rice, T.J. Miller, and F.P. Binkowski. 2006. Elucidating patterns of size-dependent predation on larval yellow perch (*Perca flavescens*) in Lake Michigan: an experimental and modeling approach. Canadian Journal of Fisheries and Aquatic Sciences 63(1):11-27.

Fulford, R.S., J.A. Rice, T.J. Miller, F.P. Binkowski, J.M. Dettmers, and B. Belonger. 2006. Foraging selectivity by larval yellow perch (*Perca flavescens*): implications for understanding recruitment in small and large lakes. Canadian Journal of Fisheries and Aquatic Sciences 63(1):28-42.

Fontana, F., R.M. Bruch, F.P. Binkowski, M. Lanfredi, M. Chicca, N. Beltrami, and L. Congiu. 2004. Karyotype characterization of the lake sturgeon, *Acipenser fluvescens* (Rafinesque 1817) by chromosome banding and fluorescent in situ hybridization. Genome 47:742-746.

Yeo, S.E., F.P. Binkowski, and J.E. Morris. 2004. Aquaculture effluents and waste by-products: characteristics, potential recovery and beneficial reuse. NCRAC, Ames, Iowa and UW Sea Grant, Madison, Wisconsin. 50 pgs.

Rosenthal, H., R.M., Bruch, F.P. Binkowski, and S.I. Doroshov. Editors. 2002. Proceedings of the 4th International Symposium on Sturgeon. Journal of Applied Ichthyology 18(4-6):219-698.

Bruch, R.M., and F.P. Binkowski. 2002. Spawning behavior of lake sturgeon (*Acipenser fluvescens)*. Journal of Applied Ichthyology. 18(4-6):570-579.

Rosenthal, H., R.M., Bruch, and F.P. Binkowski. Editors. 2002. Technical compendium to the proceedings of the 4th International Symposium on Sturgeon, Oshkosh, Wisconsin.

Heyer, C.J., T.J. Miller, F.P. Binkowski, E.M. Calderone, and J.A. Rice. 2001. Understanding maternal effects as a recruitment mechanism in Lake Michigan yellow perch (*Perca flavescens*). Canadian Journal of Fisheries and Aquatic Sciences 58:1477-1487.

SCIENTIFIC PRESENTATIONS, SYMPOSIA/SPECIAL SESSIONS AND PROFESSIONAL MEETINGS

Binkowski, F.P. 2016. "Fish: The Forgotten Food Source". Food-Water-Energy Nexus Conference. Washington, D.C. January 2016.

Binkowski, F.P. 2015. "Enriching the Lifestyle for Carnivores at the Milwaukee County Zoo". Alumni Association Event, Milwaukee County Zoo. June 6, 2015.

Binkowski, F.P. 2012-2016. Organized and presented the Aquaponics Workshop series presented by UW-Milwaukee School of Freshwater Sciences scientists at Growing Power-Milwaukee's "From the Ground Up" 3-day workshops presented monthly from January through June.

Binkowski, F. P. March 3, 2014. "Yellow Perch Aquaculture". Willy Street Co-op, Madison, WI as part of the Wisconsin Sea Grant "Eat Wisconsin" Fish campaign.

Binkowski, F. P. March 22, 2014. "Can Cultured Perch Become Wild?" Lake Michigan Yellow Perch Summit, University of Illinois Chicago Forum, Chicago, IL.

Binkowski, F.P. June 18, 2014. "Aquaculture and Aquaponics Strategies and Techniques", six-lecture series presented at the Wisconsin Association Agricultural Educators Conference, Middleton, WI.

Binkowski, F. P., Bruch, R.M. and Koenigs, R. August 20, 2014. . "100 Years of Sturgeon Management: Monitoring Lake Sturgeon Behavior Patterns Using Radio-Telemetry ". American Fisheries Society Annual Meeting, Quebec City.

VITA

NAME: Emma Wiermaa
Title: Education/Communication Specialist
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EDUCATION:

- University of Wisconsin- Eau Claire. BS Comprehensive Ecology and Environmental Biology (2011)

POSITIONS HELD:

- University of Wisconsin–Eau Claire: Research Assistant (2011)
- Longfellow Elementary Chippewa Falls-Elementary Education Program Coordinator (2006-2013)
- Alliance for the Great Lakes: Adopt-a-Beach Program Coordinator (2013)
- University of Wisconsin-Stevens Point: Outreach and Communications Specialist (2014-present)

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

World Aquaculture Society/U.S. Aquaculture Society
Wisconsin Aquaculture Association/ Wisconsin Aquaculture Industry Advisory Council
North Central Region Aquaculture Center

PROFESSIONAL CERTIFICATIONS:

North Central Region Aquaculture Center Technical Advisory Committee for Extension

SELECTED PUBLICATIONS:

Wiermaa, E. M., G. J. Fischer, and C. Hartleb. (2016). One-of-a-kind facility sparks aquaculture interest to students of all ages. *Forestry Suppliers Science Scene.* Retrieved fromhttp://www.science-scene.org/blog/aquaculture-facility

Wiermaa, E. M., C. Hartleb and G. J. Fischer. (2016). GIS suitability models identify new areas for aquaculture in Wisconsin. *Aquaculture North America*. 7 (1), Pg 26.

