# Announcement of Opportunity (21-Jan-2020)

**Freshwater Collaborative of Wisconsin (FCW)**

The Freshwater Collaborative of Wisconsin (FCW) was launched in 2019 to leverage Wisconsin's competitive advantage to be a global leader in freshwater science, technology, entrepreneurship and economic growth by fully utilizing UW System's broad expertise, world class faculty, research acumen and commitment to undergraduate and graduate student training.

A key component to the FCW is fostering collaborative research and initiatives across the 13 campuses, private sector and state institutions to address the water challenges of the 21st century. In so doing, it will grow Wisconsin's next generation of water expertise to fuel the water-based economy and meet the need for a knowledgeable and multi-talented workforce in wide ranging water related disciplines.

In July of 2019 the Wisconsin Economic Development Corporation (WEDC) awarded a Targeted Industry Project grant to the University of Wisconsin System to lay the groundwork for a successful, long-term Freshwater Collaborative of Wisconsin. The initial programming goals included in this project are designed to both build the initiative's brand and to provide initial research, student and workforce development support. FCW will lay the foundation for a new era of inter-campus, state agency, and private sector collaboration and partnership, trigger Wisconsin's lead in water sector innovation, and advance a unique platform for linking economic and workforce development with higher education.

The funds provided by WEDC are supplemented by a $1.4 million funding commitment from the UW System for the Freshwater Collaborative Research Network and additional in-kind support from all UW campuses.

Tackling these contemporary water challenges requires a wide variety of solutions. The FCW, if fully implemented, will address 10 Grand Water Challenges, which is proposed to be phased in at campuses across the UW-System over the next three biennial budgets. This initiative will encompass both research and education with educational offerings spanning undergraduate and graduate degree programs, continuing professional education, specialized training opportunities, and general public awareness.

**10 Grand Water Challenges for Wisconsin** (see appendix)

1. Agricultural Water Management
2. Industrial Water Engineering and Technology
3. Water Quality Safety and Emerging Contaminants
4. Great Lakes Management and Restoration
5. Water Infrastructure: Collection, Distribution, Treatment
6. Water Business and Finance
7. Watershed Management and Restoration
8. Water Security, Protection and Resilience
9. Healthy Recreational and Transportation Water Use
10. Aquaculture/Aquaponics/Water Food Systems

Solutions to each challenge will be underpinned by five cross-cutting themes:

1. Fundamental Research on Water Systems;
2. Driving Technology Innovation;
3. Workforce Development;
4. Resource for Science Driven Water Policy and Law; and
5. Informing Sustainable Management of Water Resources

**The Freshwater Research Collaborative (Pilot phase of FCW).**
The goal of the Research Collaborative is to enable UW System investigators to develop and coordinate their research, training and educational activities across disciplines, organizational, geographic and international boundaries to address the 10 Grand Water Challenges of the FCW's Implementation Plan with *emphasis in this pilot phase on the first four challenges*. The program will provide opportunities to foster new collaborations across system campuses, including external partnerships, and will address interdisciplinary topics.

**Tracks/ Approximate Total Funding Available**

- Track 1: Research Collaboration Summits/Working groups: ~$60,000
- Track 2: Strategic Research: ~$680,000
- Track 3: Undergraduate FCW Interdisciplinary curriculum, training & course development and design: ~$60,000
- Track 4: Freshwater Research Experience for Undergraduate Awards: ~$160,000
- Track 5: Inter-Institutional Undergraduate Training Programs: ~$100,000

**Total Funding: ~ $1M**

**The Freshwater Research Collaborative (Pilot phase of FCW)**
**Announcement of Opportunity**
*21 January 2020*

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## Program Description:

**Anticipated Type of Awards:**
There are several types of awards available as identified by the five Tracks described below.
**Estimated Number of Awards:**
The actual number of awards varies across Tracks.
**Anticipated Funding Amount:**
$1.1M in total, varies across programs and Tracks.

**Eligibility Information**
Who May Submit Proposals:
Any institution within the University of Wisconsin System, all 4-year, 2-year campuses, research institutions and centers
Who May Serve as PI:
Faculty and staff at a UW System institution .
Limit on Number of Proposals per Organization:
There are no restrictions or limits.
Limit on Number of Proposals per PI or Co-PI:
There are no restrictions or limits.

