Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2017 LCCMR Work Plan

Date of Submission: October 14, 2016

Date of Next Status Update Report: January 31, 2018

Date of Work Plan Approval: 06/07/2017

Project Completion Date: June 30, 2021

Does this submission include an amendment request? __N

PROJECT TITLE: Aquatic Invasive Species Research Center – Phase II

Sub-Project Manager: Nicholas Phelps

Organization: University of Minnesota – Minnesota Aquatic Invasive Species Research Center

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Location: Statewide

Total ENRTF Project Budget:		
	ENRTF Appropriation:	**$2,700,000**
	Amount Spent:	**$0**
	Balance:	**$2,700,000**

Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 06a

Appropriation Language:
$2,700,000 in fiscal year 2017 is from the trust fund to the Board of Regents of the University of Minnesota to support the Minnesota Aquatic Invasive Species Research Center in finding solutions to Minnesota's aquatic invasive species problems through research, control, prevention, and early detection of existing and emerging aquatic invasive species threats. This appropriation is available until June 30, 2021, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Using Science to Solve Minnesota's AIS problems: Minnesota Aquatic Invasive Species Research Center – Phase II

II. PROJECT STATEMENT:

The threats posed by aquatic invasive species (AIS) to Minnesota's lakes, rivers, and wetlands are real and growing and the science needed to address these vexing problems in Minnesota has only just begun. In order to more effectively respond to AIS, Minnesota must be equipped with better information, have more useful tools, and be able to mobilize more people who care about the quality of the state's waters. Appropriations from ENRTF (2012, 2013, 2014) provided crucial initial support for solutions-oriented research at the Minnesota Aquatic Invasive Species Research Center (MAISRC) on common and bigheaded carps, VHSV, Eurasian water milfoil, and zebra mussels. It also created the operational capacity needed to prioritize, coordinate, and spur research as well as the outreach capacity to start translating science into management action. Many of these initial projects are funded through 2019, yet other critical research needs exist. For example, more lines of research to address prevention and control of key species such as zebra mussels and curly leaf pondweed are needed, as is new research on emerging species such as starry stonewort and killer shrimp. Systems-level research is also needed on topics such as the economic impacts of AIS, rapid response techniques, and effectiveness of prevention in order to ensure our state's limited time and resources are being targeted most effectively.

With 2017 ENRTF funding and guided by MAISRC's biannual systematic Research Needs Assessments that includes input from federal, state, and local AIS managers, public stakeholders, and researchers from around the state, MAISRC will:

- launch 3-4 scientifically rigorous research efforts for response to existing AIS threats
- launch 2-6 projects on assessing and preventing new and emerging threats
- Additionally, MAISRC will be able to ensure the necessary core organizational functions are in place to accomplish this work.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of January 31, 2018:

Project Status as of July 31, 2018:

Project Status as of January 31, 2019:

Project Status as of July 31, 2019:

Project Status as of January 31, 2020:

Project Status as of July 31, 2020:

Project Status as of January 31, 2021:

Project Status as of July 31, 2021:

Overall Project Outcomes and Results:

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Research for response to existing high priority AIS threats

Description:
Developing solutions to Minnesota's AIS threats requires a long-term strategic vision and coordination of research efforts. In Activity 1, MAISRC will launch and support 3-4 new projects addressing Minnesota's highest priority research needs on existing threats, such as zebra mussels, starry stonewort, and invasive carp. These needs will be identified through MAISRC's comprehensive research needs assessment process that feeds into a competitive request for proposals that is open to all Minnesota- based research organizations. We anticipate funding 3-4 projects with duration of 3 years, and approximately $325k- $375k each, however if faster turnaround and lower-cost projects are possible, they will be considered strongly.

The research projects launched during Activity 1 will be informed by an inclusive and comprehensive biannual Research Needs Assessment that is currently underway and will be completed prior to the start of this project. This process began with the interagency MAISRC Technical Committee (MTC) meeting to review priority species and make modifications based on the present science and status of threats. The list of identified priority species (n=40) was reviewed and supported by MAISRC's Center Faculty Group and Center Advisory Board – final list available upon request.