Wiermaa, E. M., G. J. Fischer, and C. Hartleb. (2015, December 14). Students delving into aquaculture, aquaponics. *The Ashland Daily Press*. Retrieved from http://www.apg-wi.com/ashland_daily_press/news/local/students-delving-into-aquaculture-aquaponics/article_f3364d70-a1f8-11e5-90c1-27535d62dab6.html

Wiermaa, E. M., G. J. Fischer and C. Hartleb. (2015). Profitable commercial production for walleye and saugeye. *Aquaculture North America*. 6 (5), Pg 16.

Wiermaa, E. M., G. J. Fischer and C. Hartleb. (2015). Advancing student success with real life.

experience and research. *Aquaculture North America-Prospects in Aquaculture Special Feature*. 6 (3), Pg 25

Wiermaa, E. M., G. J. Fischer and C. Hartleb. (2015). RAS innovations the key to yellow perch development. *Hatchery International*. Pg.38. Retrieved from http://www.uwsp.edu/cols-ap/nadf/Documents/Wisconsin%20Research%20Yellow%20Perch.pdf

Tim Campbell

Aquatic Invasive Species Outreach Specialist
University of Wisconsin Extension and the University of Wisconsin Sea Grant Institute
445 Henry Mall
Madison, WI 53706

Education

- M.S. in Biology, Oakland University, Rochester, MI August 2011.
- B.S. in Environmental Science, University of Notre Dame, Notre Dame, IN. May 2009.

Positions Held

- Aquatic Invasive Species Outreach Specialist for University of Wisconsin Extension Environmental Resources Center. July 2014 – current.
- Aquatic Invasive Species Outreach Specialist for the University of Wisconsin Sea Grant Institute. May 2011 – current.

Service and Affiliations

- Great Lakes Panel on Aquatic Nuisance Species: Wisconsin alternate, Information & Education committee member. 2013-present
- Mississippi River Panel on Aquatic Nuisance Species: Wisconsin alternate, Information & Education committee member. Incoming MRBP Co-Chair. 2016-present
- Aquatic Nuisance Species Task Force Committee on Outreach and Education: member. 2015 – present
- North Central Region Water Network: Aquatic Invasive Species Working Group Co-Lead.
- Wisconsin Invasive Species Council: Education committee member. 2012 – present.
- Wisconsin Department of Natural Resources Invasive Species Team: Communicators team member. 2014-present.
- Upper Midwest Invasive Species Conference: Program committee. 2015 – present
- Wisconsin Lakes Convention: Program committee. 2014 – present.

Grants

- Great Lakes Sea Grant Network Habitattitude Surrender Collaborative. $100,000. Minnesota Sea Grant led GLRI. Ongoing.
- North Central Region Water Network: Aquatic Invasive Species Working Group Seed Grant. $9,480. Ongoing.
- Regional Conference on Invasive Organisms in Trade Issues. $75,000. Minnesota Sea Grant led GLRI. Completed.
- Aquatic Invasive Species Best Management Practices for Water Gardeners Video. $18,000. Illinois-Indiana Sea Grant led GLRI. Completed.
- Factors governing the distribution, abundance, and community associations of the invasive round goby in tributaries of the Laurentian Great Lakes. $8,000. Fisheries and Oceans Canada. Completed.

Research Publications

Campbell TB, Verboomen T, Montz G and Seilheimier T. 2016. Volume and contents of residual water in recreational watercraft ballast systems. Management of Biological Invasions 7(3):281-286.

Campbell TB and Tiegs SD. 2012. Factors governing the distribution, abundance, and community associations of the Invasive round goby in tributaries of the Laurentian Great Lakes. J. of Great Lakes Research. 38(3): 569-574.

Nett J, Campbell TB, Tiegs SD, and Mandrak NE. 2012. Detecting invasive round goby (*Neogobius melanostomus*) in wadeable streams: a comparison of gear types. J. of North American Fisheries Management. 32(2): 360-36.

Select Outreach Publications and Products

Campbell TB. 2014. Organisms in trade pathways for the Great Lakes: A Great Lakes BIOTIC summary. University of Wisconsin Sea Grant Institute.

Campbell TB and C Campbell. 2012. It's up to you: Decontamination guidance for recreational boaters. University of Wisconsin Sea Grant Institute.

Campbell TB. 2014. Great Lakes Briefs on Invasive Organisms Traded In Commerce Symposium Website and Symposium Proceedings. University of Wisconsin Sea Grant Institute

Campbell TB, P Skawinski, and T Plude. 2015. Starry Stonewort WATCH. University of Wisconsin Extension Environmental Resources Center.

Select Presentations

Campbell TB, T Verboomen, and K Kozloski. Making Habitattitude Work for Wisconsin. Upper Midwest Invasive Species Conference (10/21/14), Great Lakes BIOTIC Symposium (6/3/14), and the International Conference on Aquatic Invasive Species (4/12/16).