**Proposal Preparation Instructions**
See descriptions for individual Tracks. Proposals should clearly identify at the beginning of the title which Track is being proposed, e.g. *"Track 2 Strategic Research: . . ."*

Uniform Proposal Format Requirements:

Cover Page:
- Title beginning with "Track *X* …"
- Principal Investigators, contact information (including email)
- Proposing Institution and Institutional Contact for Award (including email)
- Time frame of award
- Amount of FCW funding requested
- Cost sharing proposed

Executive Summary (one page):
- Summarize proposed effort and its relevance to the themes of the FCW
- Identify Impact on furthering the goals and objectives of the FCW

**Budget Narrative:** See requirements for individual Tracks (below).

**Budgetary Information:**

Cost Sharing:

Inclusion of cost sharing if required or optional

Indirect Cost (F&A) Limitations:

F&A costs are excluded. Budgets are for direct costs and cost sharing only.

Other Budgetary Limitations:

Other budgetary limitations apply depending upon award type. Please see the full text of this solicitation for further information.

**Due dates:**

Submission deadlines and targets vary by Track. Proposals should be submitted to a particular Track according to the program's submission dates.

**Proposal review:** Proposals will be reviewed by the Freshwater Research collaboration steering committee with representatives from all 13 UW System universities (as defined in the WEDC application), or a subset of this group authorized by the Steering committee to conduct reviews. Recommendations for funding will be approved by the full committee. External reviewers may be solicited for specific technical or scientific expertise.

**Review criteria**: Proposals will be assessed based upon their strength in implementing the goals and objectives of the FCW and in capturing the widest possible participation across UW System campuses and programs. In addition, proposals will be judged based upon:

1. Whether the proposed program meets a high standard of Intellectual Merit and Scholarship necessary to advance knowledge and expand the capacity of the State to address the Grand Water Challenges enumerated above;
2. Whether the proposed program(s) accomplish one or more of the following broader impacts including the achievement of societally relevant outcomes:
    - New water-centric training programs focused on undergraduates
    - Amplified marketing and recruiting relating to UW System's position as a destination for students in freshwater education and training
    - Enhanced workforce development programming, including research experiences, training institutes and graduate research
    - Increased partnerships between academia, industry and others;
    - Expanded public engagement and literacy on water challenges within the state of Wisconsin;
    - Improved water security and safety; management, protection and preservation of water resources for the State of Wisconsin;
    - Increased economic competitiveness of Wisconsin

**How to submit:**

Submissions should be electronically by email to:
**Freshwater Research Collaborative Announcement of Opportunity 2020, Office of the Director** (Pro tempore), c/o School of Freshwater Sciences, freshwater-collaborative-AO@uwm.edu

Please note "Submission to Track X" in the subject line. Receipt of submission will be acknowledged by reply email.

**Summary of Proposed FCW Awards by Track (see below):**

| Track | | Max.per award | # anticipated | Total max. funding anticipated | Target Submission Dates | Target Award date |
|---|---|---|---|---|---|---|
| | | | | | | |
| **1** | **Research Collaboration Network Summits & Workshops** | $ 10,000 | 4-8 | $ 60,000 | anytime | ~ 1 mo. post submission |
| | | | | | | |
| **2** | **Strategic Research support** | | | $ 680,000 | 4/15/20, 8/15/20 | ~ 2-3 mo. post submission |
| 2.1 | **Research/PI Support:** Maximum per PI | $30,000/PI | 20 | $ 600,000 | | |
| 2.2 | **Required Supplemental Undergraduate research stipends** | $ 4,000 | 20 | $ 80,000 | | |
| | | | | | | |
| **3** | **UG FCW Interdisciplinary training & course development** | $ 12,000 | 5 | $ 60,000 | 4/1/20 or anytime thereafter | ~ 2 mo. post submission |
| | | | | | | |
| **4** | **Research Experience for Undergraduates Fellowships** | | | | | |
| | summer fellowships | $ 10,000 | 8 | $ 80,000 | 1 Mar | 1-Apr |
| | Academic Fall semester fellowships | $ 5,000 | 8 | $ 40,000 | 1 Jun | 1-Jul |
| | Academic Spring semester fellowships | $ 5,000 | 8 | $ 40,000 | 15 Sep | 1-Nov |
| | | | | | | |
| **5** | **Inter-institutional Undergraduate Training Initiatives** | $ 24,000 | 4 | $ 96,000 | anytime up to 10/15/20 | ~ 1 mo. post submission |