A request for input on research ideas to address these priority species was broadly disseminated to researchers, public stakeholders, AIS managers, and others, as well as from the DNR's AIS Advisory Committee. This processes yielded 383 ideas from 239 individuals and organizations. To distill and prioritize this information, additional members have been selected to join with the MTC and serve on the 2016 Research Needs Assessment Team. This team of 20 people includes leading researchers, federal, state, and local AIS managers, and diverse stakeholders from across the state. An added emphasis this year is on cross species issues, which will be informed by social scientists, a DNR conservation officer, and others.

As example, MAISRC's 2014-2015 Research Needs Assessment identified 14 high-priority needs related to control & management of priority species (n=6), preventing establishment & spread (n=4), and risk assessment & early detection (n=4). These priorities included research needs on species not currently receiving significant attention by researchers in Minnesota, including starry stonewort, spiny water fleas, hybrid milfoil, common reed, faucet snails, and quagga mussels. In a few cases, notably zebra mussels, there was a great need to significantly expand the scope of MAISRC's research. Several needs addressed systems (vs. species), such as multi-species surveillance approaches, evaluations of pathways that are vectors for multiple species, food-web impacts, and best practices for rapid response.

The 2016-2017 Research Needs Assessment process will culminate in a list of research priorities that will feed a competitive request for proposals that will be made available to all Minnesota- based researchers, in and outside of the University of Minnesota system. Minnesota-based proposers may include in their teams researchers from outside the state in order to capture capacity not otherwise available.

Selection of projects will be informed by an internal and external review process with scientists and AIS managers familiar with current science and need. Each proposal will be evaluated based on relevance to priorities, potential impact, scientific approach, researcher experience, funding and effort requested, and support from AIS stakeholders. This process insures that the projects selected are high priority topics for the state of Minnesota that are both scientifically rigorous and have a high likelihood of contributing to effective, actionable, solutions. For high quality proposals that do not get selected for funding, the MAISRC Director will discuss the feedback with the investigators with the intent of building Minnesota's capacity and the potential for future collaborations.

Summary Budget Information for Activity 1: **ENRTF Budget: $ 1,244,000**

Amount Spent: $ 0
Balance: $ 1,244,000

Outcome	Completion Date
1. 3-4 prioritized control, prevention, and early detection research projects launched on existing threats (e.g. zebra mussels, starry stonewort, spiny water fleas, hybrid milfoil, etc.)	*July 1, 2018*
2. Specific research results, solutions identified	*July 1, 2021*

Activity Status as of January 31, 2018:

Activity Status as of July 31, 2018:

Activity Status as of January 31, 2019:

Activity Status as of July 31, 2019:

Activity Status as of January 31, 2020:

Activity Status as of July 31, 2020:

Activity Status as of January 31, 2021:

Activity Status as of July 31, 2021:

Final Report Summary:

ACTIVITY 2: Research for rapid response to emerging high priority AIS threats

Description: The landscape of AIS invasion and management is ever-changing and research must remain responsive to these needs. In Activity 2, MAISRC will launch and support 2-6 research projects with the goal of providing solutions to emerging high priority AIS threats or to fill key knowledge gaps needed for decision-making. We anticipate that some of these projects will be launched in "rapid response" mode and others as part of the main competitive selection process described in Activity 1, depending on the nature of research need, how the threat emerges, and the range of expertise on current MAISRC teams. We anticipate funding 2-3 research projects with duration of 2 years and approximately $150k- $200k each, and depending on the need, 2-3 "rapid response" projects with up to 6 month duration and $5k- $25k each.

Projects selected and supported in Activity 2 will have a strong applied focus, with the intention of rapidly addressing emerging needs. It is critical that lessons are learned early in an invasion to prevent further spread and mitigate damage. As an example, MAISRC's 2016-2017 Research Needs Assessment determined there are at least seven species (e.g. snakehead, black carp, killer shrimp, red swamp crayfish, hydrilla, etc.) whose arrival is considered imminent and 11 others (e.g. rusty crayfish, New Zealand mudsnail, Didymo/rock snot, phragmites, and flowering rush) that are localized, not spreading in Minnesota, but highly invasive elsewhere. Projects launched in Activity 2 will address these newly emerging threats, notably newly arriving AIS that have high impacts elsewhere and AIS that had been localized in MN but are beginning to spread. In addition, projects may also be launched in "rapid response" mode as emerging needs related to existing species may dictate. This could include projects related to risk assessment and communication of genetic manipulation to control animal populations or assessment of rapid response plans to improve county-based programs.