Campbell TB and Tiegs SD. Factors governing the distribution, abundance, and community associations of the invasive round goby in tributaries of the Laurentian Great Lakes. Mississippi River Conservation Committee (3/19/13) and Mississippi River Aquatic Nuisance Species Panel (7/23/13). Invited.

Campbell TB, T Seilheimer, T Verboomen, and D Fox. Wakeboard boats as a novel vector of aquatic invasive species. Great Lakes Aquatic Nuisance Species Panel (12/5/13) and the National Aquatic Nuisance Species Taskforce (5/7/14). Invited.

Campbell TB. Aquatic Invasive Species in the Great Lakes: Pathways and Prevention. Clean Rivers Clean Lakes Conference , Milwaukee, Wisconsin. Invited.

Campbell TB and Tiegs SD. Factors governing the distribution, abundance, and community associations of the invasive round goby in tributaries of the Laurentian Great Lakes. International Association of Great Lakes Research. Duluth, Minnesota.

Campbell TB. 2012. Watercraft Decontamination Options for Wisconsin. Upper Midwest Invasive Species Conference. La Crosse, Wisconsin. Submitted.

AARON R. CONKLIN

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SKILLS

Accomplished writer and communications/media relations/social media specialist with more than twenty years of experience in every aspect of public and media relations strategy, including effective use of social/new media, developing media campaigns, writing feature stories and press releases, editing publications and marketing materials. Able to manage multiple complex media projects simultaneously. Excellent writing and communication skills.

EDUCATION:

University of Wisconsin-Madison, Master of Arts degree in Journalism, graduated May 1993.

Saint John's University, Collegeville, MN Bachelor of Arts degree in English, graduated cum laude, May 1990.

MEDIA RELATIONS AND WRITING EXPERIENCE:

SCIENCE COMMUNICATOR/ SOCIAL MEDIA COORDINATOR,
University of Wisconsin Aquatic Sciences Center, December 2010-present. Responsible for all forms of public and media communication for the University of Wisconsin Sea Grant Institute and Water Resources Institute, a pair of organizations devoted to funding and publicizing Great Lakes and groundwater science and research. Develop and write regular web and print stories, press releases and fact sheets. Created and maintain social media program for both institutes on multiple social media platforms (Facebook, Twitter, LinkedIn, SoundCloud, etc.) including Great Lakes Takes, a blog on Tumblr. Work closely with staff videographer and audio specialist to develop and promote unique content through multiple communication channels.

CONTRIBUTING WRITER, *Madison Magazine*, 2003-present. Research and contribute articles on arts, culture and food to urban monthly magazine. Created and maintain Stage Write, an award-winning weekly blog about the Madison-area theater scene.

CONTRIBUTING WRITER, *Isthmus,* 1994-present. Handle regular freelance assignments for weekly alternative newspaper's arts and features sections, focusing particularly on music, the arts and popular culture.

SENIOR MEDIA SPECIALIST, UW Health Marketing and Public Affairs, October 1999-September 2010.
Developed and coordinated local, regional and national media campaigns and strategies, served as media spokesperson for University of Wisconsin Hospital and Clinics and UW School of Medicine and Public Health. Wrote regular press releases, articles, web features and marketing materials on complex medical research and procedures. Worked regularly with local and national reporters, producers and editors to facilitate stories featuring UW physician experts, including outlets such as ABC National News, Good Morning America, The Today Show, *The New York Times*, *Popular Mechanics* and *Newsweek*.

CONTRIBUTING WRITER, *Wisconsin State Journal*, 2005-2013. Contributed articles on and reviews of pop culture topics, including music concerts, plays and videogames, to the arts and entertainment section of Madison's daily newspaper and its weekly arts and entertainment insert, 77 Square. Created and operated "It's All Game," a blog on gaming culture updated daily/weekly on 77square.com, from 2005-2010.

CONTRIBUTING WRITER, getinmedia.com, May 2010-September 2013. Pitched, researched and wrote feature articles about working in the entertainment and videogames industry for website operated by Full Sail University, a Florida-based technical school.

ASSOCIATE EDITOR, Athletic Business Publications, March 1998-September 1999. Served as second editor in charge of *Athletic Business*, a nationally distributed monthly trade magazine (circulation 43,000) for athletic, fitness and recreation professionals.

PUBLICATIONS EDITOR, Wisconsin Conservation Corps, May 1994-March 1998. Responsible for all aspects of public relations for state agency charged with connecting under-and unemployed 18-to 25-years olds with conservation projects.