## The Freshwater Research Collaborative (Pilot phase of FCW)
## Announcement of Opportunity (*21 Jan. 2020* )
## Track Descriptions:

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**Track 1: Research Collaboration Summits/Working groups**

Research Collaboration Summits & Working Groups are designed to foster communication and promote new collaboration among UWS faculty and scientists and relevant stakeholders with diverse expertise and who share a common interest in a new or developing area freshwater science, engineering or policy. It is anticipated that these activities will contribute to furthering the goals of the FCW by encouraging the formation of cross campus collaborations, groups and networks. RCS awards are intended to foster networking activities and thus will not directly support costs related to primary research.

**Summits** may take the form of 1-2-day workshops bringing investigators (~20) together from across UWS, as well as other stakeholders and private and public sector experts addressing long term issues of water resource conservation, policy and management. **Working groups** bring together smaller groups (8-12) to make detailed progress on focused water issues with solutions on the time scale of months to years.

Proposals should identify:

- a clear theme as the focus of its activities.
- how the proposed activity relates to the Grand Water Challenges and the goals of the FCW, and should specify the following:
    - questions that will be addressed
    - activities that will be undertaken
    - new groups of investigators that will be brought together
    - products that will be generated by network activities (including a written summary)
    - plan to disseminate information about the network and opportunities to participate
    - expected benefits of the network's activities in moving a field forward and the implications for the broader community of researchers and educators.

Budgets are limited to $10,000 for travel, support costs, etc. No more than $1,500 in salary (including fringe) for workshop support and reporting. Approximately 4-8 awards anticipated. Total funding available ~$60,000.

Target dates for submission: Open call - May be submitted at any time.

Proposal format:

1. Cover page (see above)
2. One-page Executive Summary
3. Maximum 6-page single spaced Narrative, describing topic and including proposed dates/timeline, membership of the leadership (steering committee) and responsibilities (facilitation, report writing, logistics support, etc)
4. List of Potential Participants and stakeholder groups (non-binding)
5. Budget and Budget Justification – maximum 2 pages
6. CVs of steering committee members (max 2 pages each, NSF format).

**Track 2: Strategic Research:**

Projects under Track 2 Strategic Research are designed to support interdisciplinary research across two or more UW System campuses that address one or more of the Grand Water Challenges identified in the FCW. Proposals may be submitted that address any of the 10 Grand Challenges, however, Grand Challenges 1 and 3 (*Agricultural Water Management* and *Water Quality Safety and Emerging Contaminants*) are considered high priority for this Track and for the state in keeping with the Governor's Year of Safe Drinking Water. Proposals should clearly identify which of the challenges it falls under and how they incorporate the five cross-cutting themes.

Undergraduate research awards are a required component of the research plan.

Budgets are limited to $30,000 per PI in research costs + up to $4,000 per student for supplemental undergraduate fellowships. No more than $10,000 (including fringe) of the PI portion of research costs may be in salary for the PI. Cost share of 20% is required and may be in any form, including in-kind support. Total funding available ~ $600,000 for research costs (~20 PIs), $80,000 (~20 students) for undergraduate awards. Awards may be for up to 24 months.

Proposal format:

1. Cover page (see above)
2. One-page Executive Summary
3. Maximum 15-page single spaced Narrative describing: proposed research, its intellectual merit, relevance to the Grand Challenges, relationship to Cross-cutting themes, and potential for promoting the Freshwater Collaborative across UW System.
4. List of references
5. Timeline and Milestones
6. Budget and Budget Justification – maximum 2 pages. Cost sharing commitments should be clearly identified.
7. CVs of Principal Investigators (max 2 pages each, e.g. NSF format).