Summary Budget Information for Activity 2:

ENRTF Budget: $ 526,000
Amount Spent: $ 0
Balance: $526,000

Outcome	Completion Date
1. 2-6 prioritized competitive projects and/or rapid assessments launched on new threats (e.g. snakehead, hydrilla, killer shrimp, red swamp crayfish, etc.)	July 1, 2018
2. 1-4 prioritized competitive projects and/or rapid assessments launched on new threats (e.g. snakehead, hydrilla, killer shrimp, red swamp crayfish, etc.)	July 1, 2019
3. Specific research results, solutions identified	July 1, 2020
4. Specific research results, solutions identified	July 1, 2021

Activity Status as of January 31, 2018:

Activity Status as of July 31, 2018:

Activity Status as of January 31, 2019:

Activity Status as of July 31, 2019:

Activity Status as of January 31, 2020:

Activity Status as of July 31, 2020:

Activity Status as of January 31, 2021:

Activity Status as of July 31, 2021:

Final Report Summary:

ACTIVITY 3: Core Center functions to support AIS research

Description: MAISRC was formed to strengthen the state's capacity for solving AIS problems and to do so in a collaborative, coordinated, and stable environment that allowed for long term visions to be achieved. This is being achieved through the development and implementation of a strategic plan, annual Research Showcase, biennial research needs assessments, high faculty engagement, and a supportive culture for creativity and innovation. This could not be done without the core functions of the Center. The Center is an effective and efficient way to support research on AIS for many reasons. Activity 3 will enable us to continue to provide:

Physical infrastructure and shared equipment and lab staffing needed to enable the research:
MAISRC operates a newly renovated 10,000 square foot state of the art lab facility and will provide staffing to maintain and repair the facility, assist researchers with experiment set up and organismal husbandry, and be on call to respond to emergencies that may threaten experimental organisms and research investments. Additionally, MAISRC staff will provide financial oversight and essential financial and grant reporting assistance to individual PIs. A portion of these costs will also be covered through individual research projects per the University's Internal Service Organization policy.

Leadership and direction, critical for establishing priorities and coordinating effective response:
MAISRC staff oversee the organization's fulfillment of its strategic plan, including designing and implementing the biennial Research Needs Assessment and competitive grant processes; recruiting and positioning

researchers for optimal response to emerging AIS threats; coordinating scientific peer review; working with the Center's Advisory Board and multi-agency technical committee; coordinating outreach efforts of the Minnesota DNR, Sea Grant and UMN Extension .

Communication of research progress and implementation of science-based outreach programs to ensure results are translated into management action:
MAISRC makes results of research available and translates findings in a way that is not always possible for individual researchers to do on their own. In addition to traditional research communication (i.e. peer-reviewed manuscripts), MAISRC researchers provide opportunities to engage with stakeholders, such as at the annual MAISRC Research and Management Showcase event. MAISRC communications staff also amplify these efforts and make research progress and results accessible to the public and AIS managers through the web, newsletters, social media, seminars, webinars, brochures, and workbooks. MAISRC also manage the AIS Extension program, including development of training programs and curriculum. Through this work, as well as through our technical committees and coordination teams, we ensure translation of the latest science in ways that build statewide capacity to respond to Minnesota's AIS problems.

Opportunities for state-wide cross-disciplinary research collaboration on and off campus:
MAISRC creates a central focus for AIS research and has become well known for its efforts in prioritization and research productivity. This has resulted in new cross-disciplinary collaborations across the University, bringing together fields such as natural resource management, veterinary medicine, molecular biosciences, social science, genetics, and public health. Likewise, new collaborations have developed across the state and country with academic (i.e. UMD), government (i.e. USGS, watershed districts, counties), and stakeholder organizations (i.e. lake associations, AIS professionals) working together to address Minnesota's AIS problems. International scholars are also seeking opportunities to collaborate with MAISRC and visitors have come from around the world to work with our researchers. Creating an environment that supports and cultivates collaboration, and in turn builds cost-effective capacity, is a major focus of MAISRC and can be continued with this project.

MAISRC core operations are supported through June of 2019 from 2013 ENRTF. No other funding exists to support the Center beyond this time. With 2017 ENRTF funding, these critical Center functions will be extended for two more years (July 2019 – June 2021) and will be leveraged by University of Minnesota contributions to base salaries for tenure track faculty, space & utilities, HR functions, payroll etc. valued at approximately $1.4m.