Yael Gen
Senior Artist

University of Wisconsin Sea Grant Institute
1975 Willow Drive
Room 227
Madison, WI 53706-1103

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EMPLOYMENT

2012-present **University of Wisconsin Sea Grant /Water Resources Institute,** Madison, WI
Senior Artist / Graphic Design

2008-2012 **University of Wisconsin Foundation,** Madison, WI
Creative Specialist

2004-present **Yael Gen design,** Madison, WI
Principal

2000-2004 **Wisconsin Public Television,** Madison, WI
Designer/Print coordinator

1999-2000 **Artville (now Getty Images),** Madison, WI
Illustration Development Manager

1995-99 **The Why Files** Graduate School, University of Wisconsin-Madison
Designer / developer

1988-95 **Freer Gallery of Art and Arthur M. Sackler Gallery,** Smithsonian Institution, Washington, DC
Art Director, Exhibitions

1984-88 **Greenfield/Belser Ltd.,** Washington, DC
Designer

EDUCATION

Cooper Union for the Advancement of Science and Art , New York, NY. BFA 1984

Corcoran School of Art, Washington, DC, 1979–81

PROFESSIONAL COMMUNITY INVOLVEMENT

Art Directors Club of Metropolitan Washington "Art Start" program to introduce art-related careers to underserved communities

Cooper Union portfolio day reviewer

Design Madison event participant

George Washington University Museum Education Graduate Program guest speaker/workshop leader.

Center for Citizen Initiatives Productivity Enhancement Program; business host for visiting Russian designers.

Polka Press Madison printmaking cooperative

Madison Area Technical College typography instructor, portfolio review

Madison Open Art Studios; marketing committee, grant writing

UW-Madison Academic Staff Communications Committee

UW-Madison Expanding Your Horizons presenter for young women in math, science and engineering

UW-Madison Science Expeditions exhibitor

UW-Extension Branding Committee

The Writing's on the Wall, invitational art exhibit at Madison Central Library

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Senior Artist

University of Wisconsin Sea Grant Institute
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Awards and recognition

- Alchemy Award, Public Relations Society of America-Madison Chapter
- American Association of Museums
- American Institute of Graphic Arts
- Apex Grand Award
- Art Directors Club of Metropolitan Washington
- CASE gold medal
- Champion Paper Imagination Award
- NETA Awards National Educational Telecommunications Association
- New York Art Director's Club
- PBS Communication Award
- Presidential Design Award
- Print Magazine
- Smithsonian Institution, sesquicentennial logo design and implementation
- UCDA Award of Excellence University and College Design Association

Web

- c|net
- CASE
- Digital Culture
- Getty Information Institute
- Hotwired
- PC World Top 100
- Popular Science top 100
- U.S. News and World Report
- The Wall Street Journal

VITA

NAME: James H. Grandt
TITLE: Senior Information Processing Consultant (Systems Engineer)
DEPARTMENT: Aquatic Sciences Center
CAMPUS ADDRESS: 214 Goodnight Hall, 1975 Willow Drive
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EMAIL ADDRESS: *frizby@aqua.wisc.edu*

EDUCATION:

B.S., Electrical and Computer Engineering, University of Wisconsin-Madison, May 1987

POSITIONS HELD:

Weapons Systems Specialist – E4, United States Air Force, 1977-81
Drilling Rig Floor Hand, Quarles Drilling Corporation, Elk City, Okla., May 1982-August 1982
Associate Instrumentation Specialist, Center for Limnology, University of Wisconsin-Madison, 1987-89
Instrumentation Specialist, Department of Geoscience, University of Wisconsin-Madison, 1989-97
Information Processing Consultant, Sea Grant Institute and Aquatic Sciences Center, University of Wisconsin-Madison, 1997-present

SPECIAL PROJECTS/SKILLS:

Developed Digital Sonar System for Office of Navel Research
Conference Room Design and Programming, Aquatic Sciences Center (ASC)
Technical Support JASON Project, University of Wisconsin-Madison Sea Grant Institute
iPRO (Interactive Project Reporting Online), University of Wisconsin-Madison Sea Grant Institute
iPropose (Interactive Proposal Online), University of Wisconsin-Madison Sea Grant Institute
Invasive Species Kiosk, University of Wisconsin-Madison Sea Grant Institute
Systems Administrator of Windows Active Directory Domain (12+ servers), ASC
Manage Windows and Apple Desktops (30+ clients), ASC
Exchange, SQL, and IIS Server Administrator, ASC
VMware vSphere v6.5 Administrator
Certified Cisco Firewall Administrator
Certified PaloAlto Firewall Administrator
Client Security and Protection.

SELECTED PUBLICATIONS:

Nero, R.W., J.M. Jech, J.H. Grandt, and D.L. Smith. 1990. Entrainment of Nekton in the Upwelling and Downwelling Flow Field of a Gulf Stream Meander During BioSYNOP '89. EOS, 71:2.

Clay, C.S., L.A. Powell, and J.H. Grandt. 1989. Digital Sonar System and Signal Processor. Oceans '89 Acoustic/Arctic Studies Proceedings, Vol. 4.

SELECTED PROFESSIONAL AWARDS AND RECOGNITION:

The 1997-98 Madison JASON Web site won a Gold Medal from the national Council for the Advancement and Support of Education; an Addy award in the Madison community; and is included in a Discovery Channel CD-ROM entitled, "Animal Planet" as well as Yahoo's educational Yahooligans Web site.
UW Sea Grant was chosen to receive the 1999 Wisconsin Society of Science Teachers (WSST) "Friend of Science Education Award." In honoring Sea Grant, WSST organizers made special note of the Madison JASON Project.