Target dates for submission: 15 April 2020 and 15 August 2020.

Review Criteria:

- Scientific merit
- Relevance to Grand Challenges and Wisconsin's water resources
- Relationship to cross-cutting themes
- Potential for promoting Freshwater Collaborative of Wisconsin and cross-campus collaborations and team building
- Significance of potential outcomes and impact
- Potential for enhanced educational experience for undergraduate students

**Track 3: Undergraduate FCW Interdisciplinary curriculum, training & course development and design**

The goal of Track 3 is:

1) To advance the development of learning and workforce development training tools and offerings within FCW,
2) To stimulate interdisciplinary instruction and training opportunities across UWS campuses
3) To develop innovative, new courses and curricular components, including on-line, that will benefit students from all disciplines, as well as students whose principal focus is freshwater
4) To help develop the common curricular components that will be the basis for introduction to freshwater for all UW System students

Proposal narrative should include:

1) Course and program description
2) Learning outcomes
3) When the course/training opportunity would be typically offered and by whom
4) Mode of instruction/training proposed: online, blended, hand on, internship, etc.
5) Designation of Development team – should include multiple campuses
6) Anticipated student demand, class size, etc.
7) Collaborators or groups with whom you expect to work to develop and implement the program (e.g. academic departments, Libraries, academic support services, etc.)
8) Description of how the activity will be assessed – student success, feedback, etc.

Target date for submission: 1 April 2020 or anytime thereafter.

Proposals should not exceed 10 pages single spaced + a budget of $12,000 maximum. Total funds available ~ $60,000.

Proposal format:

1. Cover page (see above)
2. One-page Executive Summary
3. Maximum 10-page single spaced Narrative (see above for content) describing potential for promoting the Freshwater Collaborative across UW System.
4. List of references
5. Budget and Budget Justification – maximum 2 pages. Cost sharing commitments (encouraged but not required) should be clearly identified.
6. CVs of Principal Investigators (max 2 pages each).

**Track 4: Freshwater Research Experience for Undergraduate Awards (FREU)** (ongoing program).

**Objectives:** This award program seeks to initiate collaborative undergraduate research, scholarship, and creative activity, while simultaneously promoting faculty research collaborations in Water Resources across UW System universities.

**Principles:** Successful, new research and scholarly collaborations develop most readily when collaborators share strong professional relationships, when centered around students, and when working in an environment of reasonable expectations surrounding deliverables. These factors promote trust and provide an environment promoting creative intellectual risk-taking.

**Call:** This program seeks proposals to support undergraduate students engaged in freshwater research, scholarship, or creative activities for the, summer and fall of 2020 and spring of 2021 if funding is available.

Proposals should clearly relate to Wisconsin's freshwater resource, should be of significant magnitude to engage an undergraduate water fellow for the duration of the award, and should be collaborative in nature.

This call is limited to UW System institutions, based upon the following qualifying standards:

- **Research, Scholarship, or Creative Activity Proposals**: Proposals are sought from each UW System campus seeking to host UW System undergraduate students with water research awards.
- **Collaborative Project Selection:** Each campus is free to determine their own internal review process, provided that selected proposals: 1) clearly relate to Wisconsin's freshwater resource, 2) are of significant magnitude to engage an undergraduate fellow in a meaningful high impact experience for the duration of the award, and 3) are collaborative in nature, ideally to include at least one faculty member from a different UW System university.
- **Undergraduate Water Research Student Selection:** Eligible students must be enrolled as a degree-seeking student for the fall 2020 or the semester in which the fellowship applies at a UW System institution and hold a minimum of Sophomore standing. Undergraduate students should have credentials predictive of their successful completion of the research. Stipends and related expenses for students during the academic year are limited to $5000 per semester. Summer awards, including stipend, housing, and research expenses are limited to $10,000. A minimum of 50% of the funds should be allocated for the student stipend. Stipend requirements vary by campus and could take the form of hourly pay, salary, or scholarship. Undergraduate summer water awardees are expected to fully engage in summer experiences and notify host and sponsor PI's of any planned summer absences in advance of the start of the summer experience. Undergraduate awardees participating during the academic year are permitted to receive independent study credit at their home institution while holding this award.
- **Presentation of Research.** Undergraduate award recipients are required to produce a co-authored poster, visual, or audio media product describing their research and contributions made by collaborating campuses. The proposal should clearly identify a proposed venue(s) for the presentation(s) . Funds should be budgeted for student presentation of research either as direct costs or as matching support.
- **Requirements of Host and Recipient Institutions**: Each host and recipient institution must provide a sponsor and supervising PI to monitor student progress. Host and sponsor PI's are