Summary Budget Information for Activity 3:

ENRTF Budget: $ 930,000
Amount Spent: $ 0
Balance: $ 930,000

Outcome	Completion Date
1. Biannual research needs assessments completed; RFPs issued; peer reviews conducted; research results shared; research, trainings, and outreach performed; shared equipment procured and maintained; etc .	July 1, 2021

Activity Status as of January 31, 2018:

Activity Status as of July 31, 2018:

Activity Status as of January 31, 2019:

Activity Status as of July 31, 2019:

Activity Status as of January 31, 2020:

Activity Status as of July 31, 2020:

Activity Status as of January 31, 2021:

Activity Status as of July 31, 2021:

Final Report Summary:

V. DISSEMINATION:

Description:
The Minnesota Aquatic Invasive Species Research Center provides a platform for information and new research findings about AIS to be widely disseminated. This is accomplished through the annual public Showcase event, reports, brochures, website, Facebook and Twitter, Extension programming, Advisory Board, Technical Committee, seminars, talks, and via peer reviewed publications and student theses. Additionally, as part of the MAISRC Extension partnership, Extension educators, citizen scientists, AIS practitioners and researchers will be collecting data that will be accessible to participants as part of a central data repository.

Status as of January 31, 2018:

Status as of July 31, 2018:

Status as of January 31, 2019:

Status as of July 31, 2019:

Status as of January 31, 2020:

Status as of July 31, 2020:

Status as of January 31, 2021:

Status as of July 31, 2021:

Final Report Summary:

VI. PROJECT BUDGET SUMMARY:
A. Preliminary ENRTF Budget Overview:
***This section represents an overview of the preliminary budget at the start of the project. It will be reconciled with actual expenditures at the time of the final report.**

Budget Category	$ Amount	Overview Explanation
Personnel:	$2,190,000	3-5 Post Docs:$457,531 salary, $91,770.16 fringe (20.75% fringe rate) 100% FTE x 2-3 years each, FTE TOTAL:10 3-5 Grad Students: $171.701 salary, $270,790 benefits (37% tuition, 9% fringe) 50% FTE x 2-3 years each, FTE TOTAL: 5 5-7 Undergraduate Students: $36,755 salary (0% fringe rate) 25% FTE x 2-3 years each, FTE TOTAL: 3.75

		5-7 Co-PI/ Scientists: $256,886 salary,$91,770 benefits (33.7% fringe rate) 4% FTE x 2-3 years each; 2 non tenured principle investigators 50% FTE x 2 years, FTE TOTAL 0.48 PI/Project Manager- Phelps: $143,775 salary, $48,452 benefits (33.7% fringe rate) 50% FTE x 2 years FTE TOTAL: 1 Co-Project Manager- Nash: $182,250 salary, $61,418 benefits (33.7% fringe rate) 100% FTE x 2 years FTE TOTAL: 2 Comm. & Admin Assistant: $ 95,175 salary 26,078 benefits (27.4% fringe rate) 100% FTE x 2 years FTE TOTAL 2 2 Aquatic laboratory techs: $111,375 salary, $30,517 benefits (27.4% fringe rate) 50% FTE x 2 years, FTE TOTAL: 2
Professional/Technical/Service Contracts:	$217,650	Services- office & gen oper. (printing/duplication, mailing, printer repairs, audio visual associated with seminars & conferences, conf. calls, surveys, insurance for shared equipment (pontoon, trailer) etc.) More detail to be provided as 5-10 specific research projects are proposed Services- lab & medical (contracts for statistics, DNA analysis, supercomputing institute, data storage, sequencing, biochemistry, microscopy; well permits, discharge licences and fees, preventative maintenance and maintenance of shared lab facilities). More detail to be provided as 5-10 specific research projects are proposed Professional Services & contracts- (fees or honoraria for guest lecturer and speakers, etc). More detail to be provided as 5-10 specific research projects are proposed Repairs- lab & field (Shared lab facility or other shared equipment; boats, transmitters, receivers, PCR machines,etc.) More detail to be provided as 5-10 specific research projects are proposed Rentals- space and facilities for conferences and events (e.g. annual Showcase)
Equipment/Tools/Supplies:	$206,000	Supplies- office & gen oper. (paper, toner, folders, brochures, displays) Supplies- lab & field (piping, glue, gas, hoses for shared washdown and laboratory facilities; anesthesia, fish, fish food, gas for boats, replacement helio & LED bulbs for experiments; tanks, reagents, sampling supplies, and other