RELEVANT COURSES/WORKSHOPS:

DEV 120 and DEV 130-Microsoft Training, October 1998
WEB 240 and WEB 250-Microsoft Training, November 1998
Windows 2000 Architectural Overview and Up, February 1999
Setting Up Exchange Internet Services, February 1999
Finding Information Across Your Enterprise, February 1999
How to Migrate Your Windows NT 4.0 Directory to Win2000, October 1999
How to Deploy Windows 2000 Security in Corporate Net, October 1999
Understanding Light Weight Directory Access Protocol in Windows 2000, August 2000
How to Deploy a Windows 2000 Server Active Directory in Your Organization, August 2000
Microsoft Exchange 2000 Launch – Milwaukee, October 2000
Managing Enterprise Applications with Application Center Server 2000, March 2001
How to Build a Scalable, Reliable Internet Infrastructure Using Windows 2000 and IIS 5.0, March 2001
Apple Technology Update, January 2002
Network Security, October 2003
Windows 2003 Server Upgrade Planning, February 2004
Intrusion Detection Class, April 2005
Firewall Authorized Agent Training, June 2005
Crestron Technology Update, February 2005
SQL Server Training, Aug 2005
Microsoft Windows Server 2008 Training April 2008
iPhone Development Education January 2009
Microsoft Virtualization January 2009
IPv6 Crash Course July 2010
Flash CS5 Class November 2010
VMware vSphere 4.1 Management January 2011
Cascading Style Sheets Class July 2011
Blackboard Class October 2012
Microsoft System Center October 2012
IT Leadership Conference December 2013
Lockdown Security Conference 2013-17

FIELD EXPERIENCE:

Fish Sampling, Green Bay, Wis., Sea Grant- and EPA-supported research, 1987 and 1988
Sonar Surveys of Green Bay, Sea Grant-supported research, 1987 and 1988
Sonar Survey of the Gulf Stream, ONR-supported research, April 1990
Sonar Survey of the Pamlico Estuary, North Carolina State University, December 1993
Sonar Survey of Lake Michigan, Sea Grant-supported research, September 1994
Seismic Refraction Experiment, NSF- and USGS-supported research, May 1995
Preliminary Sonar Configuration and Testing, ONR-supported research, July 1997
Target Identification Experiment, ONR-supported research, May 1997

John Karl

Video Producer

University of Wisconsin Aquatic Sciences Center (Sea Grant Institute and Water Resources Institute)
1975 Willow Dr.
Madison WI 53706-1177
608-263-8621
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POSITIONS HELD

- Video Producer, University of Wisconsin Sea Grant Institute, July 2007 - present.
- Science Writer, University of Wisconsin Sea Grant Institute, May 1998 - July 2007.
- Production Assistant - Office of the Registrar, Systems Division, Indiana University, Bloomington, Ind., Sept. 1997- Feb. 1998.
- Graduate Student Researcher, Indiana University - Bloomington, Sept. 1993 - June 1996.
- Graphic Designer, Center for Energy and the Urban Environment, Minneapolis, Jan. 1991 - Aug. 1993.
- Administrative Assistant, English Language Test Developer, Center for Applied Linguistics, Washington, D.C. Sept. 1987 - Sept. 1991.

RECENT ACCOMPLISHMENTS

As a science writer, I wrote news releases, newsletter articles and scripts for Earthwatch Radio about the work of the UW Sea Grant Institute and the Water Resources Institute. As a video producer, I have written and narrated scripts, shot, gathered, and edited video.

SELECTED VIDEOS

- Sea Grant: Fifty Years of Science Serving America's Coasts. http://tinyurl.com/yae7plrn
- Beauty Contained: Preventing Invasive Species from Escaping Water Gardens. http://tinyurl.com/y7o5uqap
- New Talent Tackles Wisconsin's Water Challenges. http://tinyurl.com/y8p9gk6b
- Shipwreck Exploration 2012, Five Videos, June 2012. http://tinyurl.com/y99k49ue
- Visualizing the Effects of Dioxin on Fish, Video, 3:02, https://youtu.be/ieXOYSy2NEw
  These and many more videos viewable at www.youtube.com/UWASC

SELECTED PUBLICATIONS

- Aquatic Sciences Chronicle, Quarterly Newsletter of the UW Aquatic Sciences Center. Approximately 20 articles, 2006-2008.
- Earthwatch Radio, a two-minute program on science and the environment. Approximately 180 two-minute scripts. 1998-2007.
- Littoral Drift, Bimonthly newsletter of the UW Sea Grant Institute. Approximately 60 articles, 1998-2005.

- Karl, J. and Sperling, D.L. 2000. In Search of Perch: Why have yellow perch populations nose-dived in Lake Michigan and when will they pull out of the decline? Wisconsin Natural Resources, Vol. 24, No. 1, pp. 5-8.
- PCBs in Green Bay: Locations, Amounts, and Clean-Up Scenarios, July 2000. UW Sea Grant Fact Sheet.