required to complete a pre-experience meeting to reviews project goals and student attributes, a mid-summer / mid-semester check-in, and complete a co-drafted one-page end of experience report. Host institution PI-s are expected to oversee the daily activities of REU, and collaborate with fellows on their final poster, visual, or audio media product. Host institutions assume fiscal responsibilities for funds associated with water fellows.

Target dates for submission: 15th of December for spring semester, 1 March for summer session and 1 June 2020 for fall semester.

Proposals should not exceed 10 pages single spaced + budget. Total funds available ~ $150,000

Proposal format:

1. Cover page (see above)
2. One-page Executive Summary
3. Maximum 10-page single spaced Narrative addressing: proposed UG research project, relationship to Grand Challenges and Cross-cutting themes, potential for enhancing student success and experience gained, Presentation of research – proposed format and venue
4. List of references
5. Budget and Budget Justification – maximum 2 pages. PI salary (including fringe) support is limited to $1,000 for academic year awards, and $2,000 for summer awards.
6. CVs of Principal Investigators (max 2 pages each), CV of student (if known)

**Track 5: Inter-Institutional Undergraduate Training Programs:**

The goal of this Track 5 is the implementation of unique cross campus training programs, e.g. student exchanges, summer institutes and courses, internships, etc. with a focus on hands-on training in the field or workforce environments.

Proposals are open to any innovative mechanisms, and there is no preconception of what constitutes a "Training Program". Unlike Track 3 which is for the development/design, Track 5 is for implementation of programs that are more "ready to go". Opportunities to participate should be open to any student within the UW System and thought should be given to facilitating such participation. Campuses should take advantage of their unique facilities and centers when designing these hands-on offerings. Funds may be used for supplies and equipment, travel, student support, marketing, etc. Anticipated tuition revenue (if applicable) should be estimated and a description of how it will be proportioned among collaborating institutions should be included. Cost share is encouraged.

Target date for submission: Proposals may be submitted at any time up to 15 Oct. 2020.

Up to 4 awards anticipated @ up to $25,000. Total funding available ~$100,000

Proposal format:

1. Cover page (see above)
2. One-page Executive Summary
3. Maximum 6-page single spaced Narrative describing the Inter-institutional Undergraduate Training program and the potential for enhancing and furthering the Freshwater Collaborative.
4. Budget and Budget Justification – maximum 2 pages.
5. CVs of Principal Investigators (max 2 pages each).