		consumables). More detail to be provided as 5-10 specific research projects are proposed Equipment- non capital lab & field (replacement pumps, valves, timers if needed, for shared laboratory facilities, storage containers; surgical equipment, pipetters, incubators; computer, software; trap nets, seine nets, dip nets; pumps, timers). More detail to be provided as 5-10 specific research projects are proposed.
Capital Expenditures over $5,000:	$10,000	Electrofishing backpack - est. $7500. More detail to be provided as 5-10 specific research projects are proposed.
Travel Expenses:	$76,000	Mileage, lodging, registration and meals for: investigator travel to 1 conference a year to present findings; research needs assessment participants; consulting researchers; meetings and field work. More detail to be provided as 5-10 specific research projects are proposed.
Other:	$350	voicemail service for MAISRC researchers and staff
TOTAL ENRTF BUDGET:	**$2,700,000**	

Explanation of Use of Classified Staff: N/A

Explanation of Capital Expenditures Greater Than $5,000: Electrofishing backpack - est. $7500. More detail to be provided as 5-10 specific research projects are proposed. Any equipment purchased with these funds would be retained and used for MAISRC projects in the future.

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: Approximately 26.2 FTE

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: More detail to be provided as 5-10 specific research projects are proposed.

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
University of Minnesota waived overhead (52%)	$1,400,000	$	Contributions to base salaries for tenure track faculty, space & utilities, human resources functions, payroll etc.
State			
2013 ENRTF "Aquatic Invasive Species Research Center" (Sadowsky- biocontrol of quagga & zebra mussel, Eurasian watermilfoil; Sorensen- detection, prevention, control of Asian carps; Bajer- biocontrol of common carp; Newman- Eurasian watermilfoil control with weevils; Venturelli-	$8,700,000	$1,505,853	Approximately $840,000 will be used to support personnel and other core MAISRC operations during 2017-2018 and 2018-2019 fiscal years. This appropriation ends June 30, 2019

modeling to understand threats of Heterosporis to game fish; Phelps- invasive carp control with pathogens; McCartney- mechanisms of zebra mussel spread; Galatowitsch- core operations through June 2019)			
TOTAL OTHER FUNDS:	**$8,700,000**	**$1,505,853**	

VII. PROJECT STRATEGY:

A. Project Partners: No partners are currently slated to receive funds from this request, although some may respond to the calls for proposals.

Partners NOT receiving ENRTF funding:

- The MAISRC Center Advisory Board (primarily external membership) provides guidance and input to the Director and Associate Director.
- MAISRC scientists and leadership coordinate with DNR in multiple ways as formalized in a memorandum of understanding (signed in 2013).
- As part of their research, MAISRC scientists collaborate with managers and scientists of USGS, USFWS, NPS, DNR and local government units (e.g., Minnehaha Creek Watershed District), and specific lakeshore associations. No partners are currently slated to receive funds from this request, although some may respond to the calls for proposals.

B. Project Impact and Long-term Strategy:

MAISRC was established to build long-term research capacity (including new faculty positions and facilities) although all initial funding sources were short-term (the main appropriation ends in 2019). We have been able to leverage the initial financial support, most notably through a university commitment, to make permanent two center positions (one faculty, one outreach staff). However, to ensure MAISRC continues to focus on the state's priorities and solutions-oriented research, additional ENRTF support is crucial.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	$ Amount
2012 ENRTF (Sorensen, invasive carp)	July 1, 2012- June 30, 2018	$2,000,000
2013 ENRTF (Sadowsky, Sorensen, Bajer, Newman, Venturelli, Phelps, Larkin, McCartney, Galatowitsch)	July 1, 2013- June 30, 2019	$8,700,000
2014 ENRTF (Sorensen, invasive carp)	July 1, 2014- June 30, 2017	$854,000

VIII. REPORTING REQUIREMENTS:

- **The project is for four (4) years, will begin on July 1, 2017, and end on June 30, 2021.**
- **Periodic project status update reports will be submitted January 31 and July 31 of each year.**
- **A final report and associated products will be submitted between June 30 and August 15, 2021**.