PROFESSIONAL HONORS

- APEX Award of Excellence, Web Videos, What Will Round Gobies Do to Great Lakes Streams? 2012
- APEX Award of Excellence, Web Videos, Testing Well Water for Microorganisms. 2011
- Historic Preservation Award for support of Wisconsin's maritime heritage. Wisconsin Historical Society. 2006.
- Silver Medal, Individual Institutional Relations Publications. UW Sea Grant Institute 2002-04 Biennial Report. 2006. Case Circle of Excellence Awards Program, 2006
- Award of Excellence. UW Sea Grant Biennial Report. University & College Designers Association. 2005.
- First Place, Best Web-Based Outreach Effort. Wisconsin's Great Lakes Shipwrecks. Sea Grant Week, Rockland, Maine. 2005.
- Superior Program Award. Diving into History: Research and Public Education on Wisconsin's Underwater Archaeological Resources. Great Lakes Sea Grant Network. 2004

EDUCATION

Master of Arts, Cognitive Psychology, Indiana University, July, 1996
Bachelor of Arts, Comparative Literature, University of Wisconsin, Madison, 1987

VITA

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FAX: (608) 262-0591
EMAIL: eawhite@uwc.edu

EDUCATION

B.A., English, Reed College, Portland, Oregon, 1991
The Publishing Institute, University of Denver, 1993

POSITIONS HELD

Editor, Medical Physics Publishing, Madison, Wisconsin, 1993-95
Freelance Editor, Madison, Wisconsin, 1994-95
Managing Editor, Medical Physics Publishing, Madison, Wisconsin, 1995-98
Editor, University of Wisconsin Sea Grant Institute, Madison, Wisconsin, 1998-present

SELECTED PUBLICATIONS EDITED

Moser, Anne. 2014-2015. Wisconsin Water Library STEM kit series. UW Sea Grant, Madison, Wisconsin.

Driessen, Suzanne, editor. 2013. *Home Preservation of Fish* series. UW Sea Grant, Madison, Wisconsin.

Harris, Vicky and Theresa Qualls. 2010. *Clean Marina Guidebook.* UW Sea Grant, Madison, Wisconsin.

Harrington, Moira. 2010. *40th Anniversary Report*. UW Sea Grant, Madison, Wisconsin.

Wittman, Stephen. 2008. *Climate Change in the Great Lakes Region: Starting a Public Discussion.* UW Sea Grant, Madison, Wisconsin.

Potter, Kenneth. 2006. *Design Guidelines for Bioretention Facilities*. UW Sea Grant, Madison, Wisconsin.

Malison, Jeffrey, and Christopher F. Hartleb, editors. 2005. *Best Management Practices for Aquaculture in Wisconsin and the Great Lakes Region*. UW Sea Grant, Madison, Wisconsin.

Fish Identification 1.0. Software for Identifying Fishes of Wisconsin. 2005. UW Center for Limnology, UW Sea Grant and Wis. DNR.

Yeo, Steven E.; Frederick P. Binkowski, and Joseph E. Morris. 2004. *Aquaculture Effluents and Waste By-Products: Characteristics, Potential Recovery, and Beneficial Reuse.* Ames, Iowa, Iowa State University Press.

Malison, Jeffrey, and Terence Barry, editors. 2004. *Percis III: The Third International Percid Fish Symposium*. UW Sea Grant, Madison, Wisconsin.

Rosenthal, Harold; Ronald Bruch, and Frederick Binkowski, editors. 2004. *Technical Compendium to the Proceedings of the 4th International Symposium on Sturgeon*. UW Sea Grant, Madison, Wisconsin

Keillor, Philip. 2003. *Living on the Coast*. Detroit, US Army Corps of Engineers.

Lyons, John; Philip A. Cochran, and Don Fago. 2000. *Wisconsin Fishes 2000: Status and Distribution*. University of Wisconsin Sea Grant Institute, Madison, Wisconsin.

Keillor, Philip. 1998. *Coastal Processes Manual*. University of Wisconsin Sea Grant Institute, Madison, Wisconsin.

TOM XIONG

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Current Web Developer for the University of Wisconsin-Madison Aquatic Sciences Center.

Languages and Technologies

- C#
- PHP
- WordPress
- ASP.NET
- jQuery
- SQL
- MSSQL
- MySQL

EDUCATION & CERTIFICATIONS

MADISON COLLEGE — Madison, WI
CERTIFICATES — 12/2015

- Android Applications Development Certificate
- Java Professional Developer Certificate
- LAMP Open Source Development Certificate
- PHP Professional Web Developer Certificate

UNIVERSITY OF WISCONSIN-MADISON — Madison, WI
BACHELOR OF SCIENCE, ECONOMICS — 9-2003 - 5/2008

WORK EXPERIENCE

UW-Madison Aquatic Sciences Center — Madison, WI
WEB DEVELOPER — 4/2016 – Present

- Convert current Dot Net Nuke websites to WordPress.
- Maintain, update, and support current suite of websites and apps – using C#, Visual Basic, and PHP.
- Support and maintain current and past solicitations.