# FRESHWATER COLLABORATIVE OF WISCONSIN

## 10 GRAND WATER CHALLENGES

| | Grand Challenges | Examples | Solutions | Benefits | Stakeholders | Example Projects |
|---|---|---|---|---|---|---|
| 1 | **Agricultural Water Management** | Irrigation over-withdrawal; Nutrient, pesticide, herbicide runoff and contamination of groundwater; Hormone and antibiotic release to the environment, Farm policy impacts | Use of innovative sensor technologies; Development of new "best practices"; Efficient water use; Efficient nutrient/pesticide application; Antibiotic minimization; skilled workforce; technology innovation; effective incentive systems & policies | Lower pumpage, fertilizer and antibiotic costs; reduced contaminant loading to watersheds, improved fisheries; safer drinking water; improved resilience; healthy productive soils; increased efficiencies of production and profit margins | Farmers and property owners; Lake owner associations; Recreational water users; Rural municipal water suppliers; Private well owners | - Widespread drinking water contamination in NE Wisconsin due to CAFOs and improperly maintained septic systems<br>- Ground and surface water duress in the Central Sands from overpumping and nitrate contamination -<br>impact of US Farm Bill policies |
| 2 | **Industrial Water Engineering and Technology** | Access and Risk, Efficiency, Discharge and Treatment, Reuse, Workforce, reducing virtual water use | Skilled Workforce, Sensors, Data Analysis, Integrated Systems, Reuse and Filter Technologies, Technology Innovation, Infrastructure Improvements, Intelligent/Integrated Systems and Smart Infrastructure Improvements | New intellectual properties, lower costs for businesses, guaranteed access to supply, skilled talent, entrepreneurial water community, attract new businesses to state, reduce business risk | Manufacturers, Water Technology Companies, Utilities, Municipalities | - Foxconn Industrial Water-Use and Integrated, Connected Water Systems<br>- Training Engineers for Water Tech Industry<br>- elimination of Beneficial Use Impairments |
| 3 | **Water Quality, Safety and Emerging Contaminants** | Public Health, Lead Poisoning, Legacy Contamination, Emerging Contaminants and Nanomaterials, Nutrient Contamination, Well Contamination, Surface Water Contamination, Safe Drinking Water Compliance, Effective Treatment Techniques | Better Indicators of Ecosystem Health, Identification of Harmful Contaminants, Improved Land-Management Practices, Environmentally Friendly Chemicals/ Pharmaceuticals/Nanomaterials, Improved Treatment Technologies and Infrastructure, Best-Management Practices at Industrial Plants and Hospitals, Reduced Urban Source Pollution, Improved Metals Testing | Drinkable, Swimmable, Fishable Waters; Less Lead Ingestion, Higher Water Quality; Elimination of Fish Consumption Advisories; Increased Waterfront Property Values, Reduced Beach Advisories | Public Health Officials, Pharmaceutical Companies, Hospitals, Utilities, Water Technology Companies | - Curtailing Impacts of Contaminants in Wisconsin Surface Waters<br>- Development of "Green" Nanomaterials for Industrial Users and Sold by Water Tech Industry<br>- Mitigation of Lead in Drinking Water |
| 4 | **Great Lakes Management, Protection and Restoration** | Legacy Contamination, Emerging Contaminants, Nutrient Contamination, Loss of Habitat, Invasive Species, Water Levels, Fisheries, Restoration & Protection policies | Modeling Great Lakes Dynamics and Ecosystems, Eliminating Introduction of Harmful Contaminants, DNA Sequencing of Crucial Species, Mapping Habitat, Informing Land Management Practices to Reduce Nutrient Loading, Real time integrated observing and monitoring systems | Swimmable, Fishable, Drinkable Water; Increased Property Values on Great Lakes Waterfronts; Mitigation of the Impacts of Lake Level Fluctuation; Increased Recreation and Tourism Opportunities; Improved Recreational Fish Stocking Practices; Protection Against Invasive Species | Recreation and Tourism, Shipping Industry, Municipalities | - Restoring the Green Bay Estuary<br>- Enhancing Recreational Fisheries in Western Lake Michigan Harbors<br>- Economic Enhancements of Great Lakes Waterfronts |