IX. VISUAL COMPONENT or MAP(S): Attached

Environment and Natural Resources Trust Fund
M.L. 2017 Project Budget

Project Title: Aquatic Invasive Species Research Center – Phase II
Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 06a
Project Manager: Nicholas Phelps
Organization: Minnesota Aquatic Invasive Species Research Center, University of Minnesota
Sub-Project Budget: $2,700,000
Project Length and Completion Date: 4 Years, June 30, 2021
Date of Report: October 14, 2016

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	***Activity 1:*** *Research for response to existing high priority AIS threats*			***Activity 2:*** *Research for rapid response to emerging high priority AIS threats*			***Activity 3:*** *Core Center functions to support AIS research*					
BUDGET ITEM	**Activity 1 Budget**	**Amount Spent**	**Activity 1 Balance**	**Activity 2 Budget**	**Amount Spent**	**Activity 2 Balance**	**Activity 3 Budget**	**Amount Spent**	**Activity 3 Balance**	**TOTAL BUDGET**	**TOTAL SPENT**	**TOTAL BALANCE**
Personnel (Wages and Benefits) - Total	**$980,000**		**$980,000**	**$430,000**		**$430,000**	**$780,000**		**$780,000**	**$2,190,000**	**$0**	**$2,190,000**
3-5 Post Docs:$457,531 salary, $91,770.16 fringe (20.75% fringe rate) 100% FTE x 2-3 years each, FTE TOTAL:10												
3-5 Grad Students: $171.701 salary, $270,790 benefits (37% tuition, 9% fringe) 50% FTE x 2-3 years each, FTE TOTAL: 5												
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5-7 Co-PI/ Scientists: $256,886 salary,$91,770 benefits (33.7% fringe rate) 4% FTE x 2-3 years each; 2 non tenured principle investigators 50% FTE x 2 years, FTE TOTAL 0.48												
PI/Project Manager- Phelps: $143,775 salary, $48,452 benefits (33.7% fringe rate) 50% FTE x 2 years FTE TOTAL: 1												
Co-Project Manager- Nash: $182,250 salary, $61,418 benefits (33.7% fringe rate) 100% FTE x 2 years FTE TOTAL: 2												
Comm. & Admin Assistant: $ 95,175 salary 26,078 benefits (27.4% fringe rate) 100% FTE x 2 years FTE TOTAL 2												
2 Aquatic laboratory techs: $111,375 salary, $30,517 benefits (27.4% fringe rate) 50% FTE x 2 years, FTE TOTAL: 2												
Professional/Technical Services and Contracts - Total	**$90,000**	**$0**	**$90,000**	**$45,000**	**$0**	**$45,000**	**$82,650**	**$0**	**$82,650**	**$217,650**	**$0**	**$217,650**
Services- office & gen oper. (printing/duplication, mailing, printer repairs, audio visual associated with seminars & conferences, conf. calls, surveys, insurance for shared equipment (pontoon, trailer) etc.) More detail to be provided as 5-10 specific research projects are proposed	$1,500		$1,500	$1,500		$1,500	**$8,000**		$8,000	$11,000	$0	$11,000
Services- lab & medical (contracts for statistics, DNA analysis, supercomputing institute, data storage, sequencing, biochemistry, microscopy; well permits, discharge licences and fees, preventative maintenance and maintenance of shared lab facilities). More detail to be provided as 5-10 specific research projects are proposed	$82,500		$82,500	$40,500		$40,500	**$48,000**		$48,000	$171,000	$0	$171,000
Professional Services & contracts- (fees or honoraria for guest lecturer and speakers, etc). More detail to be provided as 5-10 specific research projects are proposed	$3,000		$3,000	$3,000		$3,000	**$1,150**		$1,150	$7,150	$0	$7,150
Repairs- lab & field (Shared lab facility or other shared equipment; boats, transmitters, receivers, PCR machines,etc.) More detail to be provided as 5-10 specific research projects are proposed	$3,000		$3,000			$0	**$15,500**		$15,500	$18,500	$0	$18,500
Rentals- space and facilities for conferences and events (e.g. annual Showcase)			$0			$0	**$10,000**		$10,000	$10,000	$0	$10,000
Equipment/Tools/Supplies - Total	**$135,000**	**$0**	**$135,000**	**$30,000**	**$0**	**$30,000**	**$41,000**	**$0**	**$41,000**	**$206,000**	**$0**	**$206,000**
Supplies- office & gen oper. (paper, toner, folders, brochures, displays)	$300		$300	$600		$600	**$6,500**		$6,500	$7,400	$0	$7,400
Supplies- lab & field (piping, glue, gas, hoses for shared washdown and laboratory facilities; anesthesia, fish, fish food, gas for boats, replacement helio & LED bulbs for experiments; tanks, reagents, sampling supplies, and other consumables). More detail to be provided as 5-10 specific research projects are proposed	$59,700		$59,700	$17,400		$17,400	**$26,500**		$26,500	$103,600	$0	$103,600
Equipment- non capital lab & field (replacement pumps, valves, timers if needed, for shared laboratory facilities, storage containers; surgical equipment, pipetters, incubators; computer, software; trap nets, seine nets, dip nets; pumps, timers). More detail to be provided as 5-10 specific research projects are proposed.	$75,000		$75,000	$12,000		$12,000	**$8,000**		$8,000	$95,000	$0	$95,000
Capital Expenditures Over $5,000 - Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$10,000**	**$0**	**$10,000**	**$10,000**	**$0**	**$10,000**
Capital expenditures over $5,000: *Electrofishing backpack - est. $7500.* More detail to be provided as 5-10 specific research projects are proposed.	$0		$0			$0	**$10,000**		$10,000	$10,000	$0	$10,000
Travel - Total	**$39,000**	**$0**	**$39,000**	**$21,000**	**$0**	**$21,000**	**$16,000**	**$0**	**$16,000**	**$76,000**	**$0**	**$76,000**
Mileage, lodging, registration and meals for: investigator travel to 1 conference a year to present findings; research needs assessment participants; consulting researchers; meetings and field work. More detail to be provided as 5-10 specific research projects are proposed.	$39,000		$39,000	$21,000		$21,000	**$16,000**		$16,000	$76,000	$0	$76,000
Other - Total	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$350**	**$0**	**$350**	**$350**	**$0**	**$350**
Telecommunications: voicemail service for MAISRC researchers and staff			$0			$0	**$350**		$350	$350	$0	$350
COLUMN TOTAL	**$1,244,000**	**$0**	**$1,244,000**	**$526,000**	**$0**	**$526,000**	**$930,000**	**$0**	**$930,000**	**$2,700,000**	**$0**	**$2,700,000**