UW-Madison Division of Information Technology - TRAD — Madison, WI
STUDENT DEVELOPER — 2/2015 – 4/2016

- Developed websites for clients using WordPress and Drupal.
- Created websites using PHP, JavaScript, jQuery, HTML, and CSS.
- Created child themes and effectively uses plugins/modules to complete projects.
- Created documentation for plugins and custom code used in the development process.

Marie E. Zhuikov
Science Communicator
University of Wisconsin Sea Grant/Water Resources Institute
14 Marina Dr., Superior, WI 54880
Office Phone: (715) 399-4084, E-mail: mzhuikov@aqua.wisc.edu

EDUCATION

M.A. University of Minnesota, Minneapolis. Public Health Journalism, 2005
B.A. University of Minnesota, Minneapolis. Science Journalism major; Biology minor, 1986

RECENT EXPERIENCE

2012-present	Science Communicator, Wisconsin Sea Grant, Univ. of Wisconsin-Madison
2010-2013	Science Communications Consultant: Board of Scientific Counselors, U.S. Environmental Protection Agency; Mayo Clinic; Essentia Health; UMD Large Lakes Observatory, Office of Sustainability, Dept. of Human Resources, and MN Sea Grant Program; LiveStrong.com Website
2010-2012	Project Administrator, St. Louis River Alliance, Duluth, Minn.
2009-2010	Public Affairs Consultant, Mayo Clinic, Rochester, Minn.
1995-2009	Communications Coordinator, Minnesota Sea Grant, Univ. of Minnesota Duluth
1994-1995	Editor, Minnesota Sea Grant, Univ. of Minnesota Duluth
1989-1994	Public Affairs Specialist, USDA Forest Service, Superior National Forest, Duluth, Minn.

RECENT HONORS

Outstanding Programming Award, Great Lakes Sea Grant Network for the Stories and Science Website, 2015; **Bronze Award**, Council for Advancement and Support of Education, for cover photo and poems in the 2012-14 Wisconsin Sea Grant Biennial Report, 2015; **Travel Fellowship**, National Association of Science Writers, 2010; **Award of Excellence**, APEX Competition for Communications Professionals, for "Toward Sustainable Tourism,"2009; **Award of Excellence**, APEX Competition for Communications Professionals, for "Building Superior Coastal Communities," 2007; **Award of Excellence**, APEX Competition for Communications Professionals, for "Superior Science: Stories of Lake Superior Research," 2005; **Outstanding Service Award**, University of Minnesota Duluth, 2005; **Outstanding Program Award**, Great Lakes Sea Grant Network, for "ESCAPE from Exotics" Newspaper in Education and essay contest project, 2004; **Third Place, Literacy Programs**, Newspaper Association of America Foundation, for "The Great Lakes Invasion – Exotics on the Move" Newspaper in Education tabloid, 2004; **Outstanding Program Award**, Great Lakes Sea Grant Network, for the "Aquatic Nuisance Species-Hazard Analysis at Critical Control Point" project, 2003.

CURRENT PROFESSIONAL AFFILIATIONS

National Association of Science Writers, National Sea Grant Communications Network, Lake Superior Writers Board Chair, Northland Professional Communicators

RECENT PRODUCTS

Web Postings, Blog Entries and Electronic Publications

Author: "**Wisconsin Teachers and Students Join Expedition to Unlock Lake Michigan Secrets**," news release, http://seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=252, June 2017.

Author: "**Fishing for Landslides: Now Device Offers Insight into How and When Lake Michigan Bluffs Fail**," news release, http://seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=2525, May 2017.

Author: "**Marine and Freshwater Librarians to Visit Madison Next Week**," press room story, http://seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=2518, May 2017.

Author: "**Sea Grant's "Survey Girl" is Helping to Establish a Collaborative Stormwater Awareness Campaign for Lake Michigan**," press room story, http://seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=2517, May 2017.

Editor: "**The Battle with Mercury in the St. Louis River Estuary**," blog story, http://uwiscseagrant.tumblr.com/post/160016449627/battling-mercury-in-the-st-louis-river-estuary, April 2017.

Ghostwriter: "**Local Leaders Honored by Lake Superior Reserve**," UWS news release, http://www.duluthnewstribune.com/business/4254955-biz-buzz-april-24-2017, April 2017.

Co-author, "**Investigating the "Plankton Conveyor Belt' and the 'Sweet Spot' for Phosphorus Loading in Lake Michigan**," news release, http://seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=2505, March 2017; Illinois Indiana Sea Grant, http://www.iiseagrant.org/newsroom/sea-grant-quagga-mussel-research-leads-to-nsf-funding/, March 2017; and the National Sea Grant website, http://seagrant.noaa.gov/News/FeatureStories/TabId/268/ArtMID/715/ArticleID/741/Investigating-the%E2%80%99-Plankton-Conveyor-Belt%E2%80%99-and-the-%E2%80%98Sweet-Spot%E2%80%99-for-Phosphorus-Loading-in-Lake-Michigan.aspx, April 2017; and on pg. 18 in "Charting New Waters," by Illinois-Indiana Sea Grant and Wisconsin Sea Grant, June 2017.