# FRESHWATER COLLABORATIVE OF WISCONSIN

## 10 GRAND WATER CHALLENGES

| | Grand Challenges | Examples | Solutions | Benefits | Stakeholders | Example Projects |
|---|---|---|---|---|---|---|
| 5 | **Water Infrastructure: Collection, Distribution, Treatment** | Costly Water and Sewer Main Maintenance and Replacement, Aging Distribution System Components like Pumps, Valves and Hydrants, Non-Revenue Water Loss, Reservoir and Tank Maintenance, Overflows, Aging Treatment Plants/Filter Beds, Missized Pumps | Skilled Workforce, Sensors, Data Analysis, Integrated Systems, Asset Management, Reuse and Filter Technologies, Technology Innovation, Economically Viable Infrastructure Improvements and Replacement, Materials Advancement, Capacity Analysis | Safe Drinking Water, Swimmable and Fishable Waters, Reduced Environmental Impacts, Increased Waterfront Property Values, Reduced Flooding and Basement Backups, Fewer Overflow Events, Fewer Water Main Breaks | Municipalities, Utilities, Water Technology Companies, Engineering Consulting Firms, Public Health Officials | - Reducing Flooding in Wisconsin Communities After Massive Rain Events<br>- Study of Adequate Water Storage<br>- Assessment of Emerging Lining Technologies |
| 6 | **Water Business, Law and Finance** | Informed Operations Management, Utility Rate Management, Success Rate of Water Technology Start-Ups, Financing Critical Infrastructure | Capital Finance Solutions, Sustainable Utility Rates, Business Expansion, Start-Up Assistance, Tech Transfer | Water Manufacturing Industry Growth, Economic Investment, More Water Savvy Executives, Job Creation, Cost Management | Water Company C-Suites, Utilities, Contractors, Engineering Consulting Firms, State and Federal Agencies | - Assessing the Viability of Public-Private Infrastructure Financing Mechanisms<br>- Best Practices in Capital Planning and Asset Management |
| 7 | **Watershed Management and Restoration** | Legacy Contamination, Emerging Contaminants, Nutrient Contamination, Loss of Habitat, Invasive Species, Water Levels, Fisheries | Modeling Surface Water Dynamics and Ecosystems, Reducing Introduction of Harmful Contaminants, DNA Sequencing of Crucial Species, Mapping Habitat, Informing Land Management Practices to Reduce Nutrient Loading | Swimmable, Fishable, Drinkable Water; Increased Property Values Near Waterfronts; Mitigation of the Impacts of Lake Level Fluctuation; Increased Recreation and Tourism Opportunities; Improved Fisheries; Improved Recreational Fish Stocking Practices; Protection Against Invasive Species; Mitigating Algal Blooms | Recreation and Tourism, Shipping Industry, Municipalities | - Protecting the $1 Billion Recreational Fishery in the Driftless Zone<br>- Reducing Algal Blooms in Wisconsin's 15,000 Inland Lakes<br>- Mitigating Impacts to Health of Groundwater Depletion |
| 8 | **Water Security, Protection and Resilience** | Threats to Supply, Catastrophic Events, Food Safety, Climate Resiliency, Maritime transportation of potentially harmful goods, Spills, Flooding and Droughts, Planning and Resiliency | Identifying Threats to Water Supply; Planning and "War-gaming" for Catastrophes; Infrastructure Planning for Climate Fluctuations; Increased Security Measures (including early alert systems) at Treatment Plants; Guaranteeing Supply Access to Municipal, Agricultural and Industrial Users , Real-time, integrated monitoring systems | Improved Drinking Water Safety, Readiness for Catastrophes to Water Resources, Reduced Water Risk to Industrial Users | Federal, State and Local Governments and Agencies, Engineering Consulting Firms, First Responders, Utilities | - Planning for an Oil Spill in the Great Lakes<br>- Assessment of Security at Wisconsin's Drinking Water Plants |
| 9 | **Healthy Recreational and Transportation Water Use** | Surface Water Quality, Public Health, Beach Safety, Legacy Contamination in Seafood, Ballast Water Contamination | Bacterial Source Tracking Technologies; Improved Storm- and Wastewater Infrastructure; Technologies to Reduce Risks of Ballast; Better Land-Use Management; Sensors and Early Alert Systems | Swimmable, Fishable, Drinkable Water; Improved Recreational and Tourism Opportunities; Reduced Risk Associated with Beaches, Reduced Risk from Consuming Seafood; Improved Public Health | Recreation and Tourism, Municipalities, Public Health, Shipping Industry | - Reducing Risk of Pathogens at Wisconsin's Beaches and Inland Lakes<br>- Ballast Water Detection and Treatment Technologies for Wisconsin Harbors |
| 10 | **Aquaculture/Aquaponics/ Water Food Systems** | Aquaculture and Aquaculture Technologies, Animal and Plant Science, Economies of Scale, Food Safety, Food Processing Technologies, Workforce | Out-of-Cycle Spawning Techniques, Skilled Workforce, Water Reuse Technologies, Improved Filtration Technologies | Clean Source of Protein; Reduced Reliance on Imported Seafood; Reduced Reliance on Unsustainable Marine Fisheries; Healthier Seafood; Jobs | Aqua-Farming Startups, Farmers, Food and Beverage Industry | - Launching an "Intensive Aquaculture Industry" in Wisconsin |