Minnesota Aquatic Invasive Species Research Center

Research Priorities and Project Selection

ANNUAL THREAT ASSESSMENT (Technical Committee)

Ensure list of species needing research attention includes emerging threats as well as those already known MN AIS problems

UPDATE RESEARCH PRIORITIES (Broad input)

Determine changes needed to center's research priorities* based on new threats & research progress on current projects* * (*see lists below)

SUPPORT NEW & CONTINUING PRIORITY RESEARCH (Panels)

Make new research investments through competitive grants process and scientific peer review

*HIGH PRIORITY NEEDS (2014-2015 EXAMPLES)	**CURRENT & PENDING PROJECTS
AIS Fish	**AIS Fish**
Carp deterrents for use in small waterways	Common carp control; eDNA to assess presence of Asian carp and common carp; 'Judas fish' technique for removing carp; Food attractants to control silver carp; Bubble curtains to deter Asian carp; Eradication of invasive carps using viruses; Asian carp risk analysis; Blocking Asian carp with Lock and Dams; Common carp biocontrol and toxins
AIS Invertebrates	**AIS Invertebrates**
Early stage treatment options for zebra mussels; Genetic controls for zebra mussels; Identifying highest risks for zebra mussel & spiny water flea spread (e.g., bait, boaters, docks, lifts, etc.); Identifying pathways for new threats: killer shrimp, New Zealand mud snail, red swamp crayfish.	Zebra mussel pathways of spread through genetics; early detection tools; survey protocols; Biological control strategies –zebra mussels; Improving zebra mussel biocide efficacy. Spiny water flea impacts on game fish populations.
AIS Plants	**AIS Plants**
Better controls for hybrid/narrow leaf cattail ; Reducing curly leaf pondweed propagules as a control approach; Minimum dosing of herbicides to control hybrid milfoil; common reed risk assessment	Weevil control of Eurasian watermilfoil ; Eurasian watermilfoil biocontrol; Curly leaf pondweed controls, non-target impacts, and post-control recovery of natives; Starry stonewort risk assessment and control methods
AIS Microbes	**AIS Microbes**
Development of systematic, science- based surveillance technologies for harmful pathogens	Heterosporis threats to game fish; VHS screening

Note: AIS systems (multi-species) research needs will cross all of the areas described above.