Author: "**NOAA Programs are Rooted Across Wisconsin**," press room story, http://seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=2499, March 2017.

Booklets, Articles, Brochures

Author: "**There is no Normal at Halvorson's**," story inside *Buy Local: A Guide for Retailers, Restaurants and Culinary Schools*, April 2016.

Author: "**Metcalfe's Market Knows Wisconsin Fish is a Good Catch**," story inside *Buy Local: A Guide for Retailers, Restaurants and Culinary Schools*, April 2016.

Author/Photographer: "**A Cruise Across Time**," Lake Superior Journal article, *Lake Superior Magazine*, April-May 2016.

Editor/Photographer: "**Proceedings of the St. Louis River Estuary Summit; 2015**," September 2015.

Contributing Photographer: "**University of Wisconsin-Superior Viewbook**," August 2015.

Co-author and Project Initiator: "**On-the-Water Guide for Paddlers and Boaters: Natural and Cultural History of the Lower St. Louis River**, 64 pp. booklet, June 2013.

Novels and Anthologies

Editor, Co-Author: "**Going Coastal**," Lake Superior short stories anthology, North Star Press, May 2017.

Author: "**Plover Landing**," an eco-mystic romance novel (sequel to Eye of the Wolf), published by North Star Press, June 2014.

Author: "**Eye of the Wolf**," an eco-mystic romance novel, published by North Star Press, September 2011.

Appendix B

Data Management Plan for Student Engagement

Sea Grant Data Management Plan Form
Proposal Submission Phase

Title of the Proposal (required answer)*:* Student Engagement

Name of the lead PI (required answer)*: Sea Grant requires that the lead PI serve as the data steward.* Jennifer A. Hauxwell

Contact Information (required answer)*:* University of Wisconsin-Madison

Dataset Description(s) (required answer)*: What data will the dataset(s) contain? This includes descriptive details on data types, inclusion of metadata, data format(s), collection times / date ranges, etc. What name(s), if any, will be designated to the dataset(s)?*

No environmental data will be collected.

Do you agree to release all data no later than 2 years after the end-date of the project? (required answer)*:* n/a

Issues (required answer): *Are there any legal, access, retention, etc. issues anticipated for the dataset? If yes, please explain.* n/a

Data Size*: What will be the estimated size of the dataset? Please report estimated number of MB, GB, TB, etc., collected.*

Data Format*: What format will the dataset utilize? (i.e., Excel file, model code, audio/video recording, etc.)*

Ownership (required answer)*: Who will own the dataset, if not the lead PI?*

Post-Processing*: What post-processing, QA/QC will this dataset undergo? Who will be responsible for performing this post-processing and QA/QC to prepare the dataset for its deposition into a repository?*

n/a

Preservation Plan (required answer)*: What data repositories will be used to host the dataset? If none, how will the data be preserved?*

Products*: Will any information or data products be developed from this dataset? How will the related costs be supported? Which organization(s) will be producing these products?*

Other Comments*: Are there any additional comments related to the data that will results from your Sea Grant-funded study?*

Sea Grant Data Management Form
Project Completion Phase

Date Submitted (required answer):

Title of the Proposal (required answer)*:* Student Engagement

Name of the lead PI (required answer)*: Sea Grant requires that the lead PI serve as the data steward.*

Contact Information (required answer)*:*

Dataset Description(s) (required answer)*: What data do the dataset(s) contain? This includes details on data type, format, collection times / date range, etc. What name(s), if any, will be designated to the dataset(s)?*

Issues*: Are there any legal, access, retention, etc. issues existing for the dataset(s) (i.e.; IRB restrictions)? Please explain.*

Data Size*: What is the estimated size of the dataset? Please report estimated number of MB, GB, TB, etc., collected.*

Data Format*: What format(s) do(es) the dataset(s) utilize? (i.e., Excel file, model code, audio/video recording, etc.)*

Ownership (required answer)*: Who owns the data, if not the lead PI?*

Post-Processing*: What post-processing, QA/QC has this data undergone? What organizations performed this post-processing and QA/QC to prepare the data for its deposition into a repository?*

Preservation Plan (required answer)*: What data repositories were used to host the dataset? If none, how was the data preserved? Please provide URL for any data repositories that were used to preserve this data and any necessary information needed to extract the data.*

Keywords (required answer)*: Please provide a list of terms used to query the database.*

Release Date (required answer)*: When will this dataset be available to the public? Reminder: the release date must be no later than 2 years after the end of the project.*

Products (required answer)*: Have any information or data products been developed from this dataset? Which organization(s) produced these products? Please provide a location for any products that were produced as a result of this project.*

Preferred Data and Product Citations (required answer)*: How to reference data, publications, or any other project outcomes?*

Other Comments*: Are there any additional comments related to the data that you produced with your Sea Grant funding